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Site Screening Process Report

Site 36 - Closed Landfill

Naval Support Facility,
Indian Head
Indian Head, Maryland

Naval Facilities Engineering Command
Washington

Contract Number N62472-03-D-0057

Contract Task Order 5

May 2008

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SITE SCREENING PROCESS REPORT

SITE 36 - CLOSED LANDFILL

NAVAL SUPPORT FACILITY, INDIAN HEAD
INDIAN HEAD, MARYLAND

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

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1314 Harwood Street, SE
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Submitted by:
Tetra Tech NUS, Inc.
234 Mall Boulevard, Suite 260
King of Prussia, Pennsylvania 19406

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PREPARED UNDER THE DIRECTION OF:

Kim C. Turnbull

KIM C. TURNBULL
PROJECT MANAGER
TETRA TECH NUS, INC.
PITTSBURGH, PENNSYLVANIA

APPROVED FOR SUBMISSION BY:

John Trepanowski

JOHN J. TREPANOWSKI, P.E.
PROGRAM MANAGER
TETRA TECH NUS, INC.
KING OF PRUSSIA, PENNSYLVANIA

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ACRONYMS

µg/kg	microgram per kilogram
µg/L	microgram per liter
AET	apparent effects threshold
ASTM	American Society for Testing and Materials
AVS/SEM	acid volatile sulfide/simultaneously extracted metals
BAF	bioaccumulation factor
B&R	Brown & Root
bgs	below ground surface
BTAG	Biological Technical Assistance Group
CDI	chronic daily intake
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CLEAN	Comprehensive Long-Term Environmental Action Navy
CLP	Contract Laboratory Program
COPC	chemical of potential concern
CTO	Contract Task Order
DAF	dilution attenuation factor
DoN	Department of the Navy
EC	Environment Canada
EC50	median effect concentration
EEQ	Ecological Effects Quotient
EPA	United States Environmental Protection Agency
EqP	equilibrium partioning
ERA	ecological risk assessment
ER-M	effects range-median
FFA	Federal Facility Agreement
FS	feasibility study
GPS	Global Positioning System
HI	hazard index
HQ	hazard quotient
IAS	Initial Assessment Study
IDW	investigation-derived waste
IHDIV-NSWC	Indian Head Division, Naval Surface Warfare Center
IHIRT	Indian Head Installation Restoration Team
ILCR	incremental lifetime cancer risk

LC50	Lethal Concentration 50
LOAEL	lowest observable adverse effects level
mg/kg	milligram per kilogram
MS	matrix spike
MSD	matrix spike duplicate
NAD	North American Datum
NGVD29	National Geodetic Vertical Datum, 1929
NOAEL	no observed adverse effects level
NSF-IH	Naval Support Facility, Indian Head
ORNL	Oak Ridge National Laboratory
PAH	polynuclear aromatic hydrocarbon
PAN	Pesticide Action Network
PEC	probable effect concentration
PPE	personal protective equipment
PVC	polyvinyl chloride
QA	quality assurance
QC	quality control
RBC	risk-based concentration
RI	remedial investigation
SCV	Secondary Chronic Value
SEL	severe effects level
SM	Standard Methods
SOW	Statement of Work
SQG	Soil Quality Guideline
SSA	Site Screening Area
SSI	site screening investigation
SSL	soil screening level
SSP	Site Screening Process
SVOC	semivolatile organic compound
TAL	Target Analyte List
TCL	Target Compound List
TEC	threshold effect concentration
TOC	total organic carbon
TRV	toxicity reference value
TtNUS	Tetra Tech NUS, Inc.
USATHAMA	United States Army Toxic and Hazardous Materials Agency

UTL	upper tolerance limit
VOC	volatile organic compound

EXECUTIVE SUMMARY

INTRODUCTION

This Site Screening Process (SSP) Report for Naval Support Facility, Indian Head (NSF-IH) in Indian Head, Maryland was prepared by Tetra Tech NUS, Inc. (TtNUS) in response to Contract Task Order (CTO) 005 under the Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract Number N62472-D-03-0057. NSF-IH is part of Naval Support Activity, South Potomac within the Naval District Washington Region. Until October 1, 2005, NSF-IH was referred to as Naval District Washington, Indian Head. This report describes the SSP for Site 36 – Closed Landfill.

The objective of the SSP was to collect and evaluate sufficient data to provide the basis for a determination that either: (1) additional investigation or remediation is needed or (2) the area does not pose a threat or potential threat to public health, welfare, or the environment and should be removed from further study under the Federal Facility Agreement (FFA) (EPA Region 3 and DoN, 2000). The SSP field investigations leading to this report were outlined in a site-specific work plan (TtNUS, 2005) and a work plan (technical memorandum) for a benthic macroinvertebrate study (TtNUS, 2006) that detailed the environmental samples and analytical methods needed to make a decision for this site.

Site 36 is located in the western portion of Stump Neck Annex along Roach Road adjacent to Chickamuxen Creek. The landfill was used from 1972 to 1974 and was believed to contain metal casings such as mines, bombs, and torpedoes. The contents were reportedly certified inert and did not contain any explosives or chemicals when buried. The amount of waste is not known. Previous site visits indicated the presence of small metal parts on the site surface and debris scattered along the shoreline of the creek. Contaminants present in the waste would have been deposited in the immediate area of disposal and could have migrated to shallow groundwater and Chickamuxen Creek.

FIELD INVESTIGATIONS AND DATA EVALUATION

2005 SSP Investigation

Prior to the SSP investigation, no environmental sampling had been conducted at Site 36. A geophysical survey conducted in 2002 identified anomalies throughout the area of the suspected landfill indicating that waste may have been disposed at the site (TtNUS, 2003). As part of the SSP, surface soil, shallow groundwater, surface water, sediment, and sediment pore water samples were collected. Quality control (QC) samples (duplicates and blanks) were also collected. All samples were analyzed for Target Compound List (TCL) volatile organic compounds (VOCs), TCL semivolatile organic compounds (SVOCs), explosives, Target Analyte List (TAL) metals, hexavalent chromium, and cyanide.

Two soil borings were installed in the landfill to depths of approximately 14 feet below ground surface (bgs) and were converted into shallow groundwater monitoring wells. Another soil boring was installed upgradient of the landfill to a depth of approximately 18 feet bgs and was converted into a monitoring well.

Surface soil samples were collected from six locations across the site from depths of 0 to 1 foot bgs. Several VOCs, many SVOCs, mostly polynuclear aromatic hydrocarbons (PAHs), one explosive (nitrocellulose), and many metals were detected. Cyanide and hexavalent chromium were not detected.

Shallow groundwater samples were collected from the upgradient monitoring well and the monitoring wells installed in the landfill. Three VOCs (ethylbenzene, toluene, and trichloroethene), four SVOCs (acetophenone, benzaldehyde, 4-methylphenol, and phenol), three explosives (2,6-dinitrotoluene, RDX, and tetryl), and several metals were detected. Cyanide and hexavalent chromium were not detected.

Surface water and sediment samples were collected from six locations in Chickamuxen Creek. One VOC (methylene chloride), several metals, and cyanide were detected in surface water. SVOCs, explosives, and hexavalent chromium were not detected. Three VOCs (2-butanone, acetone, and trichlorofluoromethane), many PAHs, one explosive (nitroglycerin), several metals, and cyanide were detected. Hexavalent chromium was not detected.

Sediment pore water samples were collected from four locations around the landfill perimeter. One VOC (toluene), two SVOCs (4-methylphenol and acetophenone), four explosives (1,3,5-trinitrobenzene, 1,3-dinitrobenzene, 2,4,6-trinitrotoluene, and 4-nitrotoluene), and several metals were detected. Cyanide and hexavalent chromium were not detected.

2007 Benthic Macroinvertebrate Study

Based on the results of the SSP investigation conducted in 2005, it was determined that additional information on potential ecological risks, particularly to benthic organisms, in Chickamuxen Creek was necessary. During the benthic study in 2007, sediment samples were collected from nine additional locations in Chickamuxen Creek. Five locations were near the site, two reference locations were upstream of the site, and two reference locations were downstream of the site. QC samples were also collected. All samples were analyzed for PAHs, TAL metals and cyanide, acid volatile sulfide/simultaneously extracted metals (AVS/SEM) (cadmium, copper, lead, nickel, silver, and zinc), total organic carbon (TOC), and grain size. An analysis of the benthic macroinvertebrate community for type and quantity was also conducted.

Many PAHs and several metals were detected. PAHs were only detected in sediment samples collected near the site.

Risk Evaluation

The human health risk characterization resulted in an incremental lifetime cancer risk (ILCR) of 7.6E-04, which is greater than the United States Environmental Protection Agency (EPA) acceptable risk range of 1E-04 to 1E-06. There are no unacceptable carcinogenic risks associated with exposure to surface soil or surface water. The ILCR for exposure to shallow groundwater is 5.2E-04, and the ILCR for exposure to sediment pore water is 1.1E-04, which are both greater than the acceptable range. The primary risk driver for both media is arsenic. The ILCR for exposure to sediment is 1.1E-04. The primary risk drivers are benzo(a)pyrene, benzo(b)fluoranthene, and arsenic. This evaluation conservatively assumed that shallow groundwater and sediment port water would be used as sources of drinking water. However, this assumption is very conservative, and the risk estimate for exposure to sediment pore water is biased high. Although sediment pore water could be considered as shallow groundwater that is discharging into Chickamuxen Creek, it is highly unlikely that a water supply well would be installed in the creek. The risk screening evaluation assumed that exposure to sediment would be the same as exposure to surface soil under a residential scenario. However, this assumption is very conservative, and the risk estimate is biased high because there would be less exposure to sediment under a realistic residential exposure scenario. Also, the EPA soil screening levels used in the evaluation are based on the inhalation and inhalation routes of exposure, which is a reasonable assumption; however, exposure to sediment under a more reasonable assumption would primarily be associated with dermal contact. There are no screening levels available for dermal exposure.

The total hazard index (HI) is 21, which is greater than the EPA threshold of 1.0. Even when target organ effects are considered, the cumulative HIs for several target organs are greater than 1.0. Target organ HIs are greater than 1.0 for shallow groundwater, sediment pore water, and sediment. Risk drivers for shallow groundwater are arsenic, iron, and manganese. Risk drivers for sediment pore water are iron and manganese. The only risk driver for sediment is iron. The risk estimates for exposure to sediment pore water and sediment are biased high for the reasons stated above.

There are no unacceptable risks to ecological receptors. Potential risks to plants and invertebrates from chemicals detected in surface soil are acceptable. Based on comparisons to ecological screening levels, there are potential risks to aquatic organisms from exposure to surface water and potential risks to sediment invertebrates from exposure to sediment and sediment pore water. However, results from benthic macroinvertebrate surveys indicate that the benthic community is not being adversely affected by chemicals detected in sediment. Also, metals detected in sediment should not be bioavailable based on

AVS/SEM results. Results from food-chain modeling indicate that potential risks to terrestrial wildlife are acceptable.

Migration of soil contaminants to groundwater is not considered to be problematic.

CONCLUSIONS AND RECOMMENDATIONS

- There are unacceptable risks to human health from exposure to shallow groundwater, sediment pore water, and sediment based on a residential land use scenario. The risk estimates for exposure to sediment pore water and sediment are considered to be biased high.

- There are no unacceptable risks to ecological receptors.

- Migration of soil contaminants to groundwater is not considered to be problematic.

- Prior activities have resulted in the release of hazardous substances, pollutants, contaminants, hazardous wastes, or hazardous constituents at concentrations of potential environmental concern.

Preparation of a Feasibility Study (FS) is recommended to evaluate remedial alternatives to address potential risks to human health and the environment. Sufficient data have been collected to determine the nature and extent of contamination and to allow for the evaluation of remedial alternatives.

1.0 INTRODUCTION

This Site Screening Process (SSP) Report for Naval Support Facility, Indian Head (NSF-IH) in Indian Head, Maryland was prepared by Tetra Tech NUS, Inc. (TtNUS) in response to Contract Task Order (CTO) 005 under the Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract Number N62472-03-D-0057. NSF-IH is part of Naval Support Activity, South Potomac within the Naval District Washington Region. This report describes the SSP for Site 36 – Closed Landfill.

1.1 PURPOSE AND REPORT ORGANIZATION

The purpose of the SSP is to determine whether operations at Site 36 have resulted in the release of hazardous substances, pollutants, contaminants, hazardous wastes, or hazardous constituents at concentrations of potential environmental concern. Site 36 is among the Site Screening Areas (SSAs) identified in Appendix A of the Federal Facility Agreement (FFA) (EPA Region 3 and DoN, 2000). SSAs are those geographic areas with suspected contamination that will require some level of investigation under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) program.

Section 1.0 presents the purpose, objectives, and scope of this report and summarizes facility background information. Sections 2.0 and 3.0 provide the general investigative procedures and evaluation methods, respectively. Sections 4.0 and 5.0 provide the results of the SSP for Sites 36 and 38, respectively.

1.2 OBJECTIVE AND SCOPE

The objective of the SSP investigation was to collect sufficient data to provide the basis for a determination that either: (1) a remedial investigation (RI)/feasibility study (FS), an FS, another investigation, and/or removal action, as appropriate, is required at the area addressed by the SSP or (2) the area does not pose a threat or potential threat to public health, welfare, or the environment and therefore the area should be removed from further study under the FFA. The general scope of the SSP at Site 36 was agreed upon by the Indian Head Installation Restoration Team (IHIRT) through approval of the SSP Investigation Work Plan (TtNUS, 2005) and Benthic Macroinvertebrate Study Work Plan (TtNUS, 2006).

The investigation process consisted of research, media sampling, and analytical data evaluation. The research consisted of a review of historical facility documents related to operations at Site 36. Surface soil, shallow groundwater, surface water, sediment, and sediment pore water samples were collected. In

addition, sediment samples for macroinvertebrate analysis were collected. Analytical data were evaluated via a formal data validation process, background comparisons (for soil), and human health and ecological risk screening analyses.

1.3 FACILITY BACKGROUND

NSF-IH is located in northwestern Charles County, Maryland. As shown on Figure 1-1, NSF-IH is approximately 25 miles southwest of Washington, D.C. NSF-IH is a military facility consisting of the Main Area on the Cornwallis Neck Peninsula and the Annex on Stump Neck. As shown on Figure 1-2, the Main Area is bounded by the Potomac River on the northwest, west, and south, Mattawoman Creek to the south and east, and the Town of Indian Head to the northeast. Stump Neck Annex is located across Mattawoman Creek and is not contiguous with the Main Area. The locations of Site 36 is shown on Figure 1-2.

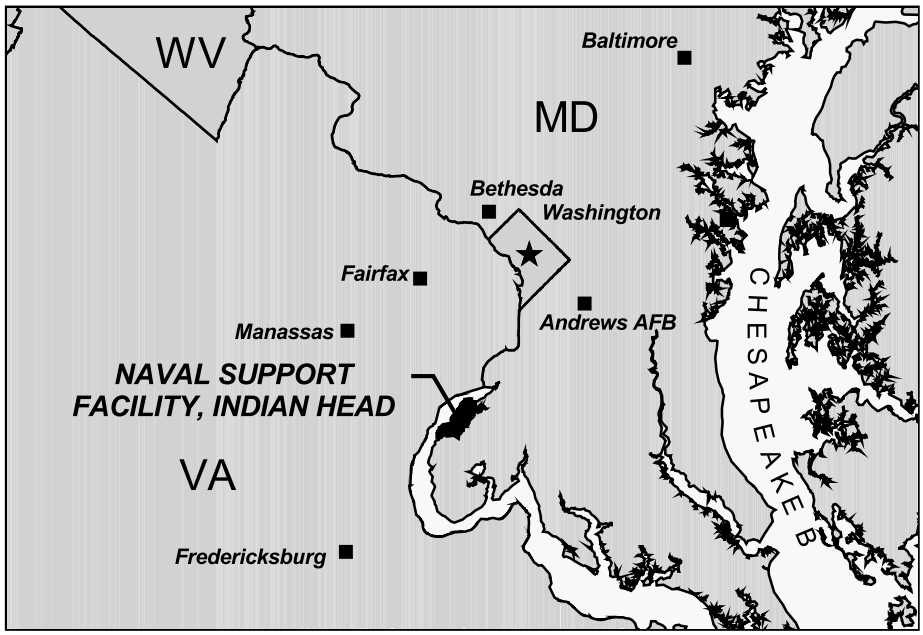
The primary mission of the Indian Head Division, Naval Surface Warfare Center (IHDIV-NSWC), the main tenant at NSF-IH, is as follows:

- To provide services in energetics for all warfare centers through engineering, fleet and operation support, manufacturing technology, limited production, and industrial base support.

- To provide research, development, testing, and evaluation of energetic materials, ordnance devices and components, and other related ordnance engineering standards including chemicals, propellants and their propulsion systems, explosives, pyrotechnics, warheads, and simulators.

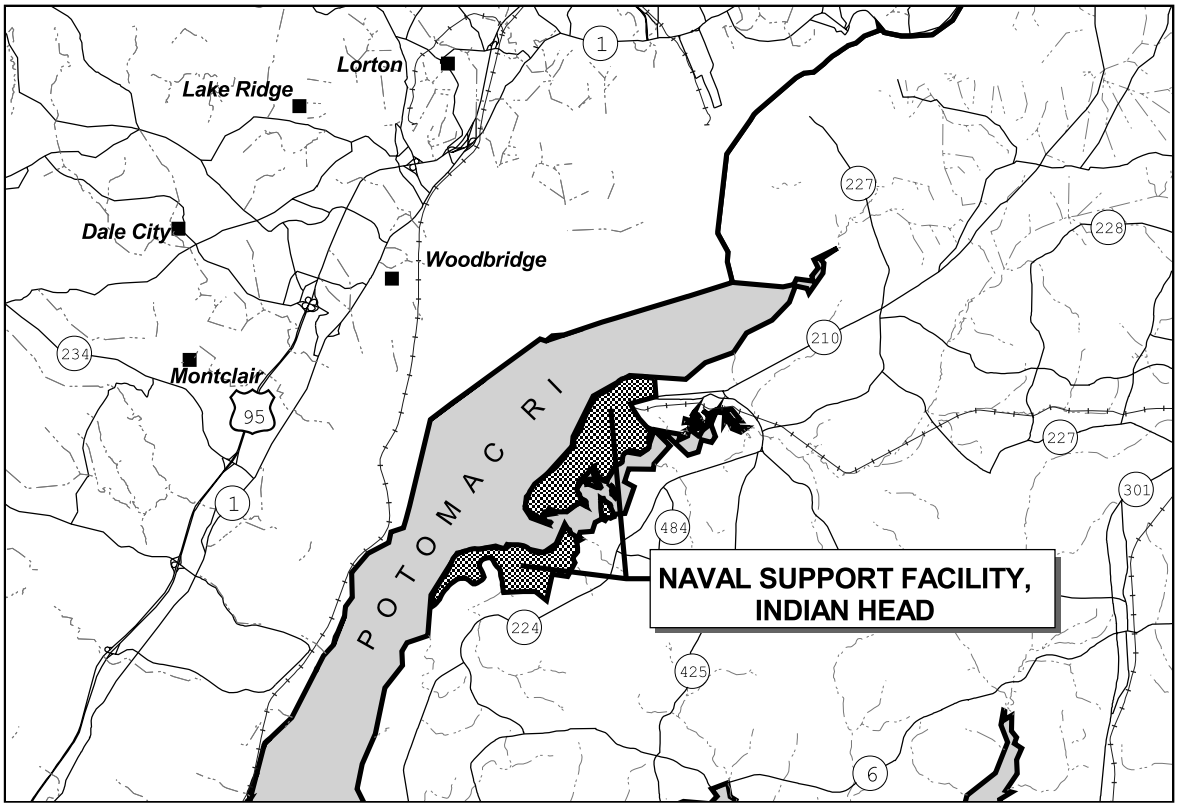
- To provide support to all warfare centers, military departments, and the ordnance industry for special weapons, explosives, safety, and ordnance environmental issues.

- To execute other responsibilities as assigned by the Commander of the IHDIV-NSWC.



LEGEND

- City
- Highway
- Railroad
- River



DRAWN BY K. PEILA — DATE 2/4/04	Tetra Tech NUS, Inc.	CONTRACT NUMBER 2144	OWNER NO. 005
CHECKED BY G. LATULIPPE — DATE 2/2/04	FACILITY LOCATION MAP NAVAL SUPPORT FACILITY, INDIAN HEAD INDIAN HEAD, MARYLAND	APPROVED BY GJL — DATE 6/4/04	
COST/SCHEDULE-AREA		APPROVED BY — — DATE —	
SCALE AS NOTED		DRAWING NO. FIGURE 1-1	REV 0

P:\GIS\NSWC_INDIAN_HEAD\WORKPLAN_SITELOCATION.APR FACILITY LOCATION MAP 12/12/05 KMP

P:\GIS\INDIANHEAD_NSWC_NEW\MXD\SITE_LOCATION_MAP.MXD 12/13/07 KM

DRAWN BY K. MOORE DATE 12/13/07	Tetra Tech NUS, Inc.	CONTRACT NUMBER 2144	OWNER NUMBER 005
CHECKED BY K. TURNBULL DATE 12/13/07	SITE LOCATION MAP SITE 36 NAVAL SUPPORT FACILITY, INDIAN HEAD INDIAN HEAD, MARYLAND	APPROVED BY JHL	DATE 6/8/04
COST/SCHEDULE-AREA		APPROVED BY —	DATE —
SCALE AS NOTED		FIGURE NO. FIGURE 1-2	REV 0

2.0 GENERAL INVESTIGATIVE PROCEDURES

Investigations were conducted in 2005 and 2007. The 2005 investigation was conducted in accordance with the SSP Work Plan (TtNUS, 2005), which was developed to identify the presence or absence of contamination. Surface soil, shallow groundwater, surface water, sediment, and sediment pore water samples were collected. Based on the results, it was determined that additional information on potential ecological risks, particularly to benthic organisms, in Chickamuxen Creek, was needed. In 2007, sediment samples were collected in accordance with the Benthic Macroinvertebrate Study Work Plan (TtNUS, 2006).

2.1 FIELD SAMPLING

2.1.1 Surface Soil Sampling

Surface soil samples were collected from depth intervals of 0 to 1 foot below ground surface (bgs) at six locations during the 2005 investigation. A shovel was used to remove the sod at each sampling location, if necessary. After the sod was removed, dedicated, plastic, disposable trowels were used to collect the samples. Sample log sheets and chain of custody forms are provided in Appendix A.

2.1.2 Groundwater Sampling

As part of the 2005 investigation, three shallow groundwater monitoring wells were installed. The wells were constructed of 2-inch-diameter polyvinyl chloride (PVC) with 10-foot-long screens and were fitted with stick-up protective casings with concrete pads and bumper posts. All wells were developed until field measurements for temperature, pH, specific conductance, and turbidity indicated stable conditions. Prior to sampling, the wells were purged using a low-flow peristaltic pump until the above field parameters had stabilized. Shallow groundwater samples were obtained using the same low-flow pump. Well construction diagrams, boring logs, well development records, low-flow purge data, sample log sheets, and chain of custody forms are provided in Appendix A.

2.1.3 Surface Water Sampling

Surface water samples were collected from six locations during the 2005 investigation. The samples were collected by directly filling the container from the surface water body. Sample log sheets and chain of custody forms are provided in Appendix A.

2.1.4 Sediment Sampling

Sediment samples were collected from six locations during the 2005 investigation. The samples were collected from the top 0 to 6 inches of the streambed using dedicated, plastic, disposable trowels. During the 2007 investigation, sediment samples were collected from nine locations using a ponar dredge. Samples for benthic invertebrate analysis were processed using a 500-micron sieve to remove fine sediment. Material remaining on the sieve was submitted for macroinvertebrate analysis. Sample log sheets and chain of custody forms are provided in Appendix A.

2.1.5 Sediment Pore Water Sampling

Sediment pore water samples were collected from four locations during the 2005 investigation. The pore water samples were collected using temporary drive-points for sample collection. The drive point at each of the locations was manually driven into the sediment such that the perforations/slots were below the top of the sediment. The portion of the drive point above the sediment was solid to preclude surface water from entering the drive point. The pore water was purged from the drive point using a peristaltic pump to ensure that representative pore water was being pumped from the sediment. Pore water samples were collected following purging. Sample log sheets and chain of custody forms are provided in Appendix A.

2.1.6 Quality Control Samples

Quality assurance (QA)/quality control (QC) samples were collected in accordance with the work plans (TtNUS, 2005 and TtNUS, 2006) and included field duplicates, equipment rinsate blanks, trip blanks, and matrix spike (MS) and matrix spike duplicate (MSD) samples. One field duplicate was collected for each type of sample (e.g., surface soil, groundwater). Equipment rinsate blanks were generated by pouring reagent grade water over the sampling equipment. A trip blank was included in every shipping cooler that contained samples for volatile organic compound (VOC) analysis. One MS/MSD sample was collected for each medium.

2.2 LABORATORY ANALYSIS

All samples collected in 2005 were analyzed for Target Compound List (TCL) VOCs, TCL semivolatile organic compounds (SVOCs), explosives (including nitrocellulose, nitroglycerin, and nitroguanidine), Target Analyte List (TAL) metals, hexavalent chromium, and cyanide. The following analytical methods were used:

- TCL VOCs via Contract Laboratory Program (CLP) Statement of Work (SOW) OLC03.2 (groundwater, surface water, sediment pore water, and aqueous QA/QC blanks) and SOW OLM04.3 (soil, sediment, and solid QA/QC blanks)

- TCL SVOCs via CLP SOW OLM04.3
- Explosives and nitroguanidine via SW-846 Method 8330
- Nitrocellulose via United States Army Toxic and Hazardous Materials Agency (USATHAMA) method
- Nitroglycerin via SW-846 Method 8332
- TAL metals and cyanide via CLP SOW ILM04.1
- Hexavalent chromium via Standard Methods (SM) 3500-Cr

All samples collected in 2007 were analyzed for polynuclear aromatic hydrocarbons (PAHs), TAL metals and cyanide, acid volatile sulfide/simultaneously extracted metals (AVS/SEM) (cadmium, copper, lead, nickel, silver, and zinc), total organic carbon (TOC), and grain size. The following analytical methods were used:

- PAHs via SW-846 Method 8270C
- TAL metals and cyanide via CLP SOW ILM04.1
- AVS/SEM via EPA Publication 821/R-91-100
- TOC via Lloyd Kahn Method (SW-846 Method 9060)
- Grain size via American Society for Testing and Materials (ASTM) Method D422

Samples were also submitted for benthic macroinvertebrate analysis.

2.3 INVESTIGATION-DERIVED WASTE HANDLING

The investigation-derived waste (IDW) produced during the investigations included borehole cuttings, well development and purge water, decontamination fluids, disposable sampling equipment, personal protective equipment (PPE), and miscellaneous trash. Solid borehole cuttings and aqueous IDW (well development/purge water and decontamination fluids) were placed in separate 55-gallon drums for subsequent testing and disposal. Samples were collected by the IDW disposal subcontractor and analyzed for the characteristics of a hazardous waste. Based on this testing, the IDW was hauled off site and disposed as nonhazardous waste. Disposable sampling equipment, PPE, and trash were double bagged in plastic trash bags and disposed in a dumpster at the facility.

2.4 SURVEYING

A registered land surveyor licensed to practice in the State of Maryland surveyed the 2005 monitoring well and sampling locations. Horizontal locations were surveyed to Maryland State Plane coordinates [North American Datum (NAD) 1983]. Vertical elevations were surveyed to National Geodetic Vertical Datum, 1929 (NGVD29).

The 2007 sampling locations were surveyed using a Global Positioning System (GPS) unit. Horizontal locations were surveyed to Maryland State Plane coordinates (NAD 1983).

3.0 GENERAL DATA EVALUATION METHODS

3.1 DATA VALIDATION

All samples were subjected to data validation. Data validation is an objective, systematic process in which analytical data are reviewed to ascertain the validity of the reported results and to identify for the data user the possible limitations of the results. This section summarizes the various aspects of the data validation process. Appendix B contains the validated analytical data for all samples. Data validation memoranda are provided in Appendix C.

3.1.1 General Data Validation Procedures

Validation of the data generated for samples collected during the SSP field efforts was completed in accordance with United States Environmental Protection Agency (EPA) National Functional Guidelines for Organic and Inorganic Data Review as modified for use in EPA Region 3 (EPA, 1994a and 1993a).

The organic data review was based on data completeness, system performance, holding times, gas chromatograph/mass spectrometer tuning, initial and continuing calibrations, laboratory method blank results, surrogate spike and internal standard recoveries, blank spike and blank spike duplicate results, MS/MSD results, compound identification, compound quantitation, field duplicates, and detection limits.

The inorganic data review was based on data completeness, holding times, calibration data, laboratory method and preparation blanks, interference check sample results, MS results, laboratory duplicate precision, laboratory control sample results, inductively coupled plasma serial dilution results, field duplicate precision, detection limits, and analyte quantitation.

Evaluation of laboratory and field QC blanks aided in the elimination of false positive results, which were identified as laboratory and/or field artifacts. Noncompliances observed during the validation process resulted in qualification of analytical data. The qualifiers alert the data user to imprecise or estimated results and, in the worst case, unreliable or unusable data.

The results of the validation process were summarized in sample delivery group-specific technical reports consisting of a memorandum, qualified analytical results, results as reported by the laboratory, and supporting documentation that provided the rationale for changes and/or qualification of the data. These memoranda provide a detailed explanation of the results of the data validation review. Copies of the data validation memoranda are included in Appendix C. All other data validation documentation is retained on file at the TtNUS Pittsburgh, Pennsylvania office.

3.1.2 Data Validation Qualifiers

Various qualifiers were attached to the analytical data by the laboratory and as a result of the data validation process. The attachment of data qualifiers to analytical results signified the occurrence of QC noncompliance. The data qualifiers assigned to the analytical results are defined as follows:

- B – This qualifier is added to a positive result reported by the laboratory if the detected concentration is determined to be attributable to contamination introduced during field sampling or laboratory analysis. The result is considered to be a false positive.

- J – Indicates that the chemical was detected. However, based on laboratory noncompliances, the associated numerical result is not a precise representation of the amount that is actually present in the sample. The concentration reported by the laboratory is considered to be an estimated value. The bias (high or low) of this result cannot be determined.

- K – Indicates that the chemical was detected. However, the associated numerical result is not a precise representation of the amount that is actually in the sample. The concentration reported by the laboratory is considered to be biased high based on laboratory noncompliances noted during the data validation process.

- L – Indicates that the chemical was detected. However, the associated numerical result is not a precise representation of the amount that is actually in the sample. The concentration reported by the laboratory is considered to be biased low based on laboratory noncompliances noted during the data validation process.

- R – Indicates that the chemical may or may not be present. The numerical result reported by the laboratory is considered to be unreliable and unusable. During the data validation process, this qualifier is applied in cases of gross laboratory technical deficiencies (i.e., holding times missed by a factor of two times the specified time limit, severe calibration noncompliances, and extremely low QC recoveries).

- U – Indicates that the chemical was not detected at the numerical detection limit (sample-specific quantitation limit) noted. Nondetect results are reported in this manner by the laboratory.

- UJ – Indicates that the chemical was not detected. However, the detection limit (sample-specific quantitation limit) is considered to be estimated based on problems encountered during laboratory

analysis, as noted during the data validation process. The associated numerical detection limit is regarded as inaccurate or imprecise. The bias (high or low) of this result cannot be determined.

- UL – Indicates that the chemical was not detected. However, the detection limit (sample-specific quantitation limit) is considered to be biased low based on problems encountered during laboratory analysis, as noted during the data validation process. The associated numerical detection limit is regarded as inaccurate or imprecise.

- UR – Indicates that the chemical may or may not be present. The nondetected analytical result reported by the laboratory is considered to be unreliable and unusable. During the data validation process, this qualifier is applied in cases of gross laboratory technical deficiencies (i.e., holding times missed by a factor of two times the specified time limit, severe calibration noncompliances, and extremely low QC recoveries).

The preceding data qualifiers may be categorized as indicative of major or minor problems. Major problems are defined as issues that result in the rejection of data, qualified with R and UR data validation qualifiers. These data are considered invalid and were not used for risk screening analysis or decision-making purposes. Minor problems are defined as issues resulting in estimation of data, qualified with J, K, L, UJ, and UL data validation qualifiers. Analytical results qualified as estimated or biased are suitable for risk screening analysis and decision-making purposes.

3.2 BACKGROUND DATABASE

A basewide background investigation was conducted at NSF-IH in 1997 (B&R Environmental, 1997). Additional background samples were collected, and the background investigation was revised in 2002 (TtNUS, 2002). The purpose of this investigation was to establish a basewide background database that would be used as a tool to evaluate analytical results for soil. The data are used to determine whether soil samples at NSF-IH contain chemicals at concentrations greater than naturally occurring background concentrations.

With few exceptions, the inorganic concentrations reported in background soils are within the range of background concentrations reported for soils in the eastern United States (Shacklette and Boerngen, 1984) and the State of Maryland (Dragun, 1991).

The background values for surface soil are presented in Table 3-1. For the SSP, the 95-percent upper tolerance limit (UTL) was used as the threshold background concentration. Chemicals detected in soil samples at concentrations less than background were not considered as chemicals of potential concern (COPCs).

3.3 HUMAN HEALTH RISK SCREENING METHODOLOGY

The purpose of the human health risk screening was to conservatively estimate the potential risks to human health so that management decisions can be made (e.g., additional study, additional action, or no further action). The risk screening analysis conducted for SSP sites consists of the following steps, which are similar to those in a baseline human health risk assessment:

- Data evaluation (i.e., selection of COPCs)
- Exposure assessment
- Toxicity assessment
- Risk characterization

The risk screening analysis is based on methodologies used to calculate EPA Region 3 risk-based concentrations (RBCs) (EPA, 2003a) to conservatively assess potential exposure and toxicity to human receptors. The RBCs for residential soil and tap water are based on a lifetime resident for carcinogens and a child resident for noncarcinogens.

3.3.1 Selection of Chemicals of Potential Concern

The following factors were considered in the selection of COPCs for human receptors:

- Occurrence and distribution of chemical in environmental media
- Chemical toxicity
- Comparison of site-specific concentrations with representative background concentrations

3.3.1.1 Occurrence and Distribution

The initial list of COPCs included any chemical detected at least once in environmental samples. Essential human nutrients not otherwise known to be associated with the site (calcium, magnesium, potassium, and sodium) and present at low concentrations and toxic only at high doses were not included in the initial list of COPCs.

3.3.1.2 Chemical Toxicity

After the initial list of COPCs was complete, the data were further screened on the basis of chemical toxicity. For purposes of this report, the values used to select COPCs based on chemical toxicity are referred to as “risk screening levels.” In general, if the maximum detected concentration was greater than

a risk screening level, the chemical was identified as a COPC. Because of the additive noncarcinogenic effects of some chemicals (some chemicals affect the same target organ or exhibit similar mechanisms of action), one-tenth of the RBC for noncarcinogenic effects was used as the risk screening level.

For soil and sediment, the following risk screening levels were used to select COPCs:

- EPA Region 3 RBCs for soil ingestion under residential land use (EPA, 2007a)
- EPA Region 3 soil screening levels (SSLs) for migration of chemicals to groundwater (EPA, 2007a)
- Federal SSLs for inhalation (transfers from soil to air) (EPA, 2007b)

EPA Region 3 SSLs for migration to groundwater have not been developed for all chemicals. For chemicals without a Region 3 SSL, federal SSLs were used, if available. For this report, federal SSLs were used for cis-1,2-dichloroethene, 2,4,5-trichlorophenol, 2,4,6-trichlorophenol, 2,4-dinitrophenol, 2-chlorophenol, 2-methylphenol, 2-nitroaniline, 3-nitroaniline, 4,6-dinitro-2-methylphenol, 4-methylphenol, 4-nitroaniline, benzaldehyde, caprolactum, dibenzofuran, pentachlorophenol, 1,3,5-trinitrobenzene, 2,4,7-trinitrotoluene, 2-nitrotoluene, 3-nitrotoluene, 4-nitrotoluene, aluminum, cobalt, mercury, and nickel. Table 3-2 summarizes the human health risk screening levels for soil.

For groundwater, surface water, and sediment pore water, EPA Region 3 RBCs for tap water (EPA, 2007a) were used to select COPCs. Table 3-3 summarizes the RBCs for tap water.

3.3.1.3 Background

Inorganic COPCs in soil were also selected based on a comparison of site concentrations to representative basewide background concentrations. If the maximum detected concentration was greater than both the risk screening level and the representative background concentration, the chemical was retained as a COPC for further risk evaluation. If the maximum concentration was less than the background concentration, the chemical was not retained as a COPC.

3.3.2 Exposure Assessment

The human health exposure assessment defines and evaluates, quantitatively or qualitatively, the type and magnitude of human exposure to the COPCs. Potential human exposure to environmental media at Site 36 is expected to be limited. Based on the current and anticipated future land use and the location of the sites, military personnel, civilian employees, contractors, and trespassers are the most likely individuals exposed. However, to evaluate the site on a conservative basis, the risks were evaluated based on a hypothetical future residential exposure scenario.

For purposes of the risk screening analysis, maximum detected site concentrations and exposure assumptions used to derive the EPA Region 3 RBCs for soil and tap water ingestion and SSLs for inhalation (transfers from soil to air) were used to assess potential exposure to environmental media.

3.3.3 Risk Characterization

The equations and exposure factors used by EPA Region 3 to calculate RBCs based on residential land use were used to estimate potential carcinogenic and noncarcinogenic risks. For carcinogens, the incremental lifetime cancer risk (ILCR) was calculated for each COPC by dividing the maximum concentration by the RBC based on an ILCR of 1E-06. The individual ILCRs were added and compared to the EPA target risk range of 1E-06 to 1E-04. If the total ILCR is within or less than this range, no action is needed at a site based on potential carcinogenic risk.

For noncarcinogens, the hazard quotient (HQ) was calculated for each COPC by dividing the maximum concentration by the RBC based on an HQ of 1.0. The individual HQs were added to calculate the hazard index (HI), which was compared to the EPA target level of 1.0. If the HI is less than this value, no action is needed based on potential noncarcinogenic risk.

3.4 ECOLOGICAL RISK SCREENING METHODOLOGY

The screening-level ecological risk assessment (ERA) was conducted in accordance with EPA guidance (EPA, 1997 and 1998) and Navy policy (DoN, 1999). Steps 1 and 2 consist of a site visit, pathway identification/problem formulation, toxicity evaluation, exposure estimation, and risk calculation. Step 3A of the Navy approach consists of refining the conservative exposure assumptions, which may result in a reduced list of COPCs.

The goal of this ecological risk screening was to conduct an initial screening of the analytical data using conservative screening values and assumptions to determine whether Site 36 needed to be further evaluated as part of a baseline ERA. The following steps were completed for this risk screening:

- Problem formulation
- Exposure assessment
- Ecological effects assessment
- Preliminary risk characterization
- Step 3A – Refinement of COPCs

3.4.1 Problem Formulation

Problem formulation is the first step of the ERA and discusses the goals, breadth, and focus of the assessment. It includes a general description of the site with emphasis on habitats and ecological receptors present. This phase also involves characterization of the site-related contaminants, contaminant sources, migration routes, and an evaluation of routes of contaminant exposure.

3.4.2 Exposure Assessment

This portion of the ecological risk screening includes identification of contaminant concentration data used to represent ecological exposure to various media and the selection of exposure point concentrations. The ecological risk screening uses the maximum detected concentration as the exposure point concentration.

3.4.3 Ecological Effects Assessment

In the ecological effects assessment, screening levels for toxicity of each chemical to terrestrial and aquatic receptors were compiled.

The EPA Ecological SSLs were used to screen for soil COPCs. These screening levels were supplemented with EPA Region 3 Biological Technical Assistance Group (BTAG) screening levels for soil, where necessary. Table 3-4 summarizes the ecological screening levels used to evaluate surface soil concentrations.

Region 3 BTAG screening levels for freshwater (EPA, 2006a) were used to screen for surface water COPCs, and Region 3 BTAG screening levels for freshwater sediment (EPA, 2006b) were used to screen for sediment COPCs. Tables 3-5 and 3-6 summarize the ecological screening levels used to evaluate surface water and sediment concentrations, respectively.

3.4.4 Preliminary Risk Characterization

The preliminary risk characterization compares maximum site concentrations to ecological screening levels and background concentrations (inorganics in surface soil only). When maximum concentrations are less than ecological screening levels and/or background concentrations, it is an indication that ecological receptors are not at risk. However, when maximum concentrations are greater than screening levels and background concentrations, the chemical is retained as a COPC, but additional evaluation of data is necessary to confirm with greater certainty whether ecological receptors are potentially at risk, especially because most screening levels are developed using conservative exposure assumptions or studies.

An Ecological Effects Quotient (EEQ) approach was used to characterize the risk to ecological receptors. This approach characterizes the potential effects by comparing exposure concentrations with the effects data. The EEQs for terrestrial receptors were calculated as follows:

$$EEQ = \frac{C_{ss}}{SSSL}$$

where:

C_{ss} = Contaminant concentration in surface soil (µg/kg or mg/kg)

SSSL = Surface Soil Screening Level (µg/kg or mg/kg), as described above

The EEQs for the aquatic receptors were calculated as follows:

$$EEQ = \frac{C_{sw}}{SWSL} \text{ or } \frac{C_{sd}}{SDSL}$$

where:

C_{sw} = Contaminant concentration in surface water (µg/L)

C_{sd} = Contaminant concentration in sediment (µg/kg or mg/kg)

SWSL = Surface Water Screening Level (µg/L)

SDSL = Sediment Screening Level (µg/kg or mg/kg)

An EEQ of greater than 1.0 was considered to indicate potential risk. Such values do not necessarily indicate that an effect will occur but only that a low (i.e., conservative) threshold has been exceeded.

Chemicals that do not have screening levels were also retained as COPCs for further evaluation but are only evaluated qualitatively. Calcium, magnesium, potassium, and sodium were excluded as COPCs because they are essential nutrients that can be tolerated by living systems even at high concentrations. Therefore, these chemicals are not discussed in the ecological risk screening.

3.4.5 Step 3A – Refinement of Chemicals of Potential Concern

Step 3 of the eight-step ERA process is baseline ERA problem formulation. This step consists of several sub-steps designed to develop the goals, breadth, and focus of the baseline ERA. Generally this step is beyond the scope of the initial, screening-level ERA. However, the initial sub-step in the process is the refinement of COPCs. The use of conservative screening levels and maximum detected concentrations in the ecological risk screening is necessary to ensure that potential risks are not underestimated.

However, if a comparison to conservative screening levels is used as the single factor for including a COPC in the baseline ERA without consideration of other information, additional studies such as toxicity testing or tissue analysis could be undertaken to investigate risks from a COPC that may not in actuality pose significant risk. Step 3A involves certain tools to reduce the uncertainties and the conservative nature of the screening-level ERA. These items include the following:

- Alternate guidelines
- Frequency of detection/spatial analysis of concentrations exceeding guidelines

Additionally, sediment samples were collected for benthic macroinvertebrate analysis from five locations adjacent to the site and from four locations considered to be reference locations (two upstream and two downstream). AVS and SEM concentrations were also analyzed in the sediment samples collected from the above listed locations. AVS/SEM data provides additional insight into the bioavailability of metals. The resulting data from these analyses were used as lines of evidence in support of a weight-of-evidence approach to determine whether benthic invertebrates are being impacted at the site.

Food-chain modeling was conducted for bioaccumulative chemicals detected in surface soil, surface water, and sediment. The mammals and birds used in the food-chain modeling were chosen to represent the groups of receptors most likely to be exposed to chemicals detected on site. The food-chain modeling included the following representative species: herbivorous receptors (bobwhite quail and meadow vole), insectivorous receptors (American woodcock and short-tailed shrew), and piscivorous receptors (great blue heron and raccoon). For each representative species, information on life history, including diet, body weight, food ingestion rate, water ingestion rate, soil or sediment ingestion rate, and home range, was collected. These input parameters, equations to conduct the food-chain modeling, and other supporting information are provided in Appendix D.

TABLE 3-1

BASEWIDE BACKGROUND CONCENTRATIONS
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	Surface Soil (mg/kg)[1]	Subsurface Soil (Non-Clay-Like) (mg/kg)[1]
Aluminum	19,700	21,400
Antimony	ND	ND
Arsenic	14.9	28.7
Barium	80.4	66.5
Beryllium	1.1	1.5
Cadmium	2.5	0.61
Calcium	2,060	1,270
Chromium	33.4	59.1
Cobalt	22.3	14.7
Copper	20.3	47.6
Iron	38,500	35,200
Lead	62.5	38.6
Magnesium	1,620	2,940
Manganese	1,390	155
Mercury	0.16	0.14
Nickel	15.4	15.9
Potassium	1,470	3,440
Selenium	1.2	3.8
Silver	0.84	1.1
Sodium	120	461
Thallium	2.3	4.1
Vanadium	53.3	102
Zinc	37.5	49.7

1 95-percent upper tolerance limit.

Source: TtNUS, 2002.

ND – Not detected.

TABLE 3-2

HUMAN HEALTH SCREENING CRITERIA - SOIL
SITE 36 - CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	EPA Region 3 RBC[1]				EPA SSL[2]
	Residential Soil		Soil to GW DAF=1	Soil to GW DAF=20	Soil to Air
Volatile Organics (µg/kg)					
1,1,2,2-Tetrachloroethane	3,200	C	0.034	0.68	580
1,1,1-Trichloroethane	160,000,000	N	1,600	32,000	1,200,000
1,1,2-Trichloroethane	11,000	C	0.039	0.78	970
1,1,2-Trichlorotrifluoroethane	2,300,000,000	N	120,000	2,300,000	---
1,1-Dichloroethane	16,000,000	N	260	5,100	1,200,000
1,1-Dichloroethene	3,900,000	N	150	2,900	290,000
1,2,4-Trichlorobenzene	780,000	N	120	2,400	180,000
1,2-Dibromo-3-chloropropane	200	C	0.00018	0.0037	23,000
1,2-Dibromoethane	320	C	0.003	0.06	10,000,000
1,2-Dichlorobenzene	7,000,000	N	230	4,600	600,000
1,2-Dichloroethane	7,000	C	0.052	1.0	360
1,2-Dichloropropane	9,400	C	0.17	3.4	15,000
1,3-Dichlorobenzene	230,000	N	15	290	---
1,4-Dichlorobenzene	27,000	C	0.21	4.2	11,000,000
2-Butanone	47,000,000	N	1,500	29,000	24,000,000
2-Hexanone	---		---	---	---
4-Methyl-2-pentanone	---		2,900	59,000	2,700,000
Acetone	70,000,000	N	1,100	22,000	---
Benzene	12,000	C	0.095	1.9	830
Bromodichloromethane	10,000	C	0.054	1.1	---
Bromoform	81,000	C	3.3	67	52,000
Bromomethane	110,000	N	2.1	41	9,400
Carbon disulfide	7,800,000	N	950	19,000	720,000
Carbon tetrachloride	4,900	C	0.11	2.1	330
Chlorobenzene	1,600,000	N	34	680	130,000
Chlorodibromomethane	7,600	C	0.041	0.83	470
Chloroethane	220,000	C	0.96	19	---
Chloroform	780,000	N	0.045	0.91	280
Chloromethane	---		46	930	2,100
cis-1,2-Dichloroethene	780,000	N	20[2]	400[2]	---
cis-1,3-Dichloropropene	6,400[3]	C	0.16[3]	3.1[3]	11,000[3]
Cyclohexane	---		---	---	8.51E+12
Dichlorodifluoromethane	16,000,000	N	550	1,100	250,000
Ethylbenzene	7,800,000	N	750	1,500	400,000
Fluorotrichloromethane	23,000,000	N	1,100	23,000	1,100,000
Isopropylbenzene	7,800,000	N	3,200	64,000	850,000
Methyl acetate	78,000,000	N	1,200	25,000	---
Methyl tert-butyl ether	160,000	C	0.59	12	8,700,000
Methylcyclohexane	---		---	---	490,000
Methylene chloride	85,000	C	0.95	19	13,000

TABLE 3-2

HUMAN HEALTH SCREENING CRITERIA - SOIL
SITE 36 - CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	EPA Region 3 RBC[1]				EPA SSL[2]
	Residential Soil		Soil to GW DAF=1	Soil to GW DAF=20	Soil to Air
Volatile Organics (µg/kg) (continued)					
Styrene	16,000,000	N	2,900	57,000	1,500,000
Tetrachloroethene	1,200	C	0.23	4.7	10,000
Toluene	6,300,000	N	1,300	27,000	650,000
Total Xylenes	16,000,000	N	150	3,000	700,000
trans-1,2-Dichloroethene	1,600,000	N	36	720	---
trans-1,3-Dichloropropene	6,400[3]	C	0.16[3]	3.1[3]	1,100[3]
Trichloroethene	1,600	C	0.013	0.26	71
Vinyl chloride	90	C	0.0062	0.12	280
Semivolatile Organics (µg/kg)					
1,1-Biphenyl	3,900,000[4]	N	4,800[4]	96,000[4]	---
2,2'-Oxybis(1-chloropropane)	9,100	N	8.40E-02	1.7	6,900
2,4,5-Trichlorophenol	7,800,000	N	12,000[2]	2,500,000[2]	---
2,4,6-Trichlorophenol	58,000	C	7.4[2]	150[2]	200,000
2,4-Dichlorophenol	230,000	N	60	1,200	---
2,4-Dimethylphenol	1,600,000	N	340	6,700	---
2,4-Dinitrophenol	160,000	N	15[2]	290[2]	---
2,4-Dinitrotoluene	160,000	N	29	570	---
2,6-Dinitrotoluene	78,000	N	12	250	---
2-Chloronaphthalene	6,300,000	N	1,600	32,000	---
2-Chlorophenol	390,000	N	180[2]	3,600[2]	---
2-Methylnaphthalene	310,000	N	220	4,400	---
2-Methylphenol	3,900,000	N	400[2]	8,000[2]	---
2-Nitroaniline	---		26[2]	510[2]	1,200
2-Nitrophenol	---		---	---	---
3,3'-Dichlorobenzidine	1,400	C	0.25	4.9	---
3-Nitroaniline	---		1.2[2]	25[2]	1.42E+09
4,6-Dinitro-2-methylphenol	---		5.1[2]	100[2]	---
4-Bromophenyl phenyl ether	---		---	---	---
4-Chloro-3-methylphenol	---		---	---	---
4-Chloroaniline	310,000	N	48	970	---
4-Chlorophenyl phenyl ether	---		---	---	---
4-Methylphenol	390,000	N	66[2]	1,300[2]	---
4-Nitroaniline	---		1.2[2]	25[2]	5.67E+09
4-Nitrophenol	---		---	---	---
Acenaphthene	4,700,000	N	5,200	10,000	---
Acenaphthylene	---		---	---	---
Acetophenone	7,800,000	N	160	3,200	---
Anthracene	23,000,000	N	23,000	470,000	---
Atrazine	2,900	C	0.44	8.8	---
Benzaldehyde	7,800,000	N	860[2]	17,000[2]	---

TABLE 3-2

HUMAN HEALTH SCREENING CRITERIA - SOIL
SITE 36 - CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	EPA Region 3 RBC[1]				EPA SSL[2]
	Residential Soil		Soil to GW DAF=1	Soil to GW DAF=20	Soil to Air
Semivolatile Organics (µg/kg) (continued)					
Benzo(a)anthracene	220	C	24	480	---
Benzo(a)pyrene	22	C	6.1	120	---
Benzo(b)fluoranthene	220	C	74	1,500	---
Benzo(g,h,i)perylene	---		---	---	---
Benzo(k)fluoranthene	2,200	C	740	15,000	---
Bis(2-chloroethoxy)methane	---		---	---	---
Bis(2-chloroethyl)ether	580	C	0.0022	0.044	240
Bis(2-ethylhexyl)phthalate	46,000	C	140,000	290,000	---
Butyl benzyl phthalate	16,000,000	N	840,000	17,000,000	---
Caprolactam	39,000,000	N	3,900[2]	78,000[2]	---
Carbazole	32,000	C	23	470	---
Chrysene	22,000	C	2,400	48,000	---
Di-n-butyl phthalate	7,800,000	N	250,000	5,000,000	---
Di-n-octyl phthalate	---		---	---	---
Dibenzo(a,h)anthracene	22	C	23	460	---
Dibenzofuran	78,000	N	2,400[2]	48,000[2]	---
Diethyl phthalate	63,000,000	N	23,000	450,000	---
Dimethyl phthalate	---		---	---	---
Fluoranthene	3,100,000	N	310,000	6,300,000	---
Fluorene	3,100,000	N	6,800	140,000	---
Hexachlorobenzene	400	C	2.6	52	950
Hexachlorobutadiene	8,200	C	92	1,800	7,800
Hexachlorocyclopentadiene	470,000	N	88,000	1,800,000	29,000
Hexachloroethane	46,000	C	18	360	54,000
Indeno(1,2,3-cd)pyrene	220	C	210	4,200	---
Isophorone	670,000	C	21	410	---
N-Nitroso-di-n-propylamine	91	C	0.0024	0.047	---
N-Nitrosodiphenylamine	130,000	C	38	760	---
Naphthalene	1,600,000	N	7.7	150	170,000
Nitrobenzene	39,000	N	1.2	23	90,000
Pentachlorophenol	5,300	C	1.4[2]	28[2]	---
Phenanthrene	---		---	---	---
Phenol	23,000,000	N	3,300	67,000	---
Pyrene	2,300,000	N	34,000	680,000	---
Explosives (mg/kg)					
1,3,5-Trinitrobenzene	2,300	N	0.025[2]	5[2]	---
1,3-Dinitrobenzene	7.8	N	0.0018	0.037	---
2,4,6-Trinitrotoluene	21	C	0.00057[2]	0.011[2]	---
2,4-Dinitrotoluene	160	N	0.029	0.57	---
2,6-Dinitrotoluene	78	N	0.012	0.25	---
2-Amino-4,6-dinitrotoluene	160	N	---	---	---

TABLE 3-2

HUMAN HEALTH SCREENING CRITERIA - SOIL
SITE 36 - CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	EPA Region 3 RBC[1]				EPA SSL[2]
	Residential Soil		Soil to GW DAF=1	Soil to GW DAF=20	Soil to Air
Explosives (mg/kg) (continued)					
2-Nitrotoluene	780	N	0.6[2]	12[2]	---
3-Nitrotoluene	---		0.00015[2]	0.003[2]	---
4-Amino-2,6-dinitrotoluene	160	N	---	---	---
4-Nitrotoluene	40	C	0.0021[2]	0.041[2]	---
HMX	3,900	N	---	---	---
Nitrobenzene	39	N	0.0012	0.023	90
Nitrocellulose	---		---	---	---
Nitroglycerin	7.8	N	---	---	---
Nitroguanidine	---		---	---	---
RDX	5.8	C	---	---	---
Tetryl	310	N	---	---	---
Inorganics (mg/kg)					
Aluminum	78,000	N	8.3[2]	170[2]	7,090,000
Antimony	31	N	0.66	13	---
Arsenic	0.43	C	0.0013	0.026	769
Barium	16,000	N	300	6,000	709,000
Beryllium	160	N	58	1,200	1,380
Cadmium	39[5]	N	1.4[5]	27[5]	1,843
Calcium	---		---	---	---
Chromium	120,000	N	9.9E+07	2.0E+09	276
Cobalt	---	N	0.17[2]	3.3[2]	1,180
Copper	3,100	N	530	11,000	---
Iron	55,000	N	---	---	---
Lead	400[6]		---	---	---
Magnesium	---		---	---	---
Manganese	1,600[7]	N	48[7]	950[7]	70,900
Mercury	23[8]	N	0.1[2]	2.1[2]	2.9
Nickel	1,600	N	14[2]	280[2]	---
Potassium	---		---	---	---
Selenium	390	N	0.95	19	---
Silver	390	N	1.6	31	---
Sodium	---		---	---	---
Thallium	5.5	N	0.18	3.6	---
Vanadium	78	N	37	730	---
Zinc	23,000	N	680	14,000	---
Miscellaneous Parameters (mg/kg)					
Cyanide	1,600[9]	N	7.4	150	---
Hexavalent chromium	230	N	2.1	42	276

TABLE 3-2

HUMAN HEALTH SCREENING CRITERIA - SOIL
SITE 36 - CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	EPA Region 3 RBC[1]			EPA SSL[2]
	Residential Soil	Soil to GW DAF=1	Soil to GW DAF=20	Soil to Air

1 EPA, 2007a.
2 EPA, 2007b.
3 Value is for 1,3-dichloropropene.
4 Value is for biphenyl.
5 Based on oral reference dose for water.
6 Office of Solid Waste and Emergency Response soil screening level (EPA, 1994b)
7 Based on oral reference dose for nonfood.
8 Value is for mercuric chloride.
9 Value is for free cyanide.

---: No screening level available. If detected, a surrogate value will be used, if appropriate.
C - Carcinogen.
DAF - Dilution attenuation factor.
EPA - United States Environmental Protection Agency.
GW - Groundwater.
N - Noncarcinogen.
RBC - Risk-based concentration.
SSL - Soil screening level.

TABLE 3-3

HUMAN HEALTH SCREENING CRITERIA - GROUNDWATER
SITE 36 - CLOSED LANDFILL AND SITE 38 - RUM POINT LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	EPA Region 3 Tap Water RBC[1]	
Volatile Organics (µg/L)		
1,1,1-Trichloroethane	9,100	N
1,1,2,2-Tetrachloroethane	0.053	C
1,1,2-Trichloroethane	0.19	C
1,1,2-Trichlorotrifluoroethane	59,000	N
1,1-Dichloroethane	900	N
1,1-Dichloroethene	350	N
1,2,4-Trichlorobenzene	61	N
1,2-Dibromo-3-chloropropane	0.0002	C
1,2-Dibromoethane	0.0053	C
1,2-Dichlorobenzene	270	N
1,2-Dichloroethane	0.12	C
1,2-Dichloropropane	0.26	C
1,3-Dichlorobenzene	18	N
1,4-Dichlorobenzene	0.28	C
2-Butanone	7,000	N
2-Hexanone	---	
4-Methyl-2-pentanone	6,300	N
Acetone	5,500	N
Benzene	0.34	C
Bromodichloromethane	0.17	C
Bromoform	8.5	C
Bromomethane	8.5	N
Carbon disulfide	1,000	N
Carbon tetrachloride	0.16	C
Chlorobenzene	90	N
Chlorodibromomethane	0.13	C
Chloroethane	3.6	C
Chloroform	0.15	C
Chloromethane	190	N
cis-1,2-Dichloroethene	61	N
cis-1,3-Dichloropropene	0.44[2]	C
Cyclohexane	12,000	N
Dichlorodifluoromethane	350	N
Ethylbenzene	1,300	N
Fluorotrichloromethane	1,300	N
Isopropylbenzene	660	N
Methyl acetate	6,100	N
Methyl tert-butyl ether	2.6	C
Methylcyclohexane	6,300	N
Methylene chloride	4.1	C
Styrene	1,600	N

TABLE 3-3

HUMAN HEALTH SCREENING CRITERIA - GROUNDWATER
SITE 36 - CLOSED LANDFILL AND SITE 38 - RUM POINT LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	EPA Region 3 Tap Water RBC[1]	
Volatile Organics (µg/L) (Continued)		
Tetrachloroethene	0.1	C
Toluene	2,300	N
Total Xylenes	210	N
trans-1,2-Dichloroethene	110	N
trans-1,3-Dichloropropene	0.44[2]	C
Trichloroethene	0.026	C
Vinyl chloride	0.015	C
Semivolatile Organics (µg/L)		
1,1-Biphenyl	300[3]	N
2,2'-Oxybis(1-chloropropane)	0.26	C
2,4,5-Trichlorophenol	3,700	N
2,4,6-Trichlorophenol	6.1	C
2,4-Dichlorophenol	110	N
2,4-Dimethylphenol	730	N
2,4-Dinitrophenol	73	N
2,4-Dinitrotoluene	73	N
2,6-Dinitrotoluene	37	N
2-Chloronaphthalene	490	N
2-Chlorophenol	30	N
2-Methylnaphthalene	24	N
2-Methylphenol	1,800	N
2-Nitroaniline	---	
2-Nitrophenol	---	
3,3'-Dichlorobenzidine	0.15	C
3-Nitroaniline	---	
4,6-Dinitro-2-methylphenol	---	
4-Bromophenyl phenyl ether	---	
4-Chloro-3-methylphenol	---	
4-Chloroaniline	150	N
4-Chlorophenyl phenyl ether	---	
4-Methylphenol	180	N
4-Nitroaniline	---	
4-Nitrophenol	---	
Acenaphthene	370	N
Acenaphthylene	---	
Acetophenone	610	N
Anthracene	1,800	N
Atrazine	0.3	C
Benzaldehyde	3,700	N
Benzo(a)anthracene	0.03	C
Benzo(a)pyrene	0.003	C
Benzo(b)fluoranthene	0.03	C

TABLE 3-3

HUMAN HEALTH SCREENING CRITERIA - GROUNDWATER
SITE 36 - CLOSED LANDFILL AND SITE 38 - RUM POINT LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	EPA Region 3 Tap Water RBC[1]	
Semivolatile Organics (µg/L) (continued)		
Benzo(g,h,i)perylene	---	
Benzo(k)fluoranthene	0.3	C
Bis(2-chloroethoxy)methane	---	
Bis(2-chloroethyl)ether	0.0096	C
Bis(2-ethylhexyl)phthalate	4.8	C
Butyl benzyl phthalate	7,300	N
Caprolactam	18,000	N
Carbazole	3.3	C
Chrysene	3	C
Di-n-butyl phthalate	3,700	N
Di-n-octyl phthalate	---	
Dibenzo(a,h)anthracene	0.003	C
Dibenzofuran	37	N
Diethyl phthalate	29,000	N
Dimethyl phthalate	---	
Fluoranthene	1,500	N
Fluorene	240	N
Hexachlorobenzene	0.042	C
Hexachlorobutadiene	0.86	C
Hexachlorocyclopentadiene	220	N
Hexachloroethane	4.8	C
Indeno(1,2,3-cd)pyrene	0.03	C
Isophorone	70	C
N-Nitroso-di-n-propylamine	0.0096	C
N-Nitrosodiphenylamine	14	C
Naphthalene	6.5	N
Nitrobenzene	3.5	N
Pentachlorophenol	0.56	C
Phenanthrene	---	
Phenol	11,000	N
Pyrene	180	N
Explosives (µg/L)		
1,3,5-Trinitrobenzene	1,100	N
1,3-Dinitrobenzene	3.7	N
2,4,6-Trinitrotoluene	2.2	C
2,4-Dinitrotoluene	73	N
2,6-Dinitrotoluene	37	N
2-Amino-4,6-dinitrotoluene	73	N
2-Nitrotoluene	61	N
3-Nitrotoluene	---	
4-Amino-2,6-dinitrotoluene	73	N
4-Nitrotoluene	4.2	C

TABLE 3-3

HUMAN HEALTH SCREENING CRITERIA - GROUNDWATER
SITE 36 - CLOSED LANDFILL AND SITE 38 - RUM POINT LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	EPA Region 3 Tap Water RBC[1]	
Explosives (µg/L)		
HMX	1,800	N
Nitrobenzene	3.5	N
Nitrocellulose	---	
Nitroglycerin	3.7	N
Nitroguanidine	---	
RDX	0.61	C
Tetryl	150	N
Inorganics (µg/L)		
Aluminum	37,000	N
Antimony	15	N
Arsenic	0.045	C
Barium	7,300	N
Beryllium	73	N
Cadmium	18[4]	N
Calcium	---	
Chromium	55,000	N
Cobalt	---	
Copper	1,500	N
Iron	26,000	N
Lead	15[5]	
Magnesium	---	
Manganese	730[6]	N
Mercury	11[7]	N
Nickel	730	N
Potassium	---	
Selenium	180	N
Silver	180	N
Sodium	---	
Thallium	2.6	N
Vanadium	37	N
Zinc	11,000	N
Miscellaneous Parameters (µg/L)		
Cyanide	730[8]	N
Hexavalent chromium	110	N

1 EPA, 2007a.
2 Value is for 1,3-dichloropropene.
3 Value is for biphenyl.
4 Based on the oral reference dose for water.
5 Action level under Safe Drinking Water Act.
6 Based on the oral reference dose for nonfood.
7 Value is for mercuric chloride.
8 Value is for free cyanide.

TABLE 3-3

HUMAN HEALTH SCREENING CRITERIA - GROUNDWATER
SITE 36 - CLOSED LANDFILL AND SITE 38 - RUM POINT LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	EPA Region 3 Tap Water RBC[1]

---: No screening level available. If detected, a surrogate value will be used, if appropriate.
C - Carcinogen.
EPA - United States Environmental Protection Agency.
N - Noncarcinogen.
RBC - Risk-based concentration.

TABLE 3-4

ECOLOGICAL SCREENING CRITERIA - SURFACE SOIL
SITE 36 - CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	Screening Value	Source
Volatile Organics (µg/kg)		
1,1,1-Trichloroethane	300[1]	BTAG
1,1,2,2-Tetrachloroethane	300[2]	BTAG
1,1,2-Trichloroethane	300[1]	BTAG
1,1,2-Trichlorotrifluoroethane	---	---
1,1-Dichloroethane	300	BTAG
1,1-Dichloroethene	---	---
1,2,4-Trichlorobenzene	100[3]	BTAG
1,2-Dibromo-3-chloropropane	---	---
1,2-Dibromoethane	5,000	BTAG
1,2-Dichlorobenzene	100	BTAG
1,2-Dichloroethane	870,000	BTAG
1,2-Dichloropropane	---	---
1,3-Dichlorobenzene	---	---
1,4-Dichlorobenzene	100	BTAG
2-Butanone	---	---
2-Hexanone	---	---
4-Methyl-2-pentanone	100,000	BTAG
Acetone	---	---
Benzene	100	BTAG
Bromodichloromethane	450,000	BTAG
Bromoform	1,147,000	BTAG
Bromomethane	---	---
Carbon disulfide	---	---
Carbon tetrachloride	300	BTAG
Chlorobenzene	100	BTAG
Chlorodibromomethane	---	---
Chloroethane	---	---
Chloroform	300	BTAG
Chloromethane	---	---
cis-1,2-Dichloroethene	300	BTAG
cis-1,3-Dichloropropene	300[4]	BTAG
Cyclohexane	---	---
Dichlorodifluoromethane	---	---
Ethylbenzene	100	BTAG
Fluorotrichloromethane	---	---
Isopropylbenzene	---	---
Methyl acetate	---	---
Methyl tert-butyl ether	---	---
Methylcyclohexane	---	---
Methylene chloride	300	BTAG
Styrene	100	BTAG
Tetrachloroethene	300	BTAG

TABLE 3-4

ECOLOGICAL SCREENING CRITERIA - SURFACE SOIL
SITE 36 - CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	Screening Value	Source
Volatile Organics (µg/kg) (Continued)		
Toluene	100	BTAG
Total Xylenes	100	BTAG
trans-1,2-Dichloroethene	300	BTAG
trans-1,3-Dichloropropene	300(4)	BTAG
Trichloroethene	300	BTAG
Vinyl chloride	300	BTAG
Semivolatile Organics (µg/kg)		
1,1-Biphenyl	---	---
2,2'-Oxybis(1-chloropropane)	---	---
2,4,5-Trichlorophenol	100	BTAG
2,4,6-Trichlorophenol	100	BTAG
2,4-Dichlorophenol	100	BTAG
2,4-Dimethylphenol	100	BTAG
2,4-Dinitrophenol	100(5)	BTAG
2,4-Dinitrotoluene	---	---
2,6-Dinitrotoluene	---	---
2-Chloronaphthalene	---	---
2-Chlorophenol	100	BTAG
2-Methylnaphthalene	29000	SSL (EPA, 2007d)
2-Methylphenol	100	BTAG
2-Nitroaniline	---	---
2-Nitrophenol	---	---
3,3'-Dichlorobenzidine	---	---
3-Nitroaniline	---	---
4,6-Dinitro-2-methylphenol	---	---
4-Bromophenyl phenyl ether	---	---
4-Chloro-3-methylphenol	---	---
4-Chloroaniline	---	---
4-Chlorophenyl phenyl ether	---	---
4-Methylphenol	100	BTAG
4-Nitroaniline	---	---
4-Nitrophenol	100	BTAG
Acenaphthene	29000	SSL (EPA, 2007d)
Acenaphthylene	29000	SSL (EPA, 2007d)
Acetophenone	---	---
Anthracene	29000	SSL (EPA, 2007d)
Atrazine	---	---
Benzaldehyde	---	---
Benzo(a)anthracene	1100	SSL (EPA, 2007d)
Benzo(a)pyrene	1100	SSL (EPA, 2007d)
Benzo(b)fluoranthene	1100	SSL (EPA, 2007d)
Benzo(g,h,i)perylene	1100	SSL (EPA, 2007d)
Benzo(k)fluoranthene	1100	SSL (EPA, 2007d)

TABLE 3-4

ECOLOGICAL SCREENING CRITERIA - SURFACE SOIL
SITE 36 - CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	Screening Value	Source
Semivolatile Organics (µg/kg) (continued)		
Bis(2-chloroethoxy)methane	---	---
Bis(2-chloroethyl)ether	---	---
Bis(2-ethylhexyl)phthalate	---	---
Butyl benzyl phthalate	---	---
Caprolactam	---	---
Carbazole	---	---
Chrysene	1100	SSL (EPA, 2007d)
Di-n-butyl phthalate	---	---
Di-n-octyl phthalate	---	---
Dibenzo(a,h)anthracene	1100	SSL (EPA, 2007d)
Dibenzofuran	---	---
Diethyl phthalate	---	---
Dimethyl phthalate	---	---
Fluoranthene	29000	SSL (EPA, 2007d)
Fluorene	29000	SSL (EPA, 2007d)
Hexachlorobenzene	---	---
Hexachlorobutadiene	---	---
Hexachlorocyclopentadiene	---	---
Hexachloroethane	---	---
Indeno(1,2,3-cd)pyrene	1100	SSL (EPA, 2007d)
Isophorone	---	---
N-Nitroso-di-n-propylamine	---	---
N-Nitrosodiphenylamine	---	---
Naphthalene	29000	SSL (EPA, 2007d)
Nitrobenzene	---	---
Pentachlorophenol	2100	SSL (EPA, 2007c)
Phenanthrene	29000	SSL (EPA, 2007d)
Phenol	100	BTAG
Pyrene	1100	SSL (EPA, 2007d)
Explosives (mg/kg)		
1,3,5-Trinitrobenzene	---	---
1,3-Dinitrobenzene	---	---
2,4,6-Trinitrotoluene	---	---
2,4-Dinitrotoluene	---	---
2,6-Dinitrotoluene	---	---
2-Amino-4,6-dinitrotoluene	---	---
2-Nitrotoluene	---	---
3-Nitrotoluene	---	---
4-Amino-2,6-dinitrotoluene	---	---
4-Nitrotoluene	---	---
HMX	---	---
Nitrobenzene	---	---
Nitrocellulose	---	---

TABLE 3-4

ECOLOGICAL SCREENING CRITERIA - SURFACE SOIL
SITE 36 - CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	Screening Value	Source
Explosives (mg/kg) (continued)		
Nitroglycerin	---	---
Nitroguanidine	---	---
RDX	---	---
Tetryl	---	---
Inorganics (mg/kg)		
Aluminum	---(6)	SSL (EPA, 2003b)
Antimony	0.27	SSL (EPA, 2005a)
Arsenic	18	SSL (EPA, 2005b)
Barium	330	SSL (EPA, 2005c)
Beryllium	21	SSL (EPA, 2005d)
Cadmium	0.36	SSL (EPA, 2005e)
Calcium	---	---
Chromium	26	SSL (EPA, 2005f)
Cobalt	13	SSL (EPA, 2005g)
Copper	28	SSL (EPA, 2007e)
Iron	---(7)	SSL (EPA, 2003c)
Lead	11	SSL (EPA, 2005h)
Magnesium	---	---
Manganese	220	SSL (EPA, 2007f)
Mercury	0.058	BTAG
Nickel	38	SSL (EPA, 2007g)
Potassium	---	---
Selenium	0.52	SSL (EPA, 2007h)
Silver	4.2	SSL (EPA, 2006c)
Sodium	---	---
Thallium	0.001	BTAG
Vanadium	7.8	SSL (EPA, 2005i)
Zinc	46	SSL (EPA, 2007i)
Miscellaneous Parameters (mg/kg)		
Cyanide	0.005	BTAG
Hexavalent chromium	---	---

1 Value is for trichloroethane.
2 Value is for tetrachloroethane.
3 Value is for trichlorobenzene.
4 Value is for dichloropropene.
5 Value is for dinitrophenol.
6 Potential for ecological risk only if soil pH is less than 5.5.
7 Potential for ecological risk only is low if soil pH is between 5 and 8.
---: No screening level available.
SSL: U.S. Environmental Protection Agency (EPA) Ecological Soil Screening Level
BTAG: EPA Region 3 Biological Technical Assistance Group screening level (EPA, 1995)

TABLE 3-5

ECOLOGICAL SCREENING CRITERIA - SURFACE WATER
SITE 36 - CLOSED LANDFILL AND SITE 38 - RUM POINT LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	EPA Region 3 BTAG Freshwater Screening Benchmark
Volatile Organics (µg/L)	
1,1,1-Trichloroethane	11
1,1,2,2-Tetrachloroethane	610
1,1,2-Trichloroethane	1,200
1,1,2-Trichlorotrifluoroethane	---
1,1-Dichloroethane	47
1,1-Dichloroethene	25
1,2,4-Trichlorobenzene	24
1,2-Dibromo-3-chloropropane	---
1,2-Dibromoethane	---
1,2-Dichlorobenzene	0.7
1,2-Dichloroethane	100
1,2-Dichloropropane	---
1,3-Dichlorobenzene	150
1,4-Dichlorobenzene	26
2-Butanone	14,000
2-Hexanone	99
4-Methyl-2-pentanone	170
Acetone	1,500
Benzene	370
Bromodichloromethane	---
Bromoform	320
Bromomethane	---
Carbon disulfide	0.92
Carbon tetrachloride	13.3
Chlorobenzene	1.3
Chlorodibromomethane	---
Chloroethane	---
Chloroform	1.8
Chloromethane	---
cis-1,2-Dichloroethene	590[(1)]
cis-1,3-Dichloropropene	0.055[(2)]
Cyclohexane	---
Dichlorodifluoromethane	---
Ethylbenzene	90
Fluorotrichloromethane	---
Isopropylbenzene	2.6
Methyl acetate	---
Methyl tert-butyl ether	11,070
Methylcyclohexane	---
Methylene chloride	98.1
Styrene	72
Tetrachloroethene	111

TABLE 3-5

ECOLOGICAL SCREENING CRITERIA - SURFACE WATER
SITE 36 - CLOSED LANDFILL AND SITE 38 - RUM POINT LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	EPA Region 3 BTAG Freshwater Screening Benchmark
Volatile Organics (µg/L) (continued)	
Toluene	2
Total Xylenes	13
trans-1,2-Dichloroethene	970
trans-1,3-Dichloropropene	0.055[(2)]
Trichloroethene	21
Vinyl chloride	930
Semivolatile Organics (µg/L)	
1,1-Biphenyl	14
2,2'-Oxybis(1-chloropropane)	---
2,4,5-Trichlorophenol	---
2,4,6-Trichlorophenol	4.9
2,4-Dichlorophenol	11
2,4-Dimethylphenol	---
2,4-Dinitrophenol	---
2,4-Dinitrotoluene	44
2,6-Dinitrotoluene	81
2-Chloronaphthalene	---
2-Chlorophenol	24
2-Methylnaphthalene	4.7
2-Methylphenol	13
2-Nitroaniline	---
2-Nitrophenol	1,920
3,3'-Dichlorobenzidine	4.5
3-Nitroaniline	---
4,6-Dinitro-2-methylphenol	---
4-Bromophenyl phenyl ether	1.5
4-Chloro-3-methylphenol	---
4-Chloroaniline	232
4-Chlorophenyl phenyl ether	---
4-Methylphenol	543
4-Nitroaniline	---
4-Nitrophenol	60
Acenaphthene	5.8
Acenaphthylene	---
Acetophenone	---
Anthracene	0.012
Atrazine	1.8
Benzaldehyde	---
Benzo(a)anthracene	0.018
Benzo(a)pyrene	0.015
Benzo(b)fluoranthene	---
Benzo(g,h,i)perylene	---
Benzo(k)fluoranthene	---

TABLE 3-5

ECOLOGICAL SCREENING CRITERIA - SURFACE WATER
SITE 36 - CLOSED LANDFILL AND SITE 38 - RUM POINT LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	EPA Region 3 BTAG Freshwater Screening Benchmark
Semivolatile Organics (µg/L) (continued)	
Bis(2-chloroethoxy)methane	---
Bis(2-chloroethyl)ether	---
Bis(2-ethylhexyl)phthalate	16
Butyl benzyl phthalate	19
Caprolactam	---
Carbazole	---
Chrysene	---
Di-n-butyl phthalate	19
Di-n-octyl phthalate	22
Dibenzo(a,h)anthracene	---
Dibenzofuran	3.7
Diethyl phthalate	210
Dimethyl phthalate	---
Fluoranthene	0.04
Fluorene	3
Hexachlorobenzene	0.0003
Hexachlorobutadiene	1.3
Hexachlorocyclopentadiene	---
Hexachloroethane	12
Indeno(1,2,3-cd)pyrene	---
Isophorone	---
N-Nitroso-di-n-propylamine	---
N-Nitrosodiphenylamine	210
Naphthalene	1.1
Nitrobenzene	---
Pentachlorophenol	0.5
Phenanthrene	0.4
Phenol	4
Pyrene	0.025
Explosives (µg/L)	
1,3,5-Trinitrobenzene	---
1,3-Dinitrobenzene	---
2,4,6-Trinitrotoluene	100
2,4-Dinitrotoluene	44
2,6-Dinitrotoluene	81
2-Amino-4,6-dinitrotoluene	1,480
2-Nitrotoluene	---
3-Nitrotoluene	750
4-Amino-2,6-dinitrotoluene	---
4-Nitrotoluene	1,900
HMX	150
Nitrobenzene	---
Nitrocellulose	---
Nitroglycerin	138

TABLE 3-5

ECOLOGICAL SCREENING CRITERIA - SURFACE WATER
SITE 36 - CLOSED LANDFILL AND SITE 38 - RUM POINT LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	EPA Region 3 BTAG Freshwater Screening Benchmark
Explosives (µg/L) (Continued)	
Nitroguanidine	---
RDX	360
Tetryl	---
Inorganics (µg/L)	
Aluminum	87
Antimony	30
Arsenic	5
Barium	4
Beryllium	0.66
Cadmium	0.25[3]
Calcium	116,000
Chromium	85[3][4]
Cobalt	23
Copper	9[3]
Iron	300
Lead	2.5[3]
Magnesium	82,000
Manganese	120
Mercury	0.026
Nickel	52[3]
Potassium	53,000
Selenium	1
Silver	3.2[3]
Sodium	680,000
Thallium	0.8
Vanadium	20
Zinc	120[3]
Miscellaneous Parameters (µg/L)	
Cyanide	5
Hexavalent chromium	11[3]

Source: United States Environmental Protection Agency (EPA), 2006a.

1 Value is for 1,2-dichloroethene.
2 Value is for 1,3-dichloropropene.
3 Based on hardness of 100 mg/L.
4 Value is for total chromium.

---: No screening level available.
BTAG - Biological Technical Assistance Group.

TABLE 3-6

ECOLOGICAL SCREENING CRITERIA - SEDIMENT
SITE 36 - CLOSED LANDFILL AND SITE 38 - RUM POINT LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	EPA Region 3 BTAG Freshwater Sediment Screening Benchmark
Volatile Organics (µg/kg)	
1,1,1-Trichloroethane	30.2
1,1,2,2-Tetrachloroethane	1,360
1,1,2-Trichloroethane	1,240
1,1,2-Trichlorotrifluoroethane	---
1,1-Dichloroethane	---
1,1-Dichloroethene	31
1,2,4-Trichlorobenzene	2,100
1,2-Dibromo-3-chloropropane	---
1,2-Dibromoethane	---
1,2-Dichlorobenzene	16.5
1,2-Dichloroethane	---
1,2-Dichloropropane	---
1,3-Dichlorobenzene	4,430
1,4-Dichlorobenzene	599
2-Butanone	---
2-Hexanone	---
4-Methyl-2-pentanone	---
Acetone	---
Benzene	---
Bromodichloromethane	---
Bromoform	654
Bromomethane	---
Carbon disulfide	0.851
Carbon tetrachloride	64.2
Chlorobenzene	8.42
Chlorodibromomethane	---
Chloroethane	---
Chloroform	---
Chloromethane	---
cis-1,2-Dichloroethene	---
cis-1,3-Dichloropropene	0.0509[(1)]
Cyclohexane	---
Dichlorodifluoromethane	---
Ethylbenzene	1,100
Fluorotrichloromethane	---
Isopropylbenzene	86
Methyl acetate	---
Methyl tert-butyl ether	---
Methylcyclohexane	---
Methylene chloride	---
Styrene	559
Tetrachloroethene	468

TABLE 3-6

ECOLOGICAL SCREENING CRITERIA - SEDIMENT
SITE 36 - CLOSED LANDFILL AND SITE 38 - RUM POINT LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	EPA Region 3 BTAG Freshwater Sediment Screening Benchmark
Volatile Organics (µg/kg) (continued)	
Toluene	---
Total Xylenes	25.2[(2)]
trans-1,2-Dichloroethene	1,050
trans-1,3-Dichloropropene	0.0509[(1)]
Trichloroethene	96.9
Vinyl chloride	---
Semivolatile Organics (µg/kg)	
1,1-Biphenyl	1,220
2,2'-Oxybis(1-chloropropane)	---
2,4,5-Trichlorophenol	---
2,4,6-Trichlorophenol	213
2,4-Dichlorophenol	117
2,4-Dimethylphenol	29
2,4-Dinitrophenol	---
2,4-Dinitrotoluene	41.6
2,6-Dinitrotoluene	---
2-Chloronaphthalene	---
2-Chlorophenol	31.2
2-Methylnaphthalene	20.2
2-Methylphenol	---
2-Nitroaniline	---
2-Nitrophenol	---
3,3'-Dichlorobenzidine	127
3-Nitroaniline	---
4,6-Dinitro-2-methylphenol	---
4-Bromophenyl phenyl ether	1,230
4-Chloro-3-methylphenol	---
4-Chloroaniline	---
4-Chlorophenyl phenyl ether	---
4-Methylphenol	670
4-Nitroaniline	---
4-Nitrophenol	---
Acenaphthene	6.7
Acenaphthylene	5.9
Acetophenone	---
Anthracene	57.2
Atrazine	6.62
Benzaldehyde	---
Benzo(a)anthracene	108
Benzo(a)pyrene	150
Benzo(b)fluoranthene	27.2[(3)]
Benzo(g,h,i)perylene	170
Benzo(k)fluoranthene	240

TABLE 3-6

ECOLOGICAL SCREENING CRITERIA - SEDIMENT
SITE 36 - CLOSED LANDFILL AND SITE 38 - RUM POINT LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	EPA Region 3 BTAG Freshwater Sediment Screening Benchmark
Semivolatile Organics (µg/kg) (continued)	
Bis(2-chloroethoxy)methane	---
Bis(2-chloroethyl)ether	---
Bis(2-ethylhexyl)phthalate	180
Butyl benzyl phthalate	10,900
Caprolactam	---
Carbazole	---
Chrysene	166
Di-n-butyl phthalate	6,470
Di-n-octyl phthalate	---
Dibenzo(a,h)anthracene	33
Dibenzofuran	415
Diethyl phthalate	603
Dimethyl phthalate	---
Fluoranthene	423
Fluorene	77.4
Hexachlorobenzene	20
Hexachlorobutadiene	---
Hexachlorocyclopentadiene	---
Hexachloroethane	1,027
Indeno(1,2,3-cd)pyrene	17
Isophorone	---
N-Nitroso-di-n-propylamine	---
N-Nitrosodiphenylamine	2,680
Naphthalene	176
Nitrobenzene	---
Pentachlorophenol	504
Phenanthrene	204
Phenol	420
Pyrene	195
Explosives (mg/kg)	
1,3,5-Trinitrobenzene	---
1,3-Dinitrobenzene	---
2,4,6-Trinitrotoluene	0.092
2,4-Dinitrotoluene	0.0416
2,6-Dinitrotoluene	---
2-Amino-4,6-dinitrotoluene	---
2-Nitrotoluene	---
3-Nitrotoluene	---
4-Amino-2,6-dinitrotoluene	---
4-Nitrotoluene	4.06
HMX	---
Nitrobenzene	---
Nitrocellulose	---

TABLE 3-6

ECOLOGICAL SCREENING CRITERIA - SEDIMENT
SITE 36 - CLOSED LANDFILL AND SITE 38 - RUM POINT LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	EPA Region 3 BTAG Freshwater Sediment Screening Benchmark
Explosives (mg/kg) (Continued)	
Nitroglycerin	---
Nitroguanidine	---
RDX	0.013
Tetryl	---
Inorganics (mg/kg)	
Aluminum	---
Antimony	2
Arsenic	9.8
Barium	---
Beryllium	---
Cadmium	0.99
Calcium	---
Chromium	43.4
Cobalt	50
Copper	31.6
Iron	20,000
Lead	35.8
Magnesium	---
Manganese	460
Mercury	0.18
Nickel	22.7
Potassium	---
Selenium	2
Silver	1
Sodium	---
Thallium	---
Vanadium	---
Zinc	121
Miscellaneous Parameters (mg/kg)	
Cyanide	0.1[(4)]
Hexavalent chromium	---

Source: United States Environmental Protection Agency (EPA), 2006b.

1 Value is for 1,3-dichloropropene.
2 Value is for m-xylene.
3 Value is for benzo(b+k)fluoranthene.
4 Value is for free cyanide.

---: No screening level available.
BTAG - Biological Technical Assistance Group.

4.0 SITE SCREENING PROCESS RESULTS

4.1 BACKGROUND

Site 36 – Closed Landfill is located in the western portion of Stump Neck Annex along Roach Road adjacent to Chickamuxen Creek. The landfill was used from 1972 to 1974 and has been inactive since that time. The fill was believed to contain metal casings such as mines, bombs, and torpedoes. The contents were reportedly certified inert and did not contain any explosives or chemicals when buried. Subsequent anecdotal information from personnel who formerly worked in Building 2010, which is located northeast of the landfill, indicated that disassembled metal parts were disposed in the water across Roach Road from Building 2010.

Prior to the SSP investigation, no environmental sampling had been conducted at Site 36. The site was identified in the Initial Assessment Study (IAS) (Hart, 1983). A site visit during the IAS indicated the presence of small metal parts in the surface soil. A geophysical survey was conducted during a site screening investigation (SSI) in 2002 (TtNUS, 2003). The survey results identified anomalies throughout the area of the suspected landfill indicating that waste may have been disposed at the site. Field observations also indicated surface debris scattered along the shoreline of Chickamuxen Creek. Because of the extent of the site and the potential for contamination, additional investigation of the site was recommended. Materials observed during an April 2003 site visit included tires, empty 55-gallon drums, a large cube-shaped tank, a part from an airplane, and a large item that appeared to be farm machinery.

4.2 SITE CHARACTERISTICS

4.2.1 Topography and Surface Features

As illustrated on Figure 4-1, the site is relatively flat and slopes gradually to the west from Roach Road to Chickamuxen Creek. The landfill covers an area of approximately 1 to 2 acres. The surface of the site is mostly covered with grasses and brushy vegetation, which becomes very dense near the shoreline. Some small and large trees are present.

Figure 4-2 shows photographs of the site near the shoreline of Chickamuxen Creek.

4.2.2 Surface Water

Chickamuxen Creek is adjacent to the northern, western, and eastern boundaries of the site. Precipitation either infiltrates into the soil or runs off into the creek. There are no obvious drainage channels at the site.

4.2.3 Geology/Soils

Logs from soil borings for the monitoring wells installed at the site indicate that shallow geologic materials consist of fill (e.g., wood fragments) mixed with sand, silt, clay, and gravel. The material beneath the fill consists of peat and river mud underlain by sand. The peat and river mud most likely correspond to former creek sediments present before the area was filled. Soil boring logs are provided in Appendix A.

4.2.4 Hydrogeology

The shallow groundwater beneath the site is unconfined and was encountered at a depth of approximately 4 feet bgs. The groundwater flows toward Chickamuxen Creek. A groundwater level measurement sheet is provided in Appendix A.

4.3 FIELD INVESTIGATIONS AND RESULTS

During the 2005 investigation, surface soil samples were collected. Soil borings were converted into monitoring wells, and shallow groundwater samples were collected. Surface water and sediment samples were collected from Chickamuxen Creek. Sediment pore water samples were also collected. The samples and analyses are summarized in Table 4-1.

During the 2007 investigation, sediment samples were collected from Chickamuxen Creek. The samples and analyses are summarized in Table 4-2.

Sample log sheets are provided in Appendix A. Summaries of positive results for surface soil, groundwater, surface water, sediment, and sediment pore water samples are provided in Tables 4-3 through 4-7, respectively. All analytical data are provided in Appendix B. Sample locations are shown on Figure 4-1.

4.3.1 Soil Boring and Monitoring Well Installation

During the 2005 investigation, two soil borings were installed in the landfill area to depths of approximately 14 ft bgs using hollow-stem auger drilling. Monitoring wells S36MW001 and S36MW002 were installed in these borings with screened intervals of 4 to 14 feet bgs. One soil boring was installed

upgradient of the landfill to a depth of approximately 18 feet bgs. Monitoring well S36MW003 was installed in this boring with a screened interval of 8 to 18 feet bgs.

The shallow groundwater monitoring wells were constructed of 2-inch-diameter PVC riser and screen and equipped with stick-up protective casings with locks.

Soil boring logs, well construction diagrams, and State of Maryland well completion reports are provided in Appendix A.

4.3.2 Surface Soil Sampling

During the 2005 investigation, surface soil samples were collected from six locations (S36SS001 through S36SS006) across the site from depths of 0 to 1 foot bgs. A field duplicate sample was collected at location S36SS001.

Several VOCs, many SVOCs (mostly PAHs), one explosive (nitrocellulose), and many metals were detected in surface soil samples (Table 4-3). Cyanide and hexavalent chromium were not detected.

No surface soil samples were collected during the 2007 investigation.

4.3.3 Groundwater Sampling

During the 2005 investigation, shallow groundwater samples were collected at monitoring wells installed within the landfill (S36MW001 and S236MW002) and at an upgradient location (S36MW003). A field duplicate sample was collected at S36MW001.

Three VOCs (ethylbenzene, toluene, and trichloroethene), four SVOCs (4-methylphenol, acetophenone, benzaldehyde, and phenol), three explosives (2,6-dinitrotoluene, RDX, and tetryl), and several metals were detected in groundwater samples from these wells (Table 4-4). Cyanide and hexavalent chromium were not detected.

No groundwater samples were collected during the 2007 investigation.

4.3.4 Surface Water Sampling

During the 2005 investigation, surface water samples were collected from four locations in Chickamuxen Creek around the landfill perimeter (S36SW001 to S36SW004) and from two locations in Chickamuxen

Creek in a suspected disposal area across Roach Road from Building 2010 (S36SW005 and S36SW006). A field duplicate sample was collected at location S36SW001.

One VOC (methylene chloride), several metals, and cyanide were detected in surface water samples (Table 4-5). SVOCs, explosives, and hexavalent chromium were not detected.

No surface water samples were collected during the 2007 investigation.

4.3.5 Sediment Sampling

During the 2005 investigation, sediment samples were collected from the same locations as surface water samples (S36SD001 to S36SD006). A field duplicate sample was collected at location S36SD001.

Three VOCs (2-butanone, acetone, and trichlorofluoromethane), many PAHs, one explosive (nitroglycerin), several metals, and cyanide were detected in sediment samples (Table 4-6). Hexavalent chromium was not detected.

During the 2007 investigation, sediment samples were collected from Chickamuxen Creek at two locations upstream of the landfill (S36SD007 and S36SD008), five locations around the landfill (S36SD009 through S36SD013), and two locations downstream of the landfill (S36SD014 and S36SD015). A field duplicate sample was collected at location S36SD012.

Many PAHs were detected in samples collected around the landfill but were not detected upstream or downstream of the landfill. Several metals were detected in all samples. Cyanide was not detected. Analytical results are provided in Table 4-6.

4.3.6 Sediment Pore Water Sampling

During the 2005 investigation, sediment pore water samples were collected from four locations around the landfill perimeter (S36PW001 to S36PW004). A field duplicate sample was collected at location S36PW001).

One VOC (toluene), two SVOCs (4-methylphenol and acetophenone), four explosives (1,3,5-trinitrobenzene, 1,3-dinitrobenzene, 2,4,6-trinitrotoluene, and 4-nitrotoluene), and several metals were detected in pore water samples (Table 4-7). Cyanide and hexavalent chromium were not detected.

No pore water samples were collected during the 2007 investigation.

4.4 HUMAN HEALTH RISK SCREENING EVALUATION

This section contains the results of the human health risk screening evaluation. The methodology used to screen for COPCs and to estimate risks is provided in Section 3.3.

4.4.1 Surface Soil

Table 4-8 is a summary of the surface soil data and includes frequencies of detection, ranges of detections, samples containing maximum detected concentrations, ranges of nondetected concentrations, average concentrations, and concentrations used for screening (i.e., maximum concentrations). The table also compares maximum concentrations to representative basewide background concentrations and to human health risk screening criteria and summarizes COPC selection and rationale. The COPCs for surface soil are benzo(a)anthracene, benzo(a)pyrene, benzo(k)fluoranthene, and dibenzo(a,h)anthracene.

The maximum concentration of one VOC (tetrachloroethene) and five SVOCs [benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, and naphthalene] exceeded screening levels for migration from soil to groundwater. None of these chemicals were detected in shallow groundwater; therefore, migration of organic chemicals from soil to groundwater is not considered to be problematic.

The maximum concentrations of a few metals also exceeded screening levels for migration from soil to groundwater. The maximum concentrations of cadmium and manganese exceeded these screening levels based on a dilution attenuation factor (DAF) of 1 but not for a DAF of 20, which is more appropriate for metals. In addition, the maximum concentration of manganese was less than basewide background concentrations, and cadmium is not a COPC for groundwater, as discussed below. The maximum concentrations of aluminum, arsenic, and cobalt exceeded these screening levels based on a DAF of 20; however, the concentrations were less than the basewide background concentrations. Therefore, migration of metals from soil to groundwater is not considered to be problematic.

4.4.2 Groundwater

Table 4-9 is a summary of the shallow groundwater data and includes frequencies of detection, ranges of detections, samples containing the maximum detected concentrations, ranges of nondetected concentrations, average concentrations, and concentrations used for screening (i.e., maximum concentrations). The table also compares maximum concentrations to human health screening criteria and summarizes COPC selection and rationale. The COPCs for shallow groundwater are trichloroethene, 4-methylphenol, RDX, antimony, arsenic, barium, iron, and manganese.

4.4.3 Surface Water

Table 4-10 is a summary of the surface water data and includes frequencies of detection, ranges of detections, samples containing the maximum detected concentrations, ranges of nondetected concentrations, average concentrations, and concentrations used for screening (i.e., maximum concentrations). The table also compares maximum concentrations to human health screening criteria and summarizes COPC selection and rationale. The COPCs for surface water are iron and manganese.

4.4.4 Sediment

Table 4-11 is a summary of the sediment data and includes frequencies of detection, ranges of detections, samples containing the maximum detected concentrations, ranges of nondetected concentrations, average concentrations, and concentrations used for screening (i.e., maximum concentrations). The table also compares maximum concentrations to human health screening criteria and summarizes COPC selection and rationale. The COPCs for sediment are benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, aluminum, antimony, arsenic, cadmium, iron, lead, manganese, mercury, and vanadium.

4.4.5 Sediment Pore Water

Table 4-12 is a summary of the sediment pore water data for unfiltered samples and includes frequencies of detection, ranges of detections, samples containing the maximum detected concentrations, ranges of nondetected concentrations, average concentrations, and concentrations used for screening (i.e., maximum concentrations). The table also compares maximum concentrations to human health screening criteria and summarizes COPC selection and rationale. The COPCs for pore water are 1,3-dinitrobenzene, arsenic, iron, manganese, nickel, and vanadium.

4.4.6 Human Health Risk Evaluation

Table 4-13 provides a human health risk evaluation for the COPCs discussed above for surface soil, shallow groundwater, surface water, sediment, and sediment pore water. The total ILCR for each medium was estimated by dividing the maximum concentrations by the respective carcinogenic RBCs (based on residential exposure and a 1E-06 cancer risk) and adding the results for each COPC. The total HQ for each medium was estimated by dividing the maximum concentrations by the respective noncarcinogenic RBCs (based on residential exposure) and adding the results for each COPC. The risk evaluation conservatively assumes that shallow groundwater, surface water, and sediment pore water were used as sources of drinking water. The evaluation also conservatively assumes residential exposure to surface soil and sediment in Chickamuxen Creek.

The estimated total cumulative ILCR is 7.6E-04, which is greater than the EPA acceptable risk range of 1E-04 to 1E-06. There are no unacceptable carcinogenic risks associated with exposure to surface soil or surface water. The total ILCR for exposure to shallow groundwater is 5.2E-04, and the total ILCR for exposure to sediment pore water is 1.1E-04, which are both greater than the acceptable range. The primary risk driver for both media is arsenic. This evaluation conservatively assumed that shallow groundwater and sediment pore water would be used as sources of drinking water. However, this assumption is very conservative, and the risk estimate for exposure to sediment pore water is biased high. Although sediment pore water could be considered as shallow groundwater that is discharging into Chickamuxen Creek, it is highly unlikely that a water supply well would be installed in the creek. The total ILCR for exposure to sediment is 1.1E-04. The primary risk drivers are benzo(a)pyrene, benzo(b)fluoranthene, and arsenic. The risk screening evaluation assumed that exposure to sediment would be the same as exposure to surface soil under a residential scenario. However, this assumption is very conservative, and the risk estimate is biased high because there would be less exposure to sediment under a realistic residential exposure scenario. The soil screening level RBCs are based on the ingestion and inhalation routes of exposure, which is a reasonable assumption; however, exposure to sediment under a more reasonable assumption would primarily be associated with dermal contact. There are no screening levels available for dermal exposure.

The total cumulative HI is 21, which is greater than the EPA threshold of 1.0. Even when target organs effects are considered, the cumulative HI for several target organs is greater than 1.0. Target organ HIs are greater than 1.0 for shallow groundwater, sediment pore water, and sediment. Risk drivers for shallow groundwater are arsenic, iron, and manganese. Risk drivers for pore water are iron and manganese. The only risk driver for sediment is iron. The risk estimates for exposure to sediment pore water and sediment are biased high for the reasons stated above.

In summary, there are potential risks to human health associated with exposure to shallow groundwater under a residential exposure scenario. Although the risk screening evaluation indicted potential risks from exposure to sediment pore water, the risk evaluation conservatively assumed the same exposure assumptions as for exposure to shallow groundwater. It is highly unlikely that a water supply well would be installed in Chickamuxen Creek; therefore, the risk estimate for exposure to sediment pore water is biased high. Although the risk screening evaluation indicated potential risks from exposure to sediment, the risk evaluation conservatively used the same exposure assumptions as for exposure to surface soil, and actual exposure to sediment would be less frequent. Therefore, the risk estimate for exposure to sediment is biased high. There are no unacceptable risks to human health from exposure to surface soil and surface water.

4.5 ECOLOGICAL RISK SCREENING EVALUATION

This section contains the results of the ecological risk screening evaluation. The methodology used to screen for COPCs and to estimate risks is provided in Section 3.4. Information on site features is discussed elsewhere in this report and is not repeated in this section.

VOCs, SVOCs, explosives, and metals could have been associated with the wastes that were disposed in the landfill and were detected in surface soil samples collected in the area. Contaminants present in the waste would have been deposited in the immediate vicinity of disposal and could have migrated to groundwater, which may become sediment pore water, surface water, and sediment in Chickamuxen Creek. Groundwater was not evaluated because ecological receptors would not be directly exposed to this medium. However, exposure to surface water and sediment pore water were evaluated.

4.5.1 Surface Soil

4.5.1.1 Steps 1 and 2 – Preliminary Screening

Table 4-14 is a summary of the Site 36 surface soil data and includes frequencies of detection, ranges of detections, samples containing the maximum detected concentrations, ranges of nondetected concentrations, average concentrations, and concentrations used for screening (i.e., maximum concentrations). The table also compares the maximum concentrations to ecological screening levels and basewide background concentrations and summarizes COPC selection and rationale. Ecological COPCs for surface soil include VOCs, SVOCs, an explosive, and metals. The VOCs include acetone, isopropylbenzene, and methyl acetate. The SVOCs include benzaldehyde and di-n-butyl phthalate. The explosive is nitrocellulose. The metals include cadmium, copper, lead, and zinc.

4.5.1.2 Step 3A – Refinement of COPCs

The methodology for refinement of COPCs is discussed in Section 3.4.5. VOCs, SVOCs, an explosive, and metals were identified as preliminary COPCs for surface soil.

Volatile Organic Compounds

Three VOCs (acetone, isopropylbenzene, and methyl acetate) were initially selected as COPCs because they did not have screening levels. The Region 3 BTAG screening levels for other VOCs range from 100 to 300 micrograms per kilogram (µg/kg). Acetone is a common laboratory contaminant, and its maximum detected concentration (170 µg/kg) is within the range of screening levels for the other VOCs. All other acetone detections were 100 µg/kg or less, so impacts to plants and invertebrates from acetone are not expected. Also, the maximum detected concentrations of the other two VOCs without screening levels

(isopropylbenzene and methyl acetate) were both 20 µg/kg, which is less than the range of screening levels for the other VOCs. Therefore, impacts to plants and invertebrates from isopropylbenzene and methyl acetate are not expected.

These VOCs are not considered to be bioaccumulative; therefore, impacts to wildlife are not expected.

Semivolatile Organic Compounds

Two SVOCs (benzaldehyde and di-n-butyl phthalate) were initially selected as COPCs because they do not have screening levels. The maximum detected concentration of di-n-butyl phthalate (49 µg/kg) is much less than the Oak Ridge National Laboratory (ORNL) plant benchmark of 200,000 µg/kg (Efroymson et al., 1997a) or the ORNL earthworm benchmark for dimethyl phthalate of 200,000 µg/kg (Efroymson et al., 1997b). Therefore, it is unlikely that plants or invertebrates are being significantly impacted from di-n-butyl phthalate in surface soil at the site. No toxicity data were located for benzaldehyde, but it is not likely that the relatively low detected concentrations (58 to 98 µg/kg) would significantly impact plants or invertebrates.

Explosives

Nitrocellulose was initially selected as a COPC because a screening level is not available. Although it is possible that nitrocellulose is related to site activities, nitrocellulose is typically considered to be a relatively inert compound, so it is unlikely to impact plants, invertebrates, or wildlife.

Metals

Cadmium was initially selected as a COPC because it was detected at concentrations that exceeded its screening level. The SSLs for cadmium (32 mg/kg for plants and 140 mg/kg for invertebrates) (EPA, 2005e) are greater than the maximum detected concentration of cadmium (3.1 mg/kg). Therefore, impacts to plants or invertebrates from cadmium in surface soil are not expected.

Lead was initially selected as a COPC because it was detected at concentrations that exceeded its screening level. The plant and invertebrate SSLs for lead (EPA, 2005h) are 120 and 1,700 mg/kg, respectively. One sample (S36SS006001) had a lead concentration of 178 mg/kg, which is greater than the plant SSL, but no samples had lead detections greater than the invertebrate SSL. Therefore, slight impacts to plants are possible, but impacts to invertebrates are unlikely from lead in surface soil at the site.

Copper and zinc were initially selected as COPCs because they were detected at concentrations that exceeded their screening levels. The ecological SSL values used as screening levels for these metals are based on risks to wildlife. The lower of the SSLs for plants and invertebrates is 70 milligrams per kilogram (mg/kg) for copper and 120 mg/kg for zinc. All detected concentrations of these metals are below these concentrations, so impacts to plants and invertebrates are unlikely.

The screening levels for these metals are based on risks to plants and/or invertebrates. There are no alternate guidelines available to evaluate potential risks to wildlife, and these metals are considered to be bioaccumulative. Therefore, food-chain modeling was conducted to evaluate potential risks.

4.5.2 Surface Water

4.5.2.1 Steps 1 and 2 – Preliminary Screening

Table 4-15 is a summary of the Site 36 surface water data and includes frequencies of detection, ranges of detections, samples containing the maximum detected concentrations, ranges of nondetected concentrations, average concentrations, and concentrations used for screening (i.e., maximum concentrations). The table also compares the maximum concentrations to ecological screening levels and summarizes COPC selection and rationale. Ecological COPCs for surface water include one VOC (chloromethane), several metals (aluminum, barium, cadmium, iron, lead, and manganese), and cyanide.

4.5.2.2 Step 3A – Refinement of COPCs

The methodology for refinement of COPCs is discussed in Section 3.4.5. One VOC, metals, and cyanide were identified as preliminary COPCs for surface water.

Chloromethane was the only VOC initially selected as a COPC in surface water because it did not have a screening level. EPA Region 4 has a chronic screening level of 5,500 micrograms per liter (µg/L) for chloromethane (EPA, 2001), which is much greater than the maximum detected concentration of 0.89 µg/L. Therefore, impacts to aquatic organisms from chloromethane in surface water at the site are unlikely.

Six metals (aluminum, barium, cadmium, iron, lead, and manganese) were initially selected as COPCs because they were detected at concentrations that exceeded their respective screening levels. The concentrations of the metals in several samples were greater than their respective screening levels, so impacts to aquatic organisms are possible. Only unfiltered surface water samples were collected as part of the investigation. Because the dissolved fraction of the metals is the bioavailable and potentially toxic fraction, there is uncertainty in comparing the concentrations of total metals to the screening levels.

However, the samples had low turbidity and were described as clear, so the dissolved results may be similar to the total results.

Cyanide was initially selected as a COPC because it was detected in one sample at a concentration (5.1 µg/L) that slightly exceeded its screening level of 5 µg/L. The slight exceedance of the criteria in one sample is not likely to cause a significant impact to aquatic organisms.

4.5.3 Sediment

4.5.3.1 Steps 1 and 2 – Preliminary Screening

Table 4-16 is a summary of the Site 36 sediment data and includes frequencies of detection, ranges of detections, samples containing the maximum detected concentrations, ranges of nondetected concentrations, average concentrations, and concentrations used for screening (i.e., maximum concentrations). The table also compares the maximum concentrations to ecological screening levels and summarizes COPC selection and rationale. Ecological COPCs for sediment include VOCs, SVOCs (mostly PAHs), an explosive (nitroglycerin), metals, and cyanide. The VOCs include 2-butanone, acetone, and trichlorofluoromethane. The SVOCs include acenaphthylene, anthracene, benzaldehyde, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, carbazole, chrysene, dibenzo(a,h)anthracene, fluoranthene, indeno(1,2,3-cd)pyrene, and pyrene. The metals include aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, silver, vanadium, and zinc.

4.5.3.2 Step 3A – Refinement of COPCs

The methodology for refinement of COPCs is discussed in Section 3.4.5. VOCs, SVOCs, nitroglycerin, metals, and cyanide were identified as preliminary COPCs for sediment.

Volatile Organic Compounds

Three VOCs were initially selected as COPCs because they did not have screening levels. Sediment benchmarks for two of the VOCs (acetone and 2-butanone) are available (Jones et al., 1997). The maximum detected concentration of acetone (47 µg/kg) was greater than the sediment benchmark of 8.7 µg/kg, but the benchmark has a footnote that indicates that acetone is polar nonionic organic compound, for which the equilibrium partitioning (EqP) model is likely to provide a conservative estimate of exposure (Jones et al., 1997). Therefore, because the sediment benchmark for acetone is conservative and because acetone is a common laboratory contaminant and may not even be present in the sediment, impacts to sediment invertebrates from acetone in the sediment are unlikely. The maximum detected concentration of 2-butanone (28 µg/kg) is much less than its sediment benchmark

(270 µg/kg) from Jones et al. (1997), which is also a conservative value. Therefore, impacts to sediment invertebrates from 2-butanone are unlikely. There is no sediment benchmark for trichlorofluoromethane, but almost all of the sediment benchmarks for other VOCs in Jones et al. (1997) are greater than the maximum trichlorofluoromethane detection of 3 µg/kg. For these reasons, impacts to sediment invertebrates from trichlorofluoromethane are not likely.

These VOCs are not considered to be bioaccumulative; therefore, impacts to piscivorous wildlife are not expected.

Semivolatile Organic Compounds

Twelve PAHs were initially selected as COPCs because they were detected at concentrations that exceeded their respective screening levels. Total PAHs were evaluated instead of the individually detected PAHs because the toxicity of PAHs may be additive and there are sediment benchmarks for total PAHs. The total PAH concentrations in four sediment samples [S36SD0010001 (1,640 µg/kg), S36SD0020001 (3,100 µg/kg), S36SD0030001 (11,000 µg/kg), and S36SD0110102 (2,033 µg/kg)] are greater than the Region 3 BTAG screening level for total PAHs (1,610 µg/kg). The BTAG screening level is the threshold effect concentration (TEC) below which adverse effects are not expected to occur (MacDonald et al., 2000). The corresponding higher-effects level is the probable effects concentration (PEC), which is the geometric mean of sediment values above which harmful effects on sediment-dwelling organisms are expected to occur more often than not (MacDonald et al., 2000). The PEC for total PAHs is 22,800 µg/kg. All detected concentrations are less than the PEC. Because total PAH concentrations at four sediment locations are greater than the TEC but less than the PEC, impacts to sediment invertebrates from PAHs are possible at these locations.

Two SVOCs (benzaldehyde and carbazole) were initially selected as COPCs because they do not have screening levels. Both chemicals had their maximum detected concentrations in sample S36SD0030001. Although impacts to sediment invertebrates from these chemicals cannot be determined because of the lack of toxicity data, any impacts are expected to be greater from the elevated concentrations of PAHs in that sample. For that reason, benzaldehyde and carbazole will not be further evaluated for risks to sediment invertebrates.

The PAHs detected are considered to be bioaccumulative, and there are no alternate guidelines available to evaluate risks to piscivorous wildlife. Therefore, food-chain modeling was conducted to evaluate potential risks.

Explosives

Nitroglycerin was initially selected as a COPC because it did not have a screening level. However, the single detection of 0.55 mg/kg is unlikely to result in significant impacts to sediment invertebrates or piscivorous wildlife.

Metals and Cyanide

Several metals (antimony, arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, silver, and zinc) were initially selected as COPCs because they were detected at concentrations that exceeded their respective screening levels. The screening levels were based on the TEC, as described above, or on a similar lower-effects level from other sources. None of the detected concentrations of antimony, arsenic, chromium, copper, and zinc were greater than the PEC or other higher-effects level [effects range-median (ER-M) for antimony]. However, because concentrations of these metals are greater than the TEC, effects to sediment invertebrates are possible at the related sample locations. At least one detected concentration of cadmium, lead, iron, manganese, mercury, and nickel was greater than the PEC or other higher-effects level [severe effects level (SEL) for iron and manganese and ER-M for silver]; therefore, effects to sediment invertebrates are likely at the related sample locations.

In addition, aluminum, barium, beryllium, and vanadium were initially selected as COPCs because they did not have screening levels. The maximum aluminum detection (30,700 mg/kg) is higher than the threshold effects level of 25,500 mg/kg as cited in Buckman (1999). Concentrations of barium exceeded the apparent effects threshold (AET) (48 mg/kg) in several samples. Concentrations of vanadium exceeded the marine AET (57 mg/kg) in several samples. Therefore impacts to sediment invertebrates from aluminum, barium, and vanadium are possible at locations with concentrations exceeding these alternate criteria. Finally, impacts from beryllium cannot be determined because of the lack of toxicity data. However, the relatively low concentrations (0.25 to 0.38 mg/kg) are unlikely to cause significant impacts to benthic invertebrates.

Many of these metals are considered to be bioaccumulative, and there are no alternate guidelines available to evaluate risks to piscivorous wildlife. Therefore, food-chain modeling was conducted to evaluate potential risks.

Cyanide was initially selected as a COPC because it was detected at a concentration that exceeded its screening level (0.1 mg/kg). Both detected concentrations of cyanide at the site (0.13 mg/kg and 0.26 mg/kg) only slightly exceeded the screening level, which is based on free cyanide. It is not likely that a significant portion of the cyanide at the site is free, so cyanide is unlikely to cause significant impacts to benthic invertebrates.

Cyanide is not considered to be bioaccumulative; therefore impacts to aquatic life are not expected.

4.5.3.3 Acid Volatile Sulfides/Simultaneously Extracted Metals

During the 2007 investigation, nine sediment samples (see Figure 4-1) were analyzed for AVS and SEM. AVS binds, on a molar basis, a number of cationic metals of environmental concern (cadmium, copper, lead, nickel, silver, and zinc) (EPA, 2005j). In sediment samples where the AVS molar concentrations are greater than SEM molar concentrations, the SEM metals are not expected to be bioavailable or directly toxic to benthic invertebrates. However, in sediment samples where the AVS molar concentrations are less than SEM molar concentrations, the SEM metals are not necessarily bioavailable or directly toxic to benthic invertebrates because other parameters such as TOC may reduce the bioavailability and toxicity of metals in the sediment. Sediments that are anoxic typically have greater AVS concentrations than sediments that are well aerated. The metals included in the SEM analysis at Site 36 included cadmium, copper, lead, nickel, and zinc.

To account for the additional binding of metals to TOC, EPA (2005j) presents a model that was developed to normalize AVS and SEM to the fraction organic carbon (f_{OC}) as follows:

$$\text{Organic carbon-normalized excess SEM} = (\Sigma\text{SEM-AVS})/f_{OC}$$

Where: ΣSEM = the sum of the 1M HCl simultaneously extractable metals (µmol/g)
AVS = acid volatile sulfide (µmol/g)
f_{OC} = fraction organic carbon (unitless)

EPA (2005j) states that when the (ΣSEM-AVS)/f_{OC}) is less than 130 µmol/g, toxicity is not likely. When it is between 130 and 3,000 µmol/g, toxicity is uncertain. When it is greater than 3,000 µmol/g, toxicity is likely.

Table 4-17 provides the organic carbon-normalized excess SEM concentrations for the nine samples. The values range from -383 µmol/g in sample S36SD0080102 to 24 µmol/g in sample S36SD0120102. None of the values are greater than the 130 µmol/g threshold. This indicates that cadmium, copper, lead, nickel, and zinc would not be bioavailable in these sediment samples. Although silver was not included in the SEM analysis in these samples, silver is not likely to be bioavailable. EPA (2005j) indicates that in sediments with concentrations of AVS > 0, silver should pose a low risk of biological effects. Therefore, benthic macroinvertebrates would not be expected to be affected by the detected concentrations of these metals in Chickamuxen Creek.

4.5.3.4 Benthic Macroinvertebrate Results

During the 2007 investigation, sediment samples for chemical analysis and benthic invertebrate community analysis were collected from nine locations in Chickamuxen Creek to determine whether the concentrations of chemicals in the sediment were adversely impacting the benthic invertebrate community in the creek. Figure 4-1 shows the locations of the samples. Samples S36SD007 and S36SD008 were considered upstream reference samples, and samples S36SD014 and S36SD015 were considered downstream reference samples. These locations were not adjacent to the site and do not appear to be impacted by site activities. The following paragraphs briefly discuss the results of the benthic community analysis.

Benthic macroinvertebrate analysis included removing the organisms from the sediment and identifying them to the lowest practical taxonomic level. The following metrics were calculated from the data: total number of organisms, total number of taxa, species diversity index, and biotic index.

The Shannon Diversity Index (Shannon, 1948) was calculated to determine the overall diversity of the benthic macroinvertebrate population at each sampling location. Diversity data are useful because they condense a substantial amount of data into a single value. The Shannon Diversity Index was calculated using the following equation:

$$H' = \left[\sum (P_i)(\ln P_i)\right]$$

where:

H' = species diversity

P_i = The proportion, or relative abundance, of each individual species to the total (measures from 0 to 1)

For most of the organisms collected, the laboratory assigned a tolerance value based on sensitivity to pollution. The tolerance values are intended for the examination of the general level of pollution regardless of the source. The North Carolina Biotic Index (Lenat, 1993) was generated as an average of the tolerance values weighed by individual abundance. The North Carolina Biotic Index was calculated using the following equation:

$$NCBI = \frac{\sum (n_i * TV)}{N}$$

where:

NCBI = North Carolina Biotic Index

n_i = Number of individuals occurring in the ith taxa

TV = Tolerance Value assigned to the ith taxa

N = Total number of individuals in the sample

Table 4-18 presents the results of the benthic community data, including a summary of the number of organisms in each sample, the number of taxa in each sample, the North Carolina Biotic Index, and the species diversity index. The results are presented on Figures 4-3 through 4-6.

As can be seen from the figures, the numbers of organisms and biotic index are similar between the site and reference samples. There is variation in the data between each set of stations (site and reference), especially for the number of organisms. This type of variation was expected, which is the reason four reference samples were collected. The site stations generally had greater numbers of taxa and greater species diversity than the reference stations indicating that the benthic community was slightly more robust at the site locations.

Another biotic or benthic index that could have been calculated was the Chesapeake Bay Benthic Index of Biotic Integrity (Versar, Inc., 2002). This benthic index is a summary of 11 metrics, some of which were measured or calculated for Site 36. These include species diversity index, species abundance, and tolerance score (which is based on the North Carolina Biotic Index). It was determined that calculation of the Chesapeake Bay Benthic Index was not necessary because the other evaluations did not show significant impacts to the benthic community near the site.

In summary, the benthic community does not appear to be impacted by chemicals in the sediment by Site 36.

4.5.4 <u>Sediment Pore Water</u>

4.5.4.1 Steps 1 and 2 – Preliminary Screening

Table 4-19 is a summary of the Site 36 sediment pore water data and includes frequencies of detection, ranges of detections, samples containing the maximum detected concentrations, ranges of nondetected concentrations, average concentrations, and concentrations used for screening (i.e., maximum concentrations). The table also compares the maximum concentrations to ecological screening levels and summarizes COPC selection and rationale. Ecological COPCs for sediment pore water include the

VOC toluene, the SVOC acetophenone, the explosives 1,3,5-trinitrobenzene and 1,3-dinitrobenzene, and several metals including aluminum, barium, cadmium, copper, iron, lead, manganese, and nickel.

4.5.4.2 Step 3A – Refinement of COPCs

The methodology for refinement of COPCs is discussed in Section 3.4.5. One VOC, one SVOC, two explosives, and several metals were identified as preliminary COPCs for sediment pore water. This Step 3A evaluation will focus on potential impacts to sediment invertebrates because they are the receptors that would be exposed to sediment pore water.

The VOC toluene was initially selected as a COPC because it was detected at a concentration that exceeded its screening level. The source of the screening level is the Canadian Water Quality Guidelines as cited in the Region 3 BTAG screening level table (EPA, 2006a). Another conservative value that is often used for screening is the Secondary Chronic Value (SCV) from Suter and Tsao (1996). The SCV for toluene in that document is 9.8 µg/L, which is greater than the maximum toluene detection in the pore water samples (4 µg/L). Therefore, impacts to sediment invertebrates from toluene in pore water are not expected.

The SVOC acetophenone was initially selected as a COPC because it did not have a screening level. Aquatic toxicity data for this chemical were found in the Pesticide Action Network (PAN) Pesticides Database (PAN, 2005). The average Lethal Concentration 50 (LC_{50}) for fish presented in the Pesticides Database was 170,750 µg/L, and acetophenone was described as not acutely toxic. Therefore, it is not likely that the single detection of 2 µg/L of acetophenone in pore water would impact sediment invertebrates.

The explosives 1,3,5-trinitrobenzene and 1,3-dinitrobenzene were initially selected as COPCs because they did not have screening levels. Secondary chronic values developed for these chemicals in Talmage, et al. (1999) are 11 µg/L for 1,3,5-trinitrobenzene and 20 µg/L for 1,3-dinitrobenzene. The maximum detected concentrations for these chemicals (less than 1 µg/L) in the pore water samples are less than the chronic values, so impacts to sediment invertebrates are unlikely.

The metals aluminum, barium, cadmium, copper, iron, lead, manganese, and nickel were detected in several of the unfiltered pore water samples at concentrations that exceeded their respective screening levels. With the exception of lead, these metals (along with arsenic and mercury in one sample each) were detected in several filtered pore water samples at concentrations that exceeded their respective screening levels. However, impacts to sediment invertebrates from these metals are not expected based on the results of the AVS/SEM analysis and benthic community study presented in Sections 4.5.3.3 and 4.5.3.4, respectively.

4.5.5 Risks to Wildlife

Food-chain modeling was conducted to evaluate potential risks to representative receptors from ingested doses of chemicals detected in surface soil and sediment that are known to bioaccumulate or biomagnify as designated in the EPA Region 3 BTAG Freshwater Screening Benchmarks (EPA, 2006b). The supporting information for the food-chain model, including surrogate receptor profiles, toxicity reference values (TRVs), bioaccumulation factors (BAFs), exposure factors and calculations, and food-chain model equations, and calculations for each receptor are presented in Appendix D.

Risk to terrestrial receptors as a result of exposure to COPCs in the surface soil and sediment was determined by estimating the chronic daily intake (CDI) and comparing the CDI to TRVs representing acceptable daily doses in mg/kg-day. The TRVs were developed from no observed adverse effect levels (NOAELs) and lowest observable adverse effect levels (LOAELs) obtained from wildlife studies, when available. The TRVs used in the food-chain model came from the ORNL Toxicological Benchmarks for Wildlife (Sample, et al., 1996), EPA ecological SSLs, and other sources as cited in Appendix D.

Food-chain modeling was first conducted using maximum detected chemical concentrations and conservative exposure factors. Surface soil food-chain model NOAEL EEQs (Table 4-20) were greater than 1.0 for cadmium (woodcock and shrew), copper (woodcock), lead (woodcock and shrew), and zinc (woodcock). Sediment food-chain model NOAEL EEQs (Table 4-21) were greater than 1.0 for cadmium, chromium, copper, lead, mercury, nickel, and zinc for the heron and the raccoon.

The average food chain scenario provides a less conservative evaluation of risk compared to the maximum (conservative) food chain scenario, but it is nevertheless conservative. For example, the EEQs in Tables 4-22 and 4-23 still assume that birds and mammals derive 100 percent of their diet from Site 36. The woodcock, heron and raccoon, however, would undoubtedly derive only a small portion of their total diet from this area, and thus, the HQs for these representative receptors in Tables 4-22 and 4-23 are very conservative. The extent to which birds represented by the woodcock would forage exclusively at the site is uncertain, as woodcock home ranges vary from as little as 8 acres to as many as 182 acres (EPA, 1993b). Small insectivorous mammals such as shrews have small home ranges and could forage totally within Site 36.

For the average exposure scenario, surface soil food-chain model NOAEL EEQs (Table 4-22) were only greater than 1.0 for lead (woodcock). However, this NOAEL EEQ was only slightly higher than 1.0 (1.8), and the LOAEL EEQ is well below 1.0 (0.065). Furthermore, as discussed above, the home range of the woodcock is larger than Site 36, and this receptor would, therefore, obtain only a portion of its food from this area. The average detected concentration of lead was less than the basewide background level (see

Table 4-14) and all detected concentrations except the maximum in sample S36SS006001 were also below the background level. Therefore, potential lead-related risks do not appear to be caused by landfill-related activities. Instead, they are presumed to be due to regional anthropogenic or natural conditions. For the average exposure scenario, sediment food-chain model NOAEL EEQs (Table 4-23) were only greater than 1.0 for mercury (heron). As described above, the heron would likely only receive a portion of its total diet from the Site 36 area because the heron's average home range (11 acres) is much larger than Site 36. Additionally, the LOAEL EEQ is below 1.0 (0.29). Therefore, risks to piscivorous wildlife from sediment-related concentrations of mercury are not expected.

In summary, site-related risks to wildlife from detected bioaccumulative chemicals are not expected.

4.5.6 Ecological Risk Screening Summary

4.5.6.1 Surface Soil

Based on comparisons of chemical concentrations in surface soil to various benchmarks, potential impacts to plants and invertebrates from chemicals in the soil are not expected, with the possible exception of lead in one sample. The lead concentration at location S36SS006 was greater than the plant screening level, so it is possible that there may be some impacts to plants in that area. However, the screening level is conservative because any of the toxicity tests used to develop screening levels for metals use highly bioavailable forms of the metal, such as metal salts, which in many cases are much more toxic that equivalent concentrations of the metals in soil collected in the field (Allen, 2002). Therefore, although the concentration of lead in one sample was greater than the plant screening level, the potential impacts, if any, are acceptable.

4.5.6.2 Surface Water

The concentrations of several metals in several samples were greater than their respective screening levels; therefore, impacts to aquatic organisms are possible. However, there is uncertainty in the possible impacts because the dissolved fraction of the metals, which is the bioavailable portion, was not determined.

4.5.6.3 Sediment

Based on comparisons of chemical concentrations in sediment to sediment screening levels, potential impacts to sediment invertebrates from PAHs are possible at four locations (S36SD001, S36SD002, S36SD003, and S36SD011), and potential impacts to sediment invertebrates from metals are possible at numerous locations. Based on results of the organic carbon-normalized excess AVS model, cadmium, copper, lead, nickel, silver, and zinc are not expected to be bioavailable to benthic macroinvertebrates in

Chickamuxen Creek sediments adjacent to Site 36. Also, results from benthic macroinvertebrae sampling and study indicate that the benthic community is not being impacted by chemicals in the sediment by Site 36.

4.5.6.4 Sediment Pore Water

Based on comparisons of chemical concentrations in sediment pore water to surface water screening levels, potential impacts to sediment invertebrates from metals in pore water are possible. However, impacts to sediment invertebrates from these metals are not expected based on the results of the AVS/SEM analysis and benthic study presented in Sections 4.5.3.3 and 4.5.3.4, respectively.

4.5.6.5 Wildlife

Average exposure scenario food-chain model EEQs were only greater than 1.0 for surface soil for lead (woodcock). The average lead concentration in surface soil is less than the basewide background level. All lead concentrations except for the maximum detected concentration are less than the basewide background level. For the average exposure scenario, sediment food-chain model NOAEL EEQs (Table 4-23) were only greater than 1.0 for mercury (heron). The heron would likely only receive a portion of its total diet from the Site 36 area because the heron's average home range (11 acres) is much larger than Site 36. Additionally, the LOAEL EEQ is less than 1.0 (0.29). Therefore, risks to wildlife from detected site-related bioaccumulative chemicals in surface soil and sediment are not expected.

4.6 SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

- Site 36 is an inactive landfill that was reportedly used for disposal of metal casings such as mines, bombs, and torpedoes. The contents were reportedly certified inert and did not contain explosives or chemicals when buried. Disassembled metal parts may have been disposed in the water across Roach Road from Building 2010. Any waste constituents would have been deposited directly in the fill or migrated to Chickamuxen Creek.

- During the 2005 investigation, three soil borings were installed and converted into monitoring wells. Surface soil, groundwater, surface water, sediment, and sediment pore water samples were collected. The samples were analyzed for TCL VOCs, TCL SVOCs, explosives, TAL metals, hexavalent chromium, and cyanide.

- During the 2007 investigation, additional sediment samples were collected. Samples were analyzed for PAHs, TAL metals and cyanide, AVS/SEM, TOC, grain size, and benthic macroinvertebrates.

- Based on the human health risk screening, benzo(a)anthracene, benzo(a)pyrene, benzo(k)fluoranthene, and dibenzo(a,h)anthracene were identified as COPCs for surface soil. COPCs for shallow groundwater were trichloroethene, 4-methylphenol, RDX, antimony, arsenic, barium, iron, and manganese. Iron and manganese were identified as COPCs for surface water. COPCs for sediment were benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, antimony, arsenic, cadmium, iron, lead, manganese, mercury, and vanadium. COPCs for sediment pore water were 1,3-dinitrobenzene, arsenic, iron, manganese, nickel, and vanadium. The risk characterization resulted in a total cumulative ILCR of 7.6E-04, which is greater than the EPA acceptable risk range of 1E-04 to 1E-06. Based on the assumption that shallow groundwater, surface water, and sediment pore water would be used as sources of drinking water, the ILCR for exposure to shallow groundwater was 5.2E-04, and the ILCR for exposure to pore water was 1.1E-04. The primary risk driver for both media is arsenic. The total ILCR for exposure to sediment was 1.1E-04, and the primary risk drivers are benzo(a)pyrene, benzo(b)fluoranthene, and arsenic. There were no unacceptable carcinogenic risks to human health associated with exposure to surface soil and surface water. The total cumulative HI was 21, which is greater than the EPA threshold of 1.0. Even when target organ effects are considered, the cumulative HI for several target organs was greater than 1.0 for groundwater, sediment pore water, and sediment. The risk drivers for shallow groundwater are arsenic, iron, and manganese, and risk drivers for sediment pore water are iron and manganese. The only risk driver for sediment is manganese.

- There are potential risks to human health associated with exposure to shallow groundwater as a source of drinking water under a residential exposure scenario. The risk screening evaluation conservatively assumed that exposure to sediment pore water would be the same as exposure to shallow groundwater under a residential scenario. However, this assumption is very conservative, and the risk estimate for exposure to sediment pore water is biased high. Although sediment pore water could be considered as shallow groundwater that is discharging into Chickamuxen Creek, it is highly unlikely that a water supply well would be installed in the creek. The risk screening evaluation assumed that exposure to sediment would be the same as exposure to surface soil under a residential scenario. However, this assumption is very conservative, and the risk estimate is biased high because there would be less exposure to sediment under a realistic residential exposure scenario. The soil screening levels are based on the ingestion and inhalation routes of exposure, which is a reasonable assumption; however, exposure to sediment under a more reasonable assumption would primarily be associated with dermal contact. There are no screening levels available for dermal exposure. There are no unacceptable risks to human health associated with exposure to surface soil and surface water.

- The potential for migration of surface soil contaminants to groundwater is not considered to be problematic.

- Based on comparisons to ecological screening levels, there are potential risks to aquatic organisms from exposure to surface water and potential risks to sediment invertebrates from exposure to sediment and sediment pore water. However, results from benthic macroinvertebrate surveys indicate that the benthic community is not being adversely affected by chemicals detected in sediment near Site 36. Additionally, metals detected in sediment should not be bioavailable based on results from the organic carbon normalized excess AVS model. Results from food-chain modeling indicate that terrestrial wildlife is not at risk from detected chemical concentrations in surface soil and sediment.

- Past activities at Site 36 have resulted in the release of hazardous substances, pollutants, contaminants, hazardous wastes, or hazardous constituents at concentrations of potential concern.

- Preparation of an FS is recommended to evaluate remedial alternatives to address potential risks to human health and the environment. Sufficient data have been collected to determine the nature and extent of contamination and to allow for the evaluation of remedial alternatives.

TABLE 4-1

SAMPLE AND ANALYSIS SUMMARY - 2005
SITE 36 – CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Location	Sample Number	Sample Depth (feet bgs)	Laboratory Analyses			
			Explosives [(1)]	TCL VOCs	TCL SVOCs	TAL Metals. Cyanide, and Hexavalent Chromium
Surface Soil						
S36SS001	S36SS0010001	0 to 1	X	X	X	X
S36SS002	S36SS0020001	0 to 1	X	X	X	X
	S36SS0020001-D	0 to 1	X	X	X	X
S36SS003	S36SS0030001	0 to 1	X	X	X	X
S36SS004	S36SS0040001	0 to 1	X	X	X	X
S36SS005	S36SS0050001	0 to 1	X	X	X	X
S36SS006	S36SS0060001	0 to 1	X	X	X	X
Sediment						
S36SD001	S36SD0010001	0 to 0.5	X	X	X	X
S36SD002	S36SD0020001	0 to 0.5	X	X	X	X
S36SD003	S36SD0030001	0 to 0.5	X	X	X	X
S36SD004	S36SD0040001	0 to 0.5	X	X	X	X
S36SD005	S36SD0050001	0 to 0.5	X	X	X	X
S36SD006	S36SD0060001	0 to 0.5	X	X	X	X
	S36SD0060001-D	0 to 0.5	X	X	X	X
Surface Water						
S36SW001	S36SW0010101	NA	X	X	X	X
	S36SW0010101-D	NA	X	X	X	X
S36SW002	S36SW0020101	NA	X	X	X	X
S36SW003	S36SW0030101	NA	X	X	X	X
S36SW004	S36SW0040101	NA	X	X	X	X
S36SW005	S36SW0050101	NA	X	X	X	X
S36SW006	S36SW0060101	NA	X	X	X	X
Groundwater						
S36MW001	S36MW0010101	NA	X	X	X	X
	S36MW0010101-D	NA	X	X	X	X
S36MW002	S36MW0020101	NA	X	X	X	X
S36MW003	S36MW0030101	NA	X	X	X	X
Pore Water (Unfiltered)						
S36PW001	S36PW0010101	NA	X	X	X	X
	S36PW0010101-D	NA	X	X	X	X
S36PW002	S36PW0020101	NA	X	X	X	X
S36PW003	S36PW0030101	NA	X	X	X	X
S36PW004	S36PW0040101	NA	X	X	X	X

TABLE 4-1

SAMPLE AND ANALYSIS SUMMARY - 2005
SITE 36 – CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Location	Sample Number	Sample Depth (feet bgs)	Laboratory Analyses			
			Explosives [(1)]	TCL VOCs	TCL SVOCs	TAL Metals. Cyanide, and Hexavalent Chromium
Pore Water (Filtered)						
S36PW001	S36PW0010101F	NA				X
	S36PW0010101F-D	NA				X
S36PW002	S36PW0020101F	NA				X
S36PW003	S36PW0030101F	NA				X
S36PW004	S36PW0040101F	NA				X

bgs Below ground surface.
D Duplicate
F Filtered sample.
NA Not applicable.
SVOC Semivolatile organic compound.
TAL Target Analyte List.
TCL Target Compound List.
VOC Volatile organic compound.

1 SW-846 Method 8330, which includes RDX, HMX, TNT, 1,3,5-trinitrobenzene, 1,3-dinitrobenzene, tetryl, nitrobenzene, 4-amino-2,6-dinitrotoluene, 2-amino-4,6-dinitrotoluene, 2,4-dinitrotoluene, 2,6-dinitrotoluene, 2-nitrotoluene, 3-nitrotoluene, and 4-nitrotoluene, plus nitroguanidine, nitrocellulose, and nitroglycerine.

TABLE 4-2

SAMPLE AND ANALYSIS SUMMARY – 2007
SITE 36 – CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Location	Sample Number	Laboratory Analysis					
		PAHs	Metals[1]	AVS/SEM[2]	TOC	Grain Size	Benthic Invertebrates
S36SD007	S36SD0070102	X	X	X	X	X	X
S36SD008	S36SD0080102	X	X	X	X	X	X
S36SD009	S36SD0090102	X	X	X	X	X	X
S36SD010	S36SD0100102	X	X	X	X	X	X
S36SD011	S36SD0110102	X	X	X	X	X	X
S36SD012	S36SD0120102	X	X	X	X	X	X
S36SD013	S36SD0130102	X	X	X	X	X	X
S36SD014	S36SD0140102	X	X	X	X	X	X
S36SD015	S35SE0150102	X	X	X	X	X	X
DUP	-D	X	X	X	X	X	?

AVS/SEM Acid volatile sulfide/simultaneously extracted metals.
PAHs Polynuclear aromatic hydrocarbons.
TOC Total organic carbon.

1 Aluminum, antimony, arsenic, barium, cadmium, copper, iron, lead, manganese, mercury, nickel, and zinc.
2 Cadmium, copper, lead, nickel, silver, and zinc.

TABLE 4-3

SUMMARY OF POSITIVE DETECTIONS - SURFACE SOIL
SITE 36 - CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

LOCATION	**S36SB001**	**S36SB002**	**S36SB002**	**S36SB002**	**S36SB003**	**S36SB004**	**S36SB005**	**S36SB006**
SAMPLE NUMBER	**S36SS0010001**	**S36SS0020001**	**S36SS0020001-AVG**	**S36SS0020001-D**	**S36SS0030001**	**S36SS0040001**	**S36SS0050001**	**S36SS0060001**
DEPTH RANGE (FEET)	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**	**0 - 1**
SAMPLE DATE	**06/28/05**	**06/29/05**	**06/29/05**	**06/29/05**	**06/28/05**	**06/28/05**	**06/29/05**	**06/28/05**
Volatile Organics (µg/kg)								
ACETONE	23 J	32 J	19 J	12 UJ	100 J	170 J	16 J	9 J
ISOPROPYLBENZENE	13 U	11 U	11.5 U	12 U	20	16 U	11 U	13 U
METHYL ACETATE	13 U	11 J	11 J	12 U	15 U	16 U	11 U	13 U
STYRENE	13 U	11 U	11.5 U	12 U	2 J	16 U	11 U	13 U
TETRACHLOROETHENE	12 J	8 J	7.5 J	7 J	6 J	11 J	10 J	7 J
Semivolatile Organics (µg/kg)								
2-METHYLNAPHTHALENE	350 U	350 U	355 U	360 U	360 U	200 J	380 U	350 U
ACENAPHTHYLENE	56 J	350 U	355 U	360 U	360 U	370 U	380 U	350 U
ANTHRACENE	89 J	350 U	355 U	360 U	360 U	370 U	380 U	350 U
BENZALDEHYDE	350 U	350 U	59 J	59 J	67 J	58 J	98 J	350 U
BENZO(A)ANTHRACENE	250 J	350 U	355 U	360 U	360 U	370 U	380 U	87 J
BENZO(A)PYRENE	240 J	350 U	355 U	360 U	52 J	370 U	56 J	93 J
BENZO(B)FLUORANTHENE	470	44 J	44 J	44 J	60 J	370 U	66 J	140 J
BENZO(G,H,I)PERYLENE	110 J	350 U	355 U	360 U	38 J	370 U	45 J	55 J
BENZO(K)FLUORANTHENE	190 J	350 U	355 U	360 U	360 U	370 U	380 U	80 J
CHRYSENE	330 J	350 U	355 U	360 U	37 J	370 U	50 J	130 J
DI-N-BUTYL PHTHALATE	49 J	350 U	355 U	360 U	360 U	370 U	41 J	37 J
DIBENZO(A,H)ANTHRACENE	42 J	350 U	355 U	360 U	360 U	370 U	380 U	350 U
FLUORANTHENE	370	44 J	44 J	360 U	48 J	370 U	53 J	160 J
INDENO(1,2,3-CD)PYRENE	120 J	350 U	355 U	360 U	360 U	370 U	380 U	51 J
NAPHTHALENE	350 U	350 U	355 U	360 U	360 U	82 J	380 U	350 U
PHENANTHRENE	110 J	350 U	355 U	360 U	360 U	370 U	380 U	52 J
PYRENE	370	39 J	39 J	360 U	54 J	370 U	53 J	140 J
Explosives (mg/kg)								
NITROCELLULOSE	2 J	1.7 J	1.6 J	1.5 J	2.1 J	3.7 J	2 J	1.2 J
Inorganics (mg/kg)								
ALUMINUM	4470	4710	4670	4630	4860	6290	4340	4820
ARSENIC	6.2	3.6	3.7	3.8	2.9	5.3	3.7	2.6
BARIUM	29.6	48.3	38.7	29.1	36.4	44.4	29.4	39.4
BERYLLIUM	0.28	0.35	0.335	0.32	0.37	0.44	0.24	0.35
CADMIUM	0.032 U	0.38	0.365	0.35	0.03 U	0.031 U	3.1	0.15
CALCIUM	321	354	359	364	1060	789	779	696
CHROMIUM	12.2	8.7	9.35	10	9	11	10.4	9.5
COBALT	5.3	5.6	5.85	6.1	4.7	11.7	3	4.7
COPPER	12.4	10.8	10.6	10.4	11.8	17	46.6	27.9
IRON	12800	14200	14600	15000	12300	16000	12200	10900
LEAD	27.7	17.6	18.15	18.7	16.4	27.9	53.8	178
MAGNESIUM	526	511	510.5	510	592	856	429	480
MANGANESE	187 K	289 K	259.5 K	230 K	184 K	298 K	146 K	171 K
MERCURY	0.089 K	0.07 K	0.0685 K	0.067 K	0.077 K	0.073 K	0.074 K	0.097 K
NICKEL	10.4	4.2	4.2	4.2	6.2	8	4.3	6.9
POTASSIUM	263	359	354	349	432	428	256	319
SODIUM	35.5 B	38.1 B	34.8 B	31.5 B	46.9	37.6 B	66.8	41.7
VANADIUM	18.2	16.2	16.9	17.6	19.6	19.1	18.5	18.3
ZINC	45.8	27.1	27.05	27	31.6	44	81	37.6

B - Detected in blank; false positive.
J - Estimated.
K - Biased high.
U - Not detected.

TABLE 4-4

SUMMARY OF POSITIVE DETECTIONS - GROUNDWATER
SITE 36 - CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

LOCATION **SAMPLE NUMBER** **SAMPLE DATE**	**S36MW001** **S36MW0010101** **07/28/05**	**S36MW001** **S36MW0010101-AVG** **07/28/05**	**S36MW001** **S36MW0010101-D** **07/28/05**	**S36MW002** **S36MW0020101** **07/28/05**	**S36MW003** **S36MW0030101** **07/28/05**
Volatile Organics (µg/L)					
ETHYLBENZENE	0.50 U	0.5 U	0.50 U	0.99	0.50 U
TOLUENE	1.2	1.09	0.98	55	0.50 U
TRICHLOROETHENE	0.6	0.58	0.56	0.50 U	0.50 U
Semivolatile Organics (µg/L)					
4-METHYLPHENOL	4 J	4.5 J	5 J	93	10 U
ACETOPHENONE	10 U	10 U	10 U	2 J	10 U
BENZALDEHYDE	2 J	1.5 J	1 J	2 J	10 U
PHENOL	2 J	1.5 J	1 J	8 J	10 U
Explosives (µg/L)					
2,6-DINITROTOLUENE	0.1 U	0.165	0.28	1.4	0.1 U
RDX	0.69	0.67	0.65	0.58	0.1 U
TETRYL	0.31	0.18	0.1 U	0.1 U	0.1 U
Inorganics (µg/L)					
ALUMINUM	63.2 B	43.4 B	23.6 B	839	65 B
ANTIMONY	2.1 L	1.55 L	2 UL	2 U	2 U
ARSENIC	4.4	5.8	7.2	22.4	2 U
BARIUM	1530	1550	1570	131	51.4
CADMIUM	1.1 K	1.05 K	1 K	0.98	0.21
CALCIUM	121000	119500	118000	22400	4700
COBALT	0.40 UL	0.4 UL	0.40 UL	1.3	8.4
IRON	67400	67550	67700	64700	101
LEAD	7.7 K	7.9 K	8.1 K	5.6 L	0.90 UL
MAGNESIUM	32600	32000	31400	21100	2720
MANGANESE	805	790.5	776	1560	132
NICKEL	0.70 U	0.7 U	0.70 U	0.70 U	6.9
POTASSIUM	16600	16350	16100	6840	3580
SODIUM	59900	58900	57900	98500	11800

B - Detected in blank; false positive.
J - Estimated.
L - Biased low.
K - Biased high.
U - Not detected.
UL - Not detected; detection limit biased low.

TABLE 4-5

SUMMARY OF POSITIVE DETECTIONS - SURFACE WATER
SITE 36 - CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

LOCATION **SAMPLE NUMBER** **SAMPLE DATE**	**S36SW001** **S36SW0010101** **07/20/05**	**S36SW001** **S36SW0010101-AVG** **07/20/05**	**S36SW001** **S36SW0010101-D** **07/20/05**	**S36SW002** **S36SW0020101** **07/20/05**	**S36SW003** **S36SW0030101** **07/20/05**	**S36SW004** **S36SW0040101** **07/20/05**	**S36SW005** **S36SW0050101** **07/20/05**	**S36SW006** **S36SW0060101** **07/21/05**
Volatile Organics (µg/L)								
CHLOROMETHANE	0.50 U	0.515	0.78	0.69	0.50 U	0.50 U	0.89	0.50 U
Inorganics (µg/L)								
ALUMINUM	53.8 J	500.9 J	948 J	78 J	475 J	504 J	113 J	67.3 J
BARIUM	23.3	29.45	35.6	18.3	28.6	28.5	26.4	30.9
CADMIUM	0.20 U	0.2 U	0.20 U	0.20 U	0.71	0.20 U	0.20 U	0.20 U
CALCIUM	19100	18950	18800	18200	18300	18100	20900	19300
CHROMIUM	0.61	1.055	1.5	0.50 U	0.94	1.1	0.50 U	0.50 U
COBALT	0.40 U	0.425	0.65	0.40 U	0.40 U	0.55	0.40 U	0.40 U
COPPER	4 B	4.25 B	4.5 B	1 U	1.2 B	7.5	1 U	1 U
IRON	1010 J	2315 J	3620 J	466 J	2790 J	1080 J	1520 J	1470 J
LEAD	0.90 U	0.825 K	1.2 K	0.90 U	13.6	4.6 K	0.90 U	0.90 U
MAGNESIUM	8570	8480	8390	8460	8480	8560	8560	8450
MANGANESE	62.8 J	121.4 J	180 J	44.8	141	93.6	492	194
NICKEL	1.4	1.7	2	0.93	1.8	1.7	1.1	1.1
SODIUM	24600	25000	25400	24500	24200	24700	26000	26300
VANADIUM	0.40 U	1.25	2.3	0.40 U	2	1.9	0.71	0.40 U
Miscellaneous Parameters (µg/L)								
CYANIDE	2 U	2 U	2 U	5.1	2 U	2 U	2 U	2 U

B - Detected in blank; false positive.
J - Estimated.
K - Biased high.
U - Not detected.

TABLE 4-6

SUMMARY OF POSITIVE DETECTIONS - SEDIMENT
SITE 36 - CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

LOCATION	**S36SD001**	**S36SD002**	**S36SD003**	**S36SD004**	**S36SD005**	**S36SD006**	**S36SD006**
SAMPLE NUMBER	**S36SD0010001**	**S36SD0020001**	**S36SD0030001**	**S36SD0040001**	**S36SD0050001**	**S36SD0060001**	**S36SD0060001-AVG**
DEPTH RANGE (FEET)	**0 - 0.5**	**0 - 0.5**	**0 - 0.5**	**0 - 0.5**	**0 - 0.5**	**0 - 0.5**	**0 - 0.5**
SAMPLE DATE	**07/20/05**	**07/20/05**	**07/20/05**	**07/20/05**	**07/20/05**	**07/21/05**	**07/21/05**
Volatile Organics (µg/kg)							
2-BUTANONE	19 J	6 J	14 J	28	12 U	13 U	14.75
ACETONE	47 J	19 J	25 J	35 J	8 J	10 J	24.5 J
TRICHLOROFLUOROMETHANE	22 U	12 U	23 U	3 J	12 U	13 U	14.5 U
Semivolatile Organics (µg/kg)							
ACENAPHTHYLENE	600 U	420 U	290 J	270 U	430 U	480 U	510 U
ANTHRACENE	600 U	420 U	420 J	270 U	430 U	480 U	510 U
BENZALDEHYDE	110 J	420 U	320 J	270 U	430 U	480 U	73 J
BENZO(A)ANTHRACENE	170 J	270 J	1200	89 J	430 U	480 U	510 U
BENZO(A)PYRENE	190 J	330 J	1000	64 J	43 J	480 U	510 U
BENZO(B)FLUORANTHENE	230 J	430 J	2300	98 J	44 J	480 U	510 U
BENZO(G,H,I)PERYLENE	130 J	130 J	490 J	39 J	430 U	480 U	510 U
BENZO(K)FLUORANTHENE	96 J	330 J	790	54 J	430 U	480 U	510 U
CARBAZOLE	600 U	420 U	61 J	270 U	430 U	480 U	510 U
CHRYSENE	140 J	280 J	1300	89 J	430 U	480 U	510 U
DIBENZO(A,H)ANTHRACENE	600 U	45 J	210 J	270 U	430 U	480 U	510 U
FLUORANTHENE	230 J	500	1300	120 J	430 U	480 U	510 U
INDENO(1,2,3-CD)PYRENE	120 J	140 J	480 J	34 J	430 U	480 U	510 U
PHENANTHRENE	110 J	120 J	110 J	65 J	430 U	480 U	510 U
PYRENE	230 J	510	1200	120 J	67 J	480 U	510 U
Explosives (mg/kg)							
NITROGLYCERIN	0.55	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U
Inorganics (mg/kg)							
ALUMINUM	7740	4340	3950	7490	3980	4550	4300
ANTIMONY	2.4 L	0.45 L	0.74 L	4.5 L	0.47 UL	0.69 L	0.4825 L
ARSENIC	4.9	5.5	9.7	7	3.3	3	2.75
BARIUM	50	26.8	40.7	61.4	28.5	31.1	31.7
BERYLLIUM	0.32	0.27	0.25	0.38	0.26	0.29	0.315
CADMIUM	3.1	0.41	0.92	2.3	0.15	0.17	0.18
CALCIUM	932	801	1210	2200	711	858	979
CHROMIUM	20.5	14	14.6	19.4	11.3	15.3	14.4
COBALT	4.2	2.1	3.7	5.7	3.3	4.5	4.45
COPPER	55.8	13.4	20.8	97	10.2 B	11.6 B	12.1 B
IRON	20300	9690	17100	15700	9110	9420	9585
LEAD	118	20.5	23.3	114	9.8	17.1	17.95
MAGNESIUM	521	794	566	905	504	588	587.5
MANGANESE	158 K	116 K	425 K	395 K	292 K	215 K	255.5 K
MERCURY	0.12	0.058 U	0.079 U	0.23	0.056 U	0.069 U	0.072 U

TABLE 4-6

SUMMARY OF POSITIVE DETECTIONS - SEDIMENT
SITE 36 - CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

LOCATION	**S36SD001**	**S36SD002**	**S36SD003**	**S36SD004**	**S36SD005**	**S36SD006**	**S36SD006**
SAMPLE NUMBER	**S36SD0010001**	**S36SD0020001**	**S36SD0030001**	**S36SD0040001**	**S36SD0050001**	**S36SD0060001**	**S36SD0060001-AVG**
DEPTH RANGE (FEET)	**0 - 0.5**	**0 - 0.5**	**0 - 0.5**	**0 - 0.5**	**0 - 0.5**	**0 - 0.5**	**0 - 0.5**
SAMPLE DATE	**07/20/05**	**07/20/05**	**07/20/05**	**07/20/05**	**07/20/05**	**07/21/05**	**07/21/05**
Inorganics (mg/kg) (continued)							
NICKEL	11.9	6	10.1	10.8	7.5	7.4 B	7.5 B
POTASSIUM	307	636	374	430	331	373	365.5
SILVER	4.9	0.56	0.5	1.3	0.37	0.48	0.415
SODIUM	99.1	93.7	97.2	134	64.5 B	83.2	81.3
VANADIUM	17.4	15.3	21.4	26.4	16.3	16	17.1
ZINC	315 J	29.7 J	44.8 J	191 J	16.6 J	22.3 J	25.4 J
Miscellaneous Parameters (mg/kg)							
CYANIDE	0.17 U	0.12 U	0.17 U	0.14 U	0.13	0.26	0.17
PERCENT CLAY (%)							
PERCENT GRAVEL (%)							
PERCENT SAND (%)							
PERCENT SILT (%)							
TOTAL ORGANIC CARBON							
AVS/SEM (umo/g)							
ACID VOLATILE SULFIDE							
CADMIUM							
COPPER							
LEAD							
NICKEL							
ZINC							

TABLE 4-6

SUMMARY OF POSITIVE DETECTIONS - SEDIMENT
SITE 36 - CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

LOCATION	**S36SD006**	**S36SD007**	**S36SD008**	**S36SD009**	**S36SD010**	**S36SD011**
SAMPLE NUMBER	**S36SD0060001-D**	**S36SD0070102**	**S36SD0080102**	**S36SD0090102**	**S36SD0100102**	**S36SD0110102**
DEPTH RANGE (FEET)	**0 - 0.5**	**0 - 0.5**	**0 - 0.5**	**0 - 0.5**	**0 - 0.5**	**0 - 0.5**
SAMPLE DATE	**07/21/05**	**04/11/07**	**04/11/07**	**04/11/07**	**04/11/07**	**04/11/07**
Volatile Organics (µg/kg)						
2-BUTANONE	23					
ACETONE	39 J					
TRICHLOROFLUOROMETHANE	16 U					
Semivolatile Organics (µg/kg)						
ACENAPHTHYLENE	540 U	200 UJ	220 UJ	83 U	190 UJ	210 UJ
ANTHRACENE	540 U	200 UJ	220 UJ	83 U	190 UJ	210 UJ
BENZALDEHYDE	73 J					
BENZO(A)ANTHRACENE	540 U	200 UJ	220 UJ	360	190 UJ	210 UJ
BENZO(A)PYRENE	540 U	200 UJ	220 UJ	320	190 UJ	810 J
BENZO(B)FLUORANTHENE	540 U	200 UJ	220 UJ	370	190 UJ	930 J
BENZO(G,H,I)PERYLENE	540 U	200 UJ	220 UJ	83 U	190 UJ	210 UJ
BENZO(K)FLUORANTHENE	540 U	200 UJ	220 UJ	42 J	190 UJ	63 J
CARBAZOLE	540 U					
CHRYSENE	540 U	200 UJ	220 UJ	62 J	190 UJ	210 UJ
DIBENZO(A,H)ANTHRACENE	540 U	200 UJ	220 UJ	83 U	190 UJ	210 UJ
FLUORANTHENE	540 U	200 UJ	220 UJ	110	190 UJ	120 J
INDENO(1,2,3-CD)PYRENE	540 U	200 UJ	220 UJ	83 U	190 UJ	210 UJ
PHENANTHRENE	540 U	200 UJ	220 UJ	79 J	190 UJ	210 UJ
PYRENE	540 U	200 UJ	220 UJ	100	190 UJ	110 J
Explosives (mg/kg)						
NITROGLYCERIN	0.50 U					
Inorganics (mg/kg)						
ALUMINUM	4050	21300 J	19600 J	7530	21500 J	30700 J
ANTIMONY	0.55 UL	3.1 UJ	3.2 UJ	1.5 L	2.9 UJ	3.4 UJ
ARSENIC	2.5	6.8 J	5.8 J	17.7	7.1 J	10.6 J
BARIUM	32.3	220 J	182 J	255	189 J	251 J
BERYLLIUM	0.34	1.3 J	1.2 J	0.61	1.3 J	1.7 J
CADMIUM	0.19	1 J	0.99 J	1	3.6 J	16 J
CALCIUM	1100	3530 J	4540 J	1660	4580 J	4900 J
CHROMIUM	13.5	27.8 J	25.4 J	110	29.8 J	42.4 J
COBALT	4.4	18.8 J	17.9 J	20.2	17.6 J	20.2 J
COPPER	12.6 B	38.3 J	38.9 J	103	45.2 J	127 J
IRON	9750	29300 J	26100 J	93500	40800 J	52200 J
LEAD	18.8	74 J	71.2 J	4100 J	61.2 J	118 J
MAGNESIUM	587	2910 J	2970 J	1070	2760 J	3870 J
MANGANESE	296 K	1740 J	1800 J	1100	1370 J	2080 J
MERCURY	0.075 U	0.22 J	0.27 J	0.12	0.26 J	0.29 J

TABLE 4-6

SUMMARY OF POSITIVE DETECTIONS - SEDIMENT
SITE 36 - CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

LOCATION	**S36SD006**	**S36SD007**	**S36SD008**	**S36SD009**	**S36SD010**	**S36SD011**
SAMPLE NUMBER	**S36SD0060001-D**	**S36SD0070102**	**S36SD0080102**	**S36SD0090102**	**S36SD0100102**	**S36SD0110102**
DEPTH RANGE (FEET)	**0 - 0.5**	**0 - 0.5**	**0 - 0.5**	**0 - 0.5**	**0 - 0.5**	**0 - 0.5**
SAMPLE DATE	**07/21/05**	**04/11/07**	**04/11/07**	**04/11/07**	**04/11/07**	**04/11/07**
Inorganics (mg/kg) (continued)						
NICKEL	7.6 B	27.6 J	27.3 J	102	26.6 J	36.6 J
POTASSIUM	358	2790 J	2560 J	734	2290 J	3500 J
SILVER	0.35	0.61 UJ	0.64 UJ	0.25 U	0.58 UJ	0.81 J
SODIUM	79.4	727 J	652 J	246 U	587 J	755 J
VANADIUM	18.2	51.1 J	43.4 J	24.6	50.1 J	66.5 J
ZINC	28.5 J	186 J	178 J	840	207 J	278 J
Miscellaneous Parameters (mg/kg)						
CYANIDE	0.16 U	0.78 UJ	0.83 UJ	0.31 UL	0.74 UJ	0.83 UJ
PERCENT CLAY (%)		20 %	18 %	5 %	31 %	21 %
PERCENT GRAVEL (%)		0 %	0 %	36 %	1 %	0 %
PERCENT SAND (%)		1 %	1 %	41 %	3 %	3 %
PERCENT SILT (%)		79 %	81 %	18 %	64 %	75 %
TOTAL ORGANIC CARBON		78800 J	91000 J	50300	82200 J	72300 J
AVS/SEM (umo/g)						
ACID VOLATILE SULFIDE		0.091 UJ	37.7 J	21 L	14.3 J	28.4 J
CADMIUM		0.0014 UJ	0.0077 J	0.0052 J	0.018 J	0.13 J
COPPER		0.014 J	0.36 J	0.63 J	0.48 J	1.3 J
LEAD		0.0038 J	0.27 J	0.57 J	0.28 J	0.48 J
NICKEL		0.011 J	0.19 J	0.52 J	0.2 J	0.25 J
ZINC		0.18 B	2 J	1.2 J	2.6 J	3 J

TABLE 4-6

SUMMARY OF POSITIVE DETECTIONS - SEDIMENT
SITE 36 - CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

LOCATION	**S36SD012**	**S36SD012**	**S36SD012**	**S36SD013**	**S36SD014**	**S36SD015**
SAMPLE NUMBER	**S36SD0120102**	**S36SD0120102-AVG**	**S36SD0120102-D**	**S36SD0130102**	**S36SD0140102**	**S36SD0150102**
DEPTH RANGE (FEET)	**0 - 0.5**	**0 - 0.5**	**0 - 0.5**	**0 - 0.5**	**0 - 0.5**	**0 - 0.5**
SAMPLE DATE	**04/11/07**	**04/11/07**	**04/11/07**	**04/11/07**	**04/12/07**	**04/12/07**
Volatile Organics (µg/kg)						
2-BUTANONE						
ACETONE						
TRICHLOROFLUOROMETHANE						
Semivolatile Organics (µg/kg)						
ACENAPHTHYLENE	250 UJ	245 UJ	240 UJ	220 UJ	170 UJ	220 UJ
ANTHRACENE	250 UJ	245 UJ	240 UJ	220 UJ	170 UJ	220 UJ
BENZALDEHYDE						
BENZO(A)ANTHRACENE	1000 J	1000 J	1000 J	220 UJ	170 UJ	220 UJ
BENZO(A)PYRENE	250 UJ	245 UJ	240 UJ	220 UJ	170 UJ	220 UJ
BENZO(B)FLUORANTHENE	250 UJ	245 UJ	240 UJ	220 UJ	170 UJ	220 UJ
BENZO(G,H,I)PERYLENE	250 UJ	245 UJ	240 UJ	220 UJ	170 UJ	220 UJ
BENZO(K)FLUORANTHENE	250 UJ	245 UJ	240 UJ	220 UJ	170 UJ	220 UJ
CARBAZOLE						
CHRYSENE	82 J	74.5 J	67 J	220 UJ	170 UJ	220 UJ
DIBENZO(A,H)ANTHRACENE	250 UJ	245 UJ	240 UJ	220 UJ	170 UJ	220 UJ
FLUORANTHENE	120 J	120 J	240 UJ	86 J	170 UJ	220 UJ
INDENO(1,2,3-CD)PYRENE	250 UJ	245 UJ	240 UJ	220 UJ	170 UJ	220 UJ
PHENANTHRENE	250 UJ	245 UJ	240 UJ	220 UJ	170 UJ	220 UJ
PYRENE	96 J	88 J	80 J	93 J	170 UJ	220 UJ
Explosives (mg/kg)						
NITROGLYCERIN						
Inorganics (mg/kg)						
ALUMINUM	19300 J	19000 J	18700 J	23000 J	25700 J	19300 J
ANTIMONY	3.9 UJ	3.9 UJ	3.9 UJ	3.3 UJ	2.4 UJ	3.6 UJ
ARSENIC	4.2 J	4.7 J	5.2 J	8.1 J	7.1 J	7.8 J
BARIUM	120 J	130 J	140 J	172 J	190 J	149 J
BERYLLIUM	0.86 J	0.91 J	0.96 J	1.7 J	1.5 J	1.6 J
CADMIUM	1.8 J	1.8 J	1.8 J	1 J	0.84 J	0.77 J
CALCIUM	3420 J	3740 J	4060 J	5990 J	5380 J	4800 J
CHROMIUM	24.4 J	24.65 J	24.9 J	30.7 J	37 J	26.5 J
COBALT	11 J	11.15 J	11.3 J	26.8 J	17.9 J	25.4 J
COPPER	33.4 J	33.2 J	33 J	38 J	40.8 J	30.4 J
IRON	21900 J	23750 J	25600 J	26000 J	29700 J	23100 J
LEAD	33.1 J	35.25 J	37.4 J	42.3 J	43.6 J	39 J
MAGNESIUM	2840 J	2885 J	2930 J	3130 J	3550 J	2750 J
MANGANESE	489 J	609 J	729 J	1180 J	1260 J	778 J
MERCURY	0.21 J	0.21 J	0.21 J	2.9 J	0.21 J	0.25 J

TABLE 4-6

SUMMARY OF POSITIVE DETECTIONS - SEDIMENT
SITE 36 - CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

LOCATION	**S36SD012**	**S36SD012**	**S36SD012**	**S36SD013**	**S36SD014**	**S36SD015**
SAMPLE NUMBER	**S36SD0120102**	**S36SD0120102-AVG**	**S36SD0120102-D**	**S36SD0130102**	**S36SD0140102**	**S36SD0150102**
DEPTH RANGE (FEET)	**0 - 0.5**	**0 - 0.5**	**0 - 0.5**	**0 - 0.5**	**0 - 0.5**	**0 - 0.5**
SAMPLE DATE	**04/11/07**	**04/11/07**	**04/11/07**	**04/11/07**	**04/12/07**	**04/12/07**
Inorganics (mg/kg) (continued)						
NICKEL	20.6 J	20.8 J	21 J	29.7 J	28.5 J	27 J
POTASSIUM	2240 J	2315 J	2390 J	2480 J	3180 J	2100 J
SILVER	0.78 UJ	1.045 J	1.7 J	0.65 UJ	0.49 UJ	0.72 UJ
SODIUM	777 UJ	777 UJ	777 UJ	650 UJ	503 J	718 UJ
VANADIUM	42.6 J	43.5 J	44.4 J	61.4 J	57.9 J	57.9 J
ZINC	146 J	149 J	152 J	204 J	184 J	188 J
Miscellaneous Parameters (mg/kg)						
CYANIDE	0.96 UJ	0.96 UJ	0.96 UJ	0.83 UJ	0.63 UJ	0.89 UJ
PERCENT CLAY (%)	12 %	13.5 %	15 %	23 %	12 %	20 %
PERCENT GRAVEL (%)	14 J %	8 J %	2 J %	1 %	4 %	1 %
PERCENT SAND (%)	20 J %	12.5 J %	5 J %	4 %	8 %	14 %
PERCENT SILT (%)	54 %	66.5 %	79 %	73 %	75 %	64 %
TOTAL ORGANIC CARBON	57000 J	77800 J	98600 J	72400 J	108000 J	162000 J
AVS/SEM (umo/g)						
ACID VOLATILE SULFIDE	0.67 J	0.3625 J	0.11 UJ	13.9 J	6.6 J	0.11 UJ
CADMIUM	0.014 J	0.007425 J	0.0017 UJ	0.015 J	0.0072 J	0.0068 J
COPPER	0.25 J	0.12945 J	0.0089 J	0.77 J	0.34 J	0.34 J
LEAD	0.12 J	0.061 J	0.002 J	0.34 J	0.15 J	0.16 J
NICKEL	0.094 J	0.0486 J	0.0064 UJ	0.2 J	0.14 J	0.19 J
ZINC	1.6 J	0.80975 J	0.039 B	3.9 J	1.7 J	2.3 J

TABLE 4-7

SUMMARY OF POSITIVE DETECTIONS - PORE WATER
SITE 36 - CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

LOCATION SAMPLE NUMBER SAMPLE DATE	S36PW001 S36PW0010101 07/21/05	S36PW001 S36PW0010101-AVG 07/21/05	S36PW001 S36PW0010101-D 07/21/05	S36PW002 S36PW0020101 07/21/05	S36PW003 S36PW0030101 07/20/05	S36PW004 S36PW0040101 07/20/05
Volatile Organics (µg/L)						
TOLUENE	0.56	0.83	1.1	4	1.1	1.3 J
Semivolatile Organics (µg/L)						
4-METHYLPHENOL	1 J	1 J	10 U	10 U	10 U	10 U
ACETOPHENONE	10 U	10 U	10 U	10 U	10 U	2 J
Explosives (µg/L)						
1,3,5-TRINITROBENZENE	0.10 U	0.1 U	0.10 U	0.076 J	0.10 U	0.20 U
1,3-DINITROBENZENE	0.25 J	0.45 J	0.65 J	0.10 U	0.10 U	0.20 U
2,4,6-TRINITROTOLUENE	0.077 J	0.077 J	0.10 U	0.10 U	0.10 U	0.20 U
4-NITROTOLUENE	0.50 U	0.073 J	0.073 J	0.50 U	0.50 U	1 U
Inorganics (µg/L)						
ALUMINUM	949 J	498.3 J	47.6 J	324 J	1930 J	539 J
ARSENIC	3.8	3.05	2.3	4.9	2.1	3.2
BARIUM	136	126.5	117	280	68.4	93.2
CADMIUM	0.76	0.535	0.31	1.3	0.23	0.3
CALCIUM	32100	31850	31600	34500	18700	31800
CHROMIUM	19.7	10.65	1.6	7.1	16.7	7.6
COBALT	8.1	4.325	0.55	3.9	7.4	4.9
COPPER	33.1	20.35	7.6	19.1	16.3	23.2
IRON	38400 J	32150 J	25900 J	82800 J	16600 J	24600 J
LEAD	14 J	7.55 J	1.1 J	6.4	2.4 K	1.9 K
MAGNESIUM	17900	18050	18200	27100	14800	22700
MANGANESE	2690	2470	2250	1890	1440	2620
NICKEL	300 J	174.8 J	49.6 J	154	364	271
POTASSIUM	1510 B	1850 B	2190 B	5100 B	1300 B	7130
SODIUM	64300	61700	59100	166000	64100	119000
VANADIUM	2.6	1.4	0.40 U	0.40 U	3.8	3.2
ZINC	68.1 J	34.575 J	2.1 B	64.9	42.5	70.4

TABLE 4-7

SUMMARY OF POSITIVE DETECTIONS - PORE WATER
SITE 36 - CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

LOCATION **SAMPLE NUMBER** **SAMPLE DATE**	**S36PW001** **S36PW0010101** **07/21/05**	**S36PW001** **S36PW0010101-AVG** **07/21/05**	**S36PW001** **S36PW0010101-D** **07/21/05**	**S36PW002** **S36PW0020101** **07/21/05**	**S36PW003** **S36PW0030101** **07/20/05**	**S36PW004** **S36PW0040101** **07/20/05**
Inorganics, Filtered (µg/L)						
ALUMINUM	171	67.4	67.4	57.8	74.4	1090
ARSENIC	2 U	2 U	2 U	6.7	2 U	2.8
BARIUM	112	110	110	138	46	70.7
CADMIUM	0.29	0.24	0.24	0.61	0.20 U	0.20 U
CALCIUM	29300	28700	28700	30200	17400	26500
CHROMIUM	0.69	0.95	0.95	0.50 U	0.72	2.9
COBALT	1.3	2	2	0.61	1.9	3.7
COPPER	4.3 B	2 B	2 B	7.2	1 U	9.6
IRON	21800	21400	21400	45500	6950	10400
LEAD	0.90 U	1.2	1.2	1.8	0.90 U	1.4
MAGNESIUM	17200	16800	16800	24900	13700	19200
MANGANESE	2270	2310	2310	1300	1170	2090
MERCURY	5.8	0.32 K	0.32 K	0.33 K	0.14 U	0.14 U
NICKEL	63.1	87.6	87.6	61.4	95.5	179
POTASSIUM	1030 B	1010 B	1010 B	4490 B	923 B	6170
SODIUM	67800	70700	70700	150000	64200	104000
VANADIUM	0.40 U	0.4 U	0.40 U	0.40 U	0.40 U	3
ZINC	14.6 B	8.7 B	8.7 B	21.1 B	11.4 B	43.6

B - Detected in blank; false positive.
J - Estimated.
K - Biased high.
U - Not detected.

TABLE 4-8

HUMAN HEALTH DATA EVALUATION - SURFACE SOIL
SITE 36 - CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	Frequency of Detection[1]	Range of Detections[1]	Sample with Maximum Detection	Range of Nondetects[2]	Average of All Results[3]	Concentration Used for Screening[4]	Background Concentration[5]	Human Health Risk Screening[6]				Selected as a COPC?	Rationale
								Region 3 RBC Residential Soil[7]	Soil to GW DAF=1	Soil to GW DAF=20	EPA SSL Soil to Air		
Volatiles (µg/kg)													
ACETONE	6/6	9 - 170	S36SS0040001	---	56.2	170	NA	7000000	1100	22000	---	No	BSL
ISOPROPYLBENZENE	1/6	20	S36SS0030001	11 - 16	8.7	20	NA	780000	3200	64000	850000	No	BSL
METHYL ACETATE	1/6	11	S36SS0020001	11 - 16	7.5	11	NA	7800000	1200	25000	---	No	BSL
STYRENE	1/6	2	S36SS0030001	11 - 16	5.7	2	NA	1600000	2900	57000	1500000	No	BSL
TETRACHLOROETHENE	6/6	6 - 12	S36SS0010001	---	8.9	12	NA	1200	**0.23**	**4.7**	10000	No	BSL
Semivolatiles (µg/kg)													
2-METHYLNAPHTHALENE	1/6	200	S36SS0040001	350 - 380	183	200	NA	31000	220	4400	---	No	BSL
ACENAPHTHYLENE	1/6	56	S36SS0010001	350 - 380	160.5	56	NA	470000[8]	---	---	---	No	BSL
ANTHRACENE	1/6	89	S36SS0010001	350 - 380	166	89	NA	2300000	23000	470000	---	No	BSL
BENZALDEHYDE	4/6	58 - 98	S36SS0050001	350	105	98	NA	780000	860	17000	---	No	BSL
BENZO(A)ANTHRACENE	2/6	87 - 250	S36SS0010001	350 - 380	178	250	NA	**220**	**24**	480	---	Yes	ASL
BENZO(A)PYRENE	4/6	52 - 240	S36SS0010001	350 - 370	134	240	NA	**22**	**6.1**	**120**	---	Yes	ASL
BENZO(B)FLUORANTHENE	5/6	44 - 470	S36SS0010001	370	161	470	NA	**220**	**74**	1500	---	Yes	ASL
BENZO(G,H,I)PERYLENE	4/6	38 - 110	S36SS0010001	350 - 370	102	110	NA	230000[9]	---	---	---	No	BSL
BENZO(K)FLUORANTHENE	2/6	80 - 190	S36SS0010001	350 - 380	167	190	NA	2200	740	15000	---	No	BSL
CHRYSENE	4/6	37 - 330	S36SS0010001	350 - 370	152	330	NA	22000	2400	48000	---	No	BSL
DIBENZO(A,H)ANTHRACENE	1/6	42	S36SS0010001	350 - 380	158	42	NA	**22**	**23**	460	---	Yes	ASL
DI-N-BUTYL PHTHALATE	3/6	37 - 49	S36SS0010001	350 - 370	112	49	NA	780000	250000	5000000	---	No	BSL
FLUORANTHENE	5/6	44 - 370	S36SS0010001	370	143	370	NA	310000	310000	6300000	---	No	BSL
INDENO(1,2,3-CD)PYRENE	2/6	51 - 120	S36SS0010001	350 - 380	151	120	NA	220	210	4200	---	No	BSL
NAPHTHALENE	1/6	82	S36SS0040001	350 - 380	163	82	NA	160000	**7.7**	150	170000	No	BSL
PHENANTHRENE	2/6	52 - 110	S36SS0010001	350 - 380	149	110	NA	230000[9]	---	---	---	No	BSL
PYRENE	5/6	39 - 370	S36SS0010001	370 - 370	140	370	NA	230000	34000	680000	---	No	BSL
Explosives (mg/kg)													
NITROCELLULOSE	6/6	1.5 - 3.7	S36SS0040001	---	2.1	3.7	NA	---	---	---	---	No	NTX
Metals (mg/kg)													
ALUMINUM	6/6	4340 - 6290	S36SS0040001	---	4908	6290	19700	7800	**8.3**	**170**	7090000	No	BSL
ARSENIC	6/6	2.6 - 6.2	S36SS0010001	---	4.1	6.2	14.9	**0.43**	**0.0013**	**0.026**	769	No	BKG
BARIUM	6/6	29.4 - 48.3	S36SS0020001	---	36.3	48.3	80.4	1600	300	6000	709000	No	BSL
BERYLLIUM	6/6	0.24 - 0.44	S36SS0040001	---	0.34	0.44	1.1	16	58	1200	1380	No	BSL
CADMIUM	3/6	0.15 - 3.1	S36SS0050001	0.03 - 0.032	0.61	3.1	**2.5**	3.9	**1.4**	27	1843	No	BSL
CALCIUM	6/6	321 - 1060	S36SS0030001	---	667	1060	2060	---	---	---	---	No	NUT
CHROMIUM	6/6	8.7 - 12.2	S36SS0010001	---	10.2	12.2	33.4	12000[10]	9.9E+07[10]	2.0E+09[10]	276	No	BSL
COBALT	6/6	3 - 11.7	S36SS0040001	---	5.9	11.7	22.3	---	**0.17**	**3.3**	1180	No	NTX, BKG
COPPER	6/6	10.4 - 46.6	S36SS0050001	---	21.1	46.6	**20.3**	310	530	11000	---	No	BSL
IRON	6/6	10900 - 16000	S36SS0040001	---	13133	16000	38500	**5500**	---	---	---	No	BKG
LEAD	6/6	16.4 - 178	S36SS0060001	---	53.7	178	**62.5**	400	---	---	---	No	BSL
MAGNESIUM	6/6	429 - 856	S36SS0040001	---	566	856	1620	---	---	---	---	No	NUT
MANGANESE	6/6	146 - 298	S36SS0040001	---	208	298	1390	**160**	**48**	950	70900	No	BKG
MERCURY	6/6	0.067 - 0.097	S36SS0060001	---	0.08	0.097	0.16	2.3	0.1	2.1	2.9	No	BSL
NICKEL	6/6	4.2 - 10.4	S36SS0010001	---	6.7	10.4	15.4	160	14	280	---	No	BSL
POTASSIUM	6/6	256 - 432	S36SS0030001	---	342	432	1470	---	---	---	---	No	NUT
SODIUM	3/6	41.7 - 66.8	S36SS0050001	31.5 - 38.1	34.9	66.8	120	---	---	---	---	No	NUT
VANADIUM	6/6	16.2 - 19.6	S36SS0030001	---	18.4	19.6	53.3	**7.8**	37	730	---	No	BKG
ZINC	6/6	27.1 - 81	S36SS0050001	---	44.5	81	**37.5**	2300	680	14000	---	No	BSL

TABLE 4-8

HUMAN HEALTH DATA EVALUATION - SURFACE SOIL
SITE 36 - CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	Frequency of Detection[1]	Range of Detections[1]	Sample with Maximum Detection	Range of Nondetects[2]	Average of All Results[3]	Concentration Used for Screening[4]	Background Concentration[5]	Human Health Risk Screening[6]				Selected as a COPC?	Rationale
								Region 3 RBC Residential Soil[7]	Soil to GW DAF=1	Soil to GW DAF=20	EPA SSL Soil to Air		

Shaded cells indicate chemicals selected as COPCs and/or exceedances of criteria. A chemical is selected as a COPC if the maximum concentration exceeds background (for inorganics) and the applicable risk-based criteria.

1 Sample and duplicate are counted as one sample when determining frequency of detection and as two samples when determining range of detections.
2 Values presented are sample-specific quantitation limits.
3 Averages are calculated using one half the detection limit for nondetect samples.
4 The maximum detected concentration is used for screening purposes.
5 Table 3-1
6 Table 3-2
7 RBCs for noncarcinogens are divided by 10 to correspond to a target hazard quotient of 0.1.
8 The value for acenaphthene is used as a surrogate for acenaphthylene.
9 The value for pyrene is used as a surrogate for benzo(g,h,i)perylene and phenanthrene.
10 Screening values for trivalent chromium are used because hexavalent chromium was analyzed for but not detected.

Associated Samples

S36SS0010001
S36SS0020001
S36SS0020001-D
S36SS0030001
S36SS0040001
S36SS0050001
S36SS0060001

Definitions

COPC - Chemical of potential concern
DAF - Dilution attenuation factor
EPA - United States Environmental Protection Agency
GW - Groundwater
NA - Not available/not applicable
RBC - Risk-based concentration
SSL - Soil screening level

Rationale Codes

ASL - Above screening level
BKG - Below background
BSL - Below screening level
NTX - No toxicity data
NUT - Essential nutrient

TABLE 4-9

HUMAN HEALTH DATA EVALUATION - GROUNDWATER
SITE 36 - CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	Frequency of Detection[1]	Range of Detections[1]	Sample with Maximum Detection	Range of Nondetects[2]	Average of All Results[3]	Concentration Used for Screening[4]	Human Health Risk Screening[5] Region 3 RBC Tap Water[6]	Selected as a COPC?	Rationale
Volatiles (µg/L)									
ETHYLBENZENE	1/3	0.99	S36MW0020101	0.5	0.50	1.0	130	No	BSL
TOLUENE	2/3	0.98 - 55	S36MW0020101	0.5	19	56	230	No	BSL
TRICHLOROETHENE	1/3	0.56 - 0.6	S36MW0010101	0.5	0.54	0.6	**0.026**	Yes	ASL
Semivolatiles (µg/L)									
4-METHYLPHENOL	2/3	4 - 93	S36MW0020101	10	34	90	**18**	Yes	ASL
ACETOPHENONE	1/3	2	S36MW0020101	10	4	2	61	No	BSL
BENZALDEHYDE	2/3	1 - 2	S36MW0010101, S36MW0020101	10	2.8	2	370	No	BSL
PHENOL	2/3	1 - 8	S36MW0020101	10	4.8	8	1100	No	BSL
Explosives (µg/L)									
2,6-DINITROTOLUENE	1/2	0.28 - 1.4	S36MW0020101	0.1	0.54	1.4	3.7	No	BSL
RDX	2/3	0.58 - 0.69	S36MW0010101	0.1	0.43	0.69	**0.61**	Yes	ASL
TETRYL	1/3	0.31	S36MW0010101	0.1	0.09	0.31	15	No	BSL
Metals (µg/L)									
ALUMINUM	1/3	839	S36MW0020101	23.6 - 65	298	839	3700	No	BSL
ANTIMONY	1/3	2.1	S36MW0010101	2	1.2	2.1	**1.5**	Yes	ASL
ARSENIC	2/3	4.4 - 22.4	S36MW0020101	2	9.7	22.4	**0.045**	Yes	ASL
BARIUM	3/3	51.4 - 1570	S36MW0010101-D	---	577	1570	**730**	Yes	ASL
CADMIUM	3/3	0.21 - 1.1	S36MW0010101	---	0.75	1.1	1.8	No	BSL
CALCIUM	3/3	4700 - 121000	S36MW0010101	---	48867	121000	NA	No	NUT
COBALT	2/3	1.3 - 8.4	S36MW0030101	0.4	3.3	8.4	NA	No	NTX
IRON	3/3	101 - 67700	S36MW0010101-D	---	44117	67700	**2600**	Yes	ASL
LEAD	2/3	5.6 - 8.1	S36MW0010101-D	0.9	4.7	8.1	15	No	BSL
MAGNESIUM	3/3	2720 - 32600	S36MW0010101	---	18607	32600	NA	No	NUT
MANGANESE	3/3	132 - 1560	S36MW0020101	---	827.5	1560	**73**	Yes	ASL
NICKEL	1/3	6.9	S36MW0030101	0.7	2.5	6.9	73	No	BSL
POTASSIUM	3/3	3580 - 16600	S36MW0010101	---	8923	16600	NA	No	NUT
SODIUM	3/3	11800 - 98500	S36MW0020101	---	56400	98500	NA	No	NUT

Shaded cells indicate chemicals selected as COPCs and/or exceedances of criteria.

1 Sample and duplicate are counted as one sample when determining frequency of detection and as two samples when determining range of detections.
2 Values presented are sample-specific quantitation limits.
3 Averages are calculated using one half the detection limit for nondetect samples.
4 The maximum detected concentration is used for screening purposes.
5 Table 3-3.
6 RBCs for noncarcinogens are divided by 10 to correspond to a target hazard quotient of 0.1.

Associated Samples

S36MW0010101
S36MW0010101-D
S36MW0020101
S36MW0030101

Definitions

COPC - Chemical of potential concern
NA - Not available/Not applicable
RBC - Risk-based concentration

Rationale Codes

ASL - Above screening level
BSL - Below screening level
NTX - No toxicity data
NUT - Essential nutrient

TABLE 4-10

HUMAN HEALTH DATA EVALUATION - SURFACE WATER
SITE 36 - CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	Frequency of Detection[1]	Range of Detections[1]	Sample with Maximum	Range of Nondetects[2]	Average of All Results[3]	Concentration Used for Screening[4]	Human Health Risk Screening[5] Region 3 RBC Tap Water[6]	Selected as a COPC?	Rationale
Volatiles (µg/L)									
CHLOROMETHANE	3/6	0.69 - 0.89	S36SW0050101	0.5	0.47	0.89	19	No	BSL
Metals (µg/L)									
ALUMINUM	6/6	53.8 - 948	S36SW0010101-D	---	290	948	3700	No	BSL
BARIUM	6/6	18.3 - 35.6	S36SW0010101-D	---	27	35.6	730	No	BSL
CADMIUM	1/6	0.71	S36SW0030101	0.2	0.2	0.71	1.8	No	BSL
CALCIUM	6/6	18100 - 20900	S36SW0050101	---	18958	20900	NA	No	NUT
CHROMIUM	3/6	0.61 - 1.5	S36SW0010101-D	0.5	0.64	1.5	5500[7]	No	BSL
COBALT	2/6	0.55 - 0.65	S36SW0010101-D	0.4	0.30	0.65	NA	No	NTX
COPPER	1/6	7.5	S36SW0040101	1 - 4.5	1.95	7.5	150	No	BSL
IRON	6/6	466 - 3620	S36SW0030101	---	1607	3620	**2600**	Yes	ASL
LEAD	3/6	1.2 - 13.6	S36SW0030101	0.9	3.4	13.6	15	No	BSL
MAGNESIUM	6/6	8390 - 8570	S36SW0010101	---	8498	8570	NA	No	NUT
MANGANESE	6/6	44.8 - 492	S36SW0050101	---	362	492	**73**	Yes	ASL
NICKEL	6/6	0.93 - 2	S36SW0010101-D	---	2.8	2	73	No	BSL
SODIUM	6/6	24200 - 26300	S36SW0060101	---	25117	26300	NA	No	NUT
VANADIUM	4/6	0.71 - 2.3	S36SW0010101-D	0.4 - 0.4	1.0	2.3	3.7	No	BSL
Miscellaneous Paramters (µg/L)									
CYANIDE	1/6	5.1	S36SW0020101	2	2.5	5.1	73	No	BSL

Shaded cells indicate chemicals selected as COPCs and/or exceedances of criteria.

1 Sample and duplicate are counted as one sample when determining frequency of detection and as two samples when determining range of detections.
2 Values presented are sample-specific quantitation limits.
3 Averages are calculated using one half the detection limit for nondetect samples.
4 The maximum detected concentration is used for screening purposes.
5 Table 3-3.
6 RBCs for noncarcinogens are divided by 10 to correspond to a target hazard quotient of 0.1.
7 The RBC for trivalent chromium is used because hexavalent chromium was analyzed for but not detected.

Associated Samples

S36SW0010101
S36SW0010101-D
S36SW0020101
S36SW0030101
S36SW0040101
S36SW0050101
S36SW0060101

Definitions

COPC - Chemical of potential concern
NA - Not available/not applicable
RBC - Risk-based concentration

Rationale Codes

ASL - Above screening level
BSL - Below screening level
NTX - No toxicity data
NUT - Essential nutrient

TABLE 4-11

HUMAN HEALTH DATA EVALUATION - SEDIMENT
SITE 36 - CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	Frequency of Detection[1]	Range of Detections[1]	Sample with Maximum Detection	Range of Nondetects[2]	Average of All Results[3]	Concentration Used for Screening[4]	Human Health Risk Screening[5] Region 3 RBC Residential Soil[6]	Selected as a COPC?	Rationale
Volatiles (µg/kg)									
2-BUTANONE	4/6	6 - 28	S36SD0040001	12 - 13	15	28	4700000	No	BSL
ACETONE	6/6	8 - 47	S36SD0010001	---	26	47	7000000	No	BSL
TRICHLOROFLUOROMETHANE	1/6	3	S36SD0040001	12 - 23	8	3	2300000	No	BSL
Semivolatiles (µg/kg)									
ACENAPHTHYLENE	1/15	290	S36SD0030001	83 - 600	153	290	470000[7]	No	BSL
ANTHRACENE	1/15	420	S36SD0030001	83 - 600	161	420	2300000	No	BSL
BENZALDEHYDE	3/6	73 - 320	S36SD0030001	270 - 480	177	320	780000	No	BSL
BENZO(A)ANTHRACENE	6/15	89 - 1200	S36SD0030001	170 - 540	285	1200	**220**	Yes	ASL
BENZO(A)PYRENE	7/15	43 - 1000	S36SD0030001	170 - 540	250	1000	**22**	Yes	ASL
BENZO(B)FLUORANTHENE	7/15	44 - 2300	S36SD0030001	170 - 540	359	2300	**220**	Yes	ASL
BENZO(G,H,I)PERYLENE	4/15	39 - 490	S36SD0030001	83 - 540	143	490	230000[8]	No	BSL
BENZO(K)FLUORANTHENE	6/15	42 - 790	S36SD0030001	170 - 540	172	790	2200	No	BSL
CARBAZOLE	1/6	61	S36SD0030001	270 - 600	196	61	32000	No	BSL
CHRYSENE	6/15	62 - 1300	S36SD0030001	170 - 540	209	1300	22000	No	BSL
DIBENZO(A,H)ANTHRACENE	2/15	45 - 210	S36SD0030001	83 - 600	136	210	**22**	Yes	ASL
FLUORANTHENE	8/15	86 - 1300	S36SD0030001	170 - 540	237	1300	310000	No	BSL
INDENO(1,2,3-CD)PYRENE	4/15	34 - 480	S36SD0030001	430 - 540	142	480	**220**	Yes	ASL
PHENANTHRENE	5/15	65 - 120	S36SD0020001	170 - 540	119	120	230000[8]	No	BSL
PYRENE	9/15	67 - 1200	S36SD0030001	170 - 540	218	1200	230000	No	BSL
Explosives (mg/kg)									
NITROGLYCERIN	1/6	0.55	S36SD0010001	0.5	0.3	0.55	0.8	No	BSL
Metals (mg/kg)									
ALUMINUM	15/15	3950 - 30700	S36SD0110102	---	14629	30700	**7800**	Yes	ASL
ANTIMONY	6/15	0.45 - 4.5	S36SD0040001	0.47 - 3.9	1.5	4.5	**3.1**	Yes	ASL
ARSENIC	15/15	2.5 - 17.7	S36SD0090102	---	7.3	17.7	**0.43**	Yes	ASL
BARIUM	15/15	26.8 - 255	S36SD0090102	---	132	255.0	1600	No	BSL
BERYLLIUM	15/15	0.25 - 1.7	S36SD0110102; S36SD0130102	---	0.9	1.7	16	No	BSL
CADMIUM	15/15	0.15 - 16	S36SD0110102	---	2.3	16.0	**3.9**	Yes	ASL
CALCIUM	15/15	711 - 5990	S36SD0130102	---	3064	5990	NA	No	NUT
CHROMIUM	15/15	11.3 - 110	S36SD0090102	---	30.0	110.0	12000[9]	No	BSL
COBALT	15/15	2.1 - 26.8	S36SD0130102	---	13.3	26.8	NA	No	NTX
COPPER	13/15	13.4 - 127	S36SD0110102	10.2 - 12.6	46.2	127.0	310	No	BSL
IRON	15/15	9110 - 93500	S36SD0090102	---	28396	93500	**5500**	Yes	ASL
LEAD	15/15	9.8 - 4100	S36SD0090102	---	326	4100	**400**	Yes	ASL
MAGNESIUM	15/15	504 - 3870	S36SD0110102	---	1985	3870	NA	No	NUT
MANGANESE	15/15	116 - 2080	S36SD0110102	---	904	2080	**160**	Yes	ASL
MERCURY	11/15	0.12 - 2.9	S36SD0130102	0.056 - 0.079	0.35	2.90	**2.3**	Yes	ASL
NICKEL	14/15	6 - 102	S36SD0090102	7.4 - 7.6	25.1	102.0	160	No	BSL

TABLE 4-11

HUMAN HEALTH DATA EVALUATION - SEDIMENT
SITE 36 - CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	Frequency of Detection[1]	Range of Detections[1]	Sample with Maximum Detection	Range of Nondetects[2]	Average of All Results[3]	Concentration Used for Screening[4]	Human Health Risk Screening[5] Region 3 RBC Residential Soil[6]	Selected as a COPC?	Rationale
Metals (mg/kg) (continued)									
POTASSIUM	15/15	307 - 3500	S36SD0110102	---	1626	3500	NA	No	NUT
SILVER	8/15	0.35 - 4.9	S36SD0010001	0.25 - 0.78	0.8	4.9	39	No	BSL
SODIUM	10/15	79.4 - 755	S36SD0110102	64.5 - 755	330	755	NA	No	NUT
VANADIUM	15/15	15.3 - 66.5	S36SD0110102	---	38.0	66.5	**7.8**	Yes	ASL
ZINC	15/15	16.6 - 840	S36SD0010001	---	202	315	2300	No	BSL
Miscellaneous Parameters (mg/kg)									
CYANIDE	2/15	0.13 - 0.26	S36SD0060001	0.12 - 0.96	0.27	0.26	160	No	BSL

Shaded cells indicate chemicals selected as COPCs and/or exceedances of criteria.

1 Sample and duplicate are counted as one sample when determining frequency of detection and as two samples when determining range of detections.
2 Values presented are sample-specific quantitation limits.
3 Averages are calculated using one half the detection limit for nondetect samples.
4 The maximum detected concentration is used for screening purposes.
5 Table 3-2.
6 RBCs for noncarcinogens are divided by 10 to correspond to a target hazard quotient of 0.1.
7 The value for acenaphthene is used as a surrogate for acenaphthylene.
8 The value for pyrene is used as a surrogate for genzo(g,h,i)perylene and phenanthrene.
9 The RBC for trivalent chromium is used because hexavalent chromium was analyzed for but not detected.

Associated Samples
S36SD0010001
S36SD0020001
S36SD0030001
S36SD0040001
S36SD0050001
S36SD0060001
S36SD0060001-D
S36SD0070102
S36SD0080102
S36SD0090102
S36SD0100102

Definitions
COPC - Chemical of potential concern
NA - Not available/not applicable
ND - Not detected
RBC - Risk-based concentration

Rationale Codes
ASL - Above screening level
BSL - Below screening level
NTX - No toxicity data
NUT - Essential nutrient

TABLE 4-12

HUMAN HEALTH DATA EVALUATION - PORE WATER
SITE 36 - CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND]

Chemical	Frequency of Detection[1]	Range of Detections[1]	Sample with Maximum Detection	Range of Nondetects[2]	Average of All Results[3]	Concentration Used for Screening[4]	Human Health Risk Screening[5] Region 3 RBC Tap Water[6]	Selected as a COPC?	Rationale
Volatiles (µg/L)									
TOLUENE	4/4	0.56 - 4	S36PW0020101	---	1.8	4	230	No	BSL
Semivolatiles (µg/L)									
4-METHYLPHENOL	1/4	1	S36PW0010101	10	4	1	18	No	BSL
ACETOPHENONE	1/4	2	S36PW0040101	10	4.25	2	61	No	BSL
Explosives (µg/L)									
1,3,5-TRINITROBENZENE	1/4	0.076	S36PW0020101	0.1 - 0.2	0.07	0.076	110	No	BSL
1,3-DINITROBENZENE	1/4	0.25 - 0.65	S36PW0010101-D	0.1 - 0.2	0.16	0.65	**0.37**	Yes	ASL
2,4,6-TRINITROTOLUENE	1/4	0.077	S36PW0010101	0.1 - 0.2	0.07	0.077	2.2	No	BSL
4-NITROTOLUENE	1/4	0.073	S36PW0010101-D	0.5 - 1	0.27	0.073	4.2	No	BSL
Metals (unfiltered) (µg/L)									
ALUMINUM	4/4	17.6 - 1930	S36PW0030101	---	823	1930	3700	No	BSL
ARSENIC	4/4	2.1 - 4.9	S36PW0020101	---	3.3	4.9	**0.045**	Yes	ASL
BARIUM	4/4	68.4 - 280	S36PW0020101	---	142	280	730	No	BSL
CADMIUM	4/4	0.23 - 1.3	S36PW0020101	---	0.59	1.3	1.8	No	BSL
CALCIUM	4/4	18700 - 34500	S36PW0020101	---	29212	34500	NA	No	NUT
CHROMIUM	4/4	1.6 - 19.7	S36PW0010101	---	10.5	19.7	5500[7]	No	BSL
COBALT	4/4	0.55 - 8.1	S36PW0010101	---	5.1	8.1	NA	No	NTX
COPPER	4/4	7.6 - 33.1	S36PW0010101	---	19.7	33.1	150	No	BSL
IRON	4/4	16600 - 82800	S36PW0020101	---	39038	82800	**2600**	Yes	ASL
LEAD	4/4	1.1 - 14	S36PW0010101	---	4.6	14	15	No	BSL
MAGNESIUM	4/4	14800 - 27100	S36PW0020101	---	20662	27100	NA	No	NUT
MANGANESE	4/4	1440 - 2690	S36PW0010101	---	2105	2690	**73**	Yes	ASL
NICKEL	4/4	49.6 - 364	S36PW0030101	---	241	364	**73**	Yes	ASL
POTASSIUM	1/4	7130	S36PW0040101	1300 - 5100	2813	7130	NA	No	NUT
SODIUM	4/4	59100 - 166000	S36PW0020101	---	65350	166000	NA	No	NUT
VANADIUM	3/4	2.6 - 3.8	S36PW0030101	0.4	2.2	3.8	**3.7**	Yes	ASL
ZINC	4/4	42.5 - 70.4	S36PW0040101	2.1	53.1	70.4	1100	No	BSL

Shaded cells indicate chemicals selected as COPCs and/or exceedances of criteria.

1 Sample and duplicate are counted as one sample when determining frequency of detection and as two samples when determining range of detections.
2 Values presented are sample-specific quantitation limits.
3 Averages are calculated using one half the detection limit for nondetect samples.
4 The maximum detected concentration is used for screening purposes.
5 Table 3-3.
6 RBCs for noncarcinogens are divided by 10 to correspond to a target hazard quotient of 0.1.
7 The RBC for trivalent chromium is used because hexavalent chromium was analyzed for but not detected.

Associated Samples

S36PW0010101
S36PW0010101-D
S36PW0020101
S36PW0030101
S36PW0040101

Definitions

COPC - chemical of potential concern
NA - Not available/not applicable
RBC - Risk-based concentration

Rationale Codes

ASL - Above screening level
BSL - Below screening level
NTX - No toxicity data
NUT - Essential nutrient

TABLE 4-13

CHEMICAL-SPECIFIC HUMAN HEALTH RISKS
SITE 36 - CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	Maximum Concentration	Carcinogenic Risks		Noncarcinogenic Risks			Evaluation of Target Organ HIs	
		RBC[1]	Estimated ILCR	Primary Target Organ	RBC[1]	Estimated HQ	Target Organ	Total HI
Surface Soil (mg/kg)								
Benzo(a)anthracene	0.25	0.22	1.1E-06	NA[2]	NA[2]	---	NA	NA
Benzo(a)pyrene	0.24	0.022	1.1E-05	NA[2]	NA[2]	---		
Benzo(b)fluoranthene	0.47	0.22	2.1E-06	NA[2]	NA[2]	---		
Dibenzo(a,h)anthracene	0.042	0.022	1.9E-06	NA[2]	NA[2]	---		
		Total ILCR	1.6E-05		**Total HQ**	0.00		
Groundwater (µg/L)								
Trichloroethene	0.6	0.026	2.3E-05	unspecified	10[3]	0.06	blood	2.74
4-Methylphenol	93	NA[2]	NA[2]	unspecified	180	0.52	cardiovascular	2.25
RDX	0.69	0.61	1.1E-06	prostate	110[3]	0.01	CNS	2.14
Antimony	2.1	NA[2]	NA[2]	blood, lifespan	15	0.14	GI	2.60
Arsenic	22.4	0.045	5.0E-04	cardiovascular	11[3]	2.04	lifespan	0.14
Barium	1570	NA[2]	NA[2]	cardiovascular	7300	0.22	liver	2.60
Iron	67700	NA[2]	NA[2]	blood, GI, liver	26000	2.60	prostate	0.01
Manganese	1560	NA[2]	NA[2]	CNS	730	2.14	unspecified	0.58
		Total ILCR	5.2E-04		**Total HQ**	7.72		
Surface Water (µg/L)								
Iron	2790	NA[2]	NA[2]	blood, GI, liver	26000	0.11	blood	0.11
Manganese	492	NA[2]	NA[2]	CNS	730	0.67	CNS	0.67
		Total ILCR	0		**Total HQ**	0.78	GI	0.11
							liver	0.11
Pore Water (µg/L)								
1,3-Dinitrobenzene	0.65	NA[2]	NA[2]	spleen	3.7	0.18	blood	3.18
Arsenic	4.9	0.045	1.1E-04	cardiovascular	11[3]	0.45	body weight	0.50
Iron	82800	NA[2]	NA[2]	blood, GI, liver	26000	3.18	cardiovascular	0.45
Manganese	2690	NA[2]	NA[2]	CNS	730	3.68	CNS	3.68
Nickel	364	NA[2]	NA[2]	body weight	730	0.50	GI	3.18
Vanadium	3.8	NA[2]	NA[2]	NOEL	37	0.10	liver	3.18
		Total ILCR	1.1E-04		**Total HQ**	8.09	NOEL	0.10
							spleen	0.18

TABLE 4-13

CHEMICAL-SPECIFIC HUMAN HEALTH RISKS
SITE 36 - CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	Maximum Concentration	Carcinogenic Risks		Noncarcinogenic Risks		
		RBC[1]	Estimated ILCR	Primary Target Organ	RBC[1]	Estimated HQ
Sediment (mg/kg)						
Benzo(a)anthracene	1.2	0.22	5.5E-06	NA[2]	NA[2]	---
Benzo(a)pyrene	1.0	0.022	4.5E-05	NA[2]	NA[2]	---
Benzo(b)fluoranthene	2.3	0.22	1.0E-05	NA[2]	NA[2]	---
Dibenzo(a,h)anthracene	0.21	0.022	9.5E-06	NA[2]	NA[2]	---
Indeno(1,2,3-cd)pyrene	0.48	0.22	2.2E-06	NA[2]	NA[2]	---
Aluminum	30700	NA[2]	NA[2]	body weight	78000	0.39
Antimony	4.5	NA[2]	NA[2]	blood, lifespan	31	0.15
Arsenic	17.7	0.43	4.1E-05	cardiovascular	23[3]	0.77
Cadmium	16.0	NA[2]	NA[2]	kidney	39	0.41
Iron	93500	NA[2]	NA[2]	blood, GI, liver	55000	1.70
Lead	4100	NA[4]	NA[4]	NA[4]	NA[4]	---
Manganese	425	NA[2]	NA[2]	CNS	1600	0.27
Mercury	2.90	NA[2]	NA[2]	CNS	23	0.13
Vanadium	66.5	NA[2]	NA[2]	NOEL	78	0.85
		Total ILCR	1.1E-04		**Total HQ**	4.66
		Total Cumulative ILCR	7.6E-04		**Cumulative HI**	21

Evaluation of Target Organ HIs	
Target Organ	**Total HI**
blood	1.85
body weight	0.39
cardiovascular	0.77
CNS	0.39
GI	1.70
kidney	0.41
lifespan	0.15
liver	1.70
NOEL	0.85

Cumulative HIs	
blood	7.88
body weight	0.89
cardiovascular	3.47
CNS	6.89
GI	7.60
kidney	0.41
lifespan	0.29
liver	7.60
NOEL	0.96
prostate	0.01
spleen	0.18
unspecified	0.58

Abbreviations:

CNS	Central nervous system.
GI	Gastrointestinal
HI	Hazard index.
HQ	Hazard quotient.
ILCR	Incremental lifetime cancer risk.
NOEL	No observed effects level
RBC	Risk-based concentration.

Footnotes:

1 RBCs (EPA, 2007a) for residential soil or tap water.
2 NA - Not applicable. EPA has not established a cancer slope factor or oral reference dose (RfD) for this chemical.
3 Calculated using the RfD per EPA guidance (EPA, 2003).
4 The average concentration of lead in sediment is 326 mg/kg, which is less than the screening level of 400 mg/kg. Therefore, lead does not pose a significant risk to potential receptors.

TABLE 4-14

ECOLOGICAL DATA EVALUATION - SURFACE SOIL
SITE 36 - CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	Frequency of Detection[1]	Range of Detections[1]	Sample with Maximum Detection	Range of Nondetects[2]	Average of All Results[3]	Concentration Used for Screening[4]	Background Concentration[5]	Ecological Screening Level[6]	Selected as a COPC?	Rationale
Volatiles (µg/kg)										
ACETONE	6/6	9 - 170	S36SS0040001	---	56.2	170	NA	NA	Yes	NTX
ISOPROPYLBENZENE	1/6	20	S36SS0030001	11 - 16	8.7	20	NA	NA	Yes	NTX
METHYL ACETATE	1/6	11	S36SS0020001	11 - 16	7.5	11	NA	NA	Yes	NTX
STYRENE	1/6	2	S36SS0030001	11 - 16	5.7	2	NA	100	No	BSL
TETRACHLOROETHENE	6/6	6 - 12	S36SS0010001	---	8.9	12	NA	300	No	BSL
Semivolatiles (µg/kg)										
2-METHYLNAPHTHALENE	1/6	200	S36SS0040001	350 - 380	183	200	NA	29000	No	BSL
ACENAPHTHYLENE	1/6	56	S36SS0010001	350 - 380	160.5	56	NA	29000	No	BSL
ANTHRACENE	1/6	89	S36SS0010001	350 - 380	166	89	NA	29000	No	BSL
BENZALDEHYDE	4/6	58 - 98	S36SS0050001	350	105	98	NA	NA	Yes	NTX
BENZO(A)ANTHRACENE	2/6	87 - 250	S36SS0010001	350 - 380	178	250	NA	1100	No	BSL
BENZO(A)PYRENE	4/6	52 - 240	S36SS0010001	350 - 370	134	240	NA	1100	No	BSL
BENZO(B)FLUORANTHENE	5/6	44 - 470	S36SS0010001	370	161	470	NA	1100	No	BSL
BENZO(G,H,I)PERYLENE	4/6	38 - 110	S36SS0010001	350 - 370	102	110	NA	1100	No	BSL
BENZO(K)FLUORANTHENE	2/6	80 - 190	S36SS0010001	350 - 380	167	190	NA	1100	No	BSL
CHRYSENE	4/6	37 - 330	S36SS0010001	350 - 370	152	330	NA	1100	No	BSL
DIBENZO(A,H)ANTHRACENE	1/6	42	S36SS0010001	350 - 380	158	42	NA	1100	No	BSL
DI-N-BUTYL PHTHALATE	3/6	37 - 49	S36SS0010001	350 - 370	112	49	NA	NA	Yes	NTX
FLUORANTHENE	5/6	44 - 370	S36SS0010001	370	143	370	NA	29000	No	BSL
INDENO(1,2,3-CD)PYRENE	2/6	51 - 120	S36SS0010001	350 - 380	151	120	NA	1100	No	BSL
NAPHTHALENE	1/6	82	S36SS0040001	350 - 380	163	82	NA	29000	No	BSL
PHENANTHRENE	2/6	52 - 110	S36SS0010001	350 - 380	149	110	NA	29000	No	BSL
PYRENE	5/6	39 - 370	S36SS0010001	370 - 370	140	370	NA	1100	No	BSL
Explosives (mg/kg)										
NITROCELLULOSE	6/6	1.5 - 3.7	S36SS0040001	---	2.1	3.7	NA	NA	Yes	NTX
Metals (mg/kg)										
ALUMINUM	6/6	4340 - 6290	S36SS0040001	---	4908	6290	19700	NA[7]	No	BKG
ARSENIC	6/6	2.6 - 6.2	S36SS0010001	---	4.1	6.2	14.9	18	No	BSL
BARIUM	6/6	29.4 - 48.3	S36SS0020001	---	36.3	48.3	80.4	330	No	BSL
BERYLLIUM	6/6	0.24 - 0.44	S36SS0040001	---	0.34	0.44	1.1	21	No	BSL
CADMIUM	3/6	0.15 - 3.1	S36SS0050001	0.03 - 0.032	0.61	3.1	**2.5**	**0.36**	Yes	ASL
CALCIUM	6/6	321 - 1060	S36SS0030001	---	667	1060	2060	NA	No	NUT
CHROMIUM	6/6	8.7 - 12.2	S36SS0010001	---	10.2	12.2	33.4	26	No	BSL
COBALT	6/6	3 - 11.7	S36SS0040001	---	5.9	11.7	22.3	13	No	BSL
COPPER	6/6	10.4 - 46.6	S36SS0050001	---	21.1	46.6	**20.3**	**28**	Yes	ASL
IRON	6/6	10900 - 16000	S36SS0040001	---	13133	16000	38500	NA[8]	No	BKG
LEAD	6/6	16.4 - 178	S36SS0060001	---	53.7	178	**62.5**	**11**	Yes	ASL
MAGNESIUM	6/6	429 - 856	S36SS0040001	---	566	856	1620	NA	No	NUT

TABLE 4-14

ECOLOGICAL DATA EVALUATION - SURFACE SOIL
SITE 36 - CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	Frequency of Detection(1)	Range of Detections(1)	Sample with Maximum Detection	Range of Nondetects(2)	Average of All Results(3)	Concentration Used for Screening(4)	Background Concentration(5)	Ecological Screening Level(6)	Selected as a COPC?	Rationale
Metals (mg/kg) (continued)										
MANGANESE	6/6	146 - 298	S36SS0040001	---	208	298	1390	**220**	No	BKG
MERCURY	6/6	0.067 - 0.097	S36SS0060001	---	0.08	0.097	0.16	**0.058**	No	BKG
NICKEL	6/6	4.2 - 10.4	S36SS0010001	---	6.7	10.4	15.4	38	No	BKG
POTASSIUM	6/6	256 - 432	S36SS0030001	---	342	432	1470	NA	No	NUT
SODIUM	3/6	41.7 - 66.8	S36SS0050001	31.5 - 38.1	34.9	66.8	120	NA	No	NUT
VANADIUM	6/6	16.2 - 19.6	S36SS0030001	---	18.4	19.6	53.3	**7.8**	No	BKG
ZINC	6/6	27.1 - 81	S36SS0050001	---	44.5	81	**37.5**	**46**	Yes	ASL

Shaded cells indicate chemicals selected as COPCs and/or exceedances of criteria.

1 Sample and duplicate are counted as one sample when determining frequency of detection and as two samples when determining range of detections.
2 Values presented are sample-specific quantitation limits.
3 Averages are calculated using one half the detection limit for nondetect samples.
4 The maximum detected concentration is used for screening purposes.
5 Table 3-1.
6 Table 3-4.
7 Potential for ecological risk only if soil pH is less than 5.5.
8 Potential for ecological risk only is low if soil pH is between 5 and 8.

Associated Samples

S36SS0010001
S36SS0020001
S36SS0020001-D
S36SS0030001
S36SS0040001
S36SS0050001
S36SS0060001

Definitions
COPC - Chemical of potential concern
NA - Not available/not applicable

Rationale Codes
ASL - Above screening level
BKG - Below background
BSL - Below screening level
NTX - No screening level
NUT - Essential nutrient

TABLE 4-15

ECOLOGICAL DATA EVALUATION - SURFACE WATER
SITE 36 - CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	Frequency of Detection[1]	Range of Detections[1]	Sample with Maximum	Range of Nondetects[2]	Average of All Results[3]	Concentration Used for Screening[4]	Ecological Screening Level[5]	Selected as a COPC?	Rationale
Volatiles (µg/L)									
CHLOROMETHANE	3/6	0.69 - 0.89	S36SW0050101	0.5	0.47	0.89	NA	Yes	NTX
Metals (µg/L)									
ALUMINUM	6/6	53.8 - 948	S36SW0010101-D	---	290	948	**87**	Yes	ASL
BARIUM	6/6	18.3 - 35.6	S36SW0010101-D	---	27	35.6	**4**	Yes	ASL
CADMIUM	1/6	0.71	S36SW0030101	0.2	0.2	0.71	**0.25**	Yes	ASL
CALCIUM	6/6	18100 - 20900	S36SW0050101	---	18958	20900	NA	No	NUT
CHROMIUM	3/6	0.61 - 1.5	S36SW0010101-D	0.5	0.64	1.5	85	No	BSL
COBALT	2/6	0.55 - 0.65	S36SW0010101-D	0.4	0.30	0.65	23	No	BSL
COPPER	1/6	7.5	S36SW0040101	1 - 4.5	1.95	7.5	9	No	BSL
IRON	6/6	466 - 3620	S36SW0030101	---	1607	3620	**300**	Yes	ASL
LEAD	3/6	1.2 - 13.6	S36SW0030101	0.9	3.4	13.6	**2.5**	Yes	ASL
MAGNESIUM	6/6	8390 - 8570	S36SW0010101	---	8498	8570	82000	No	NUT
MANGANESE	6/6	44.8 - 492	S36SW0050101	---	362	492	**120**	Yes	ASL
NICKEL	6/6	0.93 - 2	S36SW0010101-D	---	2.8	2	52	No	BSL
SODIUM	6/6	24200 - 26300	S36SW0060101	---	25117	26300	680000	No	NUT
VANADIUM	4/6	0.71 - 2.3	S36SW0010101-D	0.4 - 0.4	1.0	2.3	20.0	No	BSL
Miscellaneous Paramters (µg/L)									
CYANIDE	1/6	5.1	S36SW0020101	2	2.5	5.1	**5**	Yes	ASL

Shaded cells indicate chemicals selected as COPCs and/or exceedances of criteria.

1 Sample and duplicate are counted as one sample when determining frequency of detection and as two samples when determining range of detections.
2 Values presented are sample-specific quantitation limits.
3 Averages are calculated using one half the detection limit for nondetect samples.
4 The maximum detected concentration is used for screening purposes.
5 Table 3-5.

Associated Samples

S36SW0010101
S36SW0010101-D
S36SW0020101
S36SW0030101
S36SW0040101
S36SW0050101
S36SW0060101

Definitions
COPC - Chemical of potential concern
NA - Not available/not applicable

Rationale Codes
ASL - Above screening level
BSL - Below screening level
NTX - No toxicity data
NUT - Essential nutrient

TABLE 4-16

ECOLOGICAL DATA EVALUATION - SEDIMENT
SITE 36 - CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	Frequency of Detection[1]	Range of Detections[1]	Sample with Maximum Detection	Range of Nondetects[2]	Average of All Results[3]	Concentration Used for Screening[4]	Ecological Screening Level[5]	Ecological Effects Quotient	Selected as a COPC?	Rationale
Volatile Organics (µg/kg)										
2-Butanone	5/6	6 - 28	S36SD0040001	12 - 13	14.6	28	NA	NA	Yes	NTX
Acetone	6/6	8 - 47	S36SD0010001	0	26.4	47 J	NA	NA	Yes	NTX
Trichlorofluoromethane	1/6	3	S36SD0040001	12 - 23	7.5	3 J	NA	NA	Yes	NTX
Semivolatile Organics (µg/kg)										
Acenapthylene	1/15	290	S36SD0030001	83 - 600	152	290 J	5.9	49.2	Yes	ASL
Anthracene	1/15	420	S36SD0030001	83 - 600	161	420 J	57.2	7.3	Yes	ASL
Benzaldehyde	3/6	73 - 320	S36SD0030001	270 - 480	177	320 J	NA	NA	Yes	NTX
Benzo(a)anthracene	6/15	89 - 1200	S36SD0030001	170 - 540	285	1200	108	11.1	Yes	ASL
Benzo(a)pyrene	7/15	43 - 1000	S36SD0030001	170 - 540	250	1000	150	6.7	Yes	ASL
Benzo(b)fluoranthene	7/15	44 - 2300	S36SD0030001	170 - 540	359	2300	27.2	84.6	Yes	ASL
Benzo(g,h,i)perylene	4/15	39 - 490	S36SD0030001	83 - 540	143	490 J	170	2.9	Yes	ASL
Benzo(k)fluoranthene	6/15	42 - 790	S36SD0030001	170 - 540	172	790	240	3.3	Yes	ASL
Carbazole	1/6	61	S36SD0030001	270 - 600	196	61 J	NA	NA	Yes	NTX
Chrysene	6/15	62 - 1300	S36SD0030001	170 - 540	209	1300	166	7.8	Yes	ASL
Dibenzo(a,h)anthracene	2/15	45 - 210	S36SD0030001	83 - 600	136	210 J	33	6.4	Yes	ASL
Fluoranthene	8/15	86 - 1300	S36SD0030001	170 - 540	237	1300	423	3.1	Yes	ASL
Indeno(1,2,3-c,d)pyrene	4/15	34 - 480	S36SD0030001	83 - 540	142	480 J	17	28.2	Yes	ASL
Phenanthrene	5/15	65 - 120	S36SD0020001	170 - 540	119	120 J	204	0.6	No	BSL
Pyrene	9/15	67 - 1200	S36SD0030001	170 - 540	218	1200	195	6.2	Yes	ASL
Explosives (mg/kg)										
Nitroglycerin	1/6	0.55	S36SD0010001	0.5	0.3	0.55	NA	NA	Yes	NTX
Inorganics (mg/kg)										
Aluminum	15/15	3950 - 30700	S36SD0110102	0	14629	30700 J	NA	NA	Yes	NTX
Antimony	6/15	0.45 - 4.5	S36SD0040001	0.47 - 3.9	1.55	4.5 L	2	2.3	Yes	ASL
Arsenic	15/15	2.5 - 17.7	S36SD0090102	0	7.26	17.7	9.8	1.8	Yes	ASL
Barium	15/15	26.8 - 255	S36SD0090102	0	132	255	NA	NA	Yes	NTX
Beryllium	15/15	0.25 - 1.7	S36SD0110102	0	0.91	1.7 J	NA	NA	Yes	NTX
Cadmium	15/15	0.15 - 16	S36SD0110102	0	2.27	16 J	0.99	16.2	Yes	ASL
Calcium	15/15	711 - 5990	S36SD0130102	0	3064	5990 J	NUT	NA	No	NUT
Chromium	15/15	11.3 - 110	S36SD0090102	0	29.9	110	43.4	2.5	Yes	ASL
Cobalt	15/15	2.1 - 26.8	S36SD0130102	0	13.3	26.8 J	50	0.5	No	BSL
Copper	13/15	13.4 - 127	S36SD0110102	10.2 - 12.6	46.2	127 J	31.6	4.0	Yes	ASL
Iron	15/15	9110 - 93500	S36SD0090102	0	28396	93500	20000	4.7	Yes	ASL
Lead	15/15	9.8 - 4100	S36SD0090102	0	326	4100 J	35.8	115	Yes	ASL
Magnesium	15/15	504 - 3870	S36SD0110102	0	1985	3870 J	NUT	NA	No	NUT
Manganese	15/15	116 - 2080	S36SD0110102	0	904	2080 J	460	4.5	Yes	ASL
Mercury	11/15	0.12 - 2.9	S36SD0130102	0.056 - 0.079	0.35	2.9 J	0.18	16.1	Yes	ASL

TABLE 4-16

ECOLOGICAL DATA EVALUATION - SEDIMENT
SITE 36 - CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	Frequency of Detection[1]	Range of Detections[1]	Sample with Maximum Detection	Range of Nondetects[2]	Average of All Results[3]	Concentration Used for Screening[4]	Ecological Screening Level[5]	Ecological Effects Quotient	Selected as a COPC?	Rationale
Inorganics (mg/kg) (continued)										
Nickel	14/15	6 - 102	S36SD0090102	7.4 - 7.6	25.1	102	22.7	4.5	Yes	ASL
Potassium	15/15	307 - 3500	S36SD0110102	0	1626	3500 J	NUT	NA	No	NUT
Silver	8/15	0.35 - 4.9	S36SD0010001	0.25 - 0.78	0.79	4.9	1	4.9	Yes	ASL
Sodium	10/15	79.4 - 755	S36SD0110102	64.5 - 777	330	755 J	NUT	NA	No	NUT
Vanadium	15/15	15.3 - 66.5	S36SD0110102	0	38	66.5 J	NA	NA	Yes	NTX
Zinc	15/15	16.6 - 840	S36SD0090102	0	202	840	121	6.9	Yes	ASL
AVS/SEM Metals (µmol/g)										
Acid Volatile Sulfide	7/9	0.67 - 37.7	S36SD0080102	0.091 - 0.11	13.6	37.7 J	NA	NA	NA	NA
Cadmium	8/9	0.0052 - 0.13	S36SD0110102	0.0014 - 0.0017	0.022	0.13 J	NA	NA	NA	NA
Copper	9/9	0.0089 - 1.3	S36SD0110102	0	0.48	1.3 J	NA	NA	NA	NA
Lead	9/9	0.002 - 0.57	S36SD0090102	0	0.26	0.57 J	NA	NA	NA	NA
Nickel	9/9	0.011 - 0.52	S36SD0090102	0.0064	0.19	0.52 J	NA	NA	NA	NA
Zinc	8/9	1.2 - 3.9	S36SD0130102	0.039 - 0.18	1.96	3.9 J	NA	NA	NA	NA
Miscellaneous Parameters (mg/kg)										
Cyanide	2/15	0.13 - 0.26	S36SD0060001	0.12 - 0.96	0.267	0.26	0.1	2.6	Yes	ASL
Total Organic Carbon	9/9	50300 - 162000	S36SD0150102	0	88311	162000 J	NA	NA	NA	NA

Shaded cells indicate chemicals selected as COPCs and/or exceedances of criteria.

1 Sample and duplicate are counted as one sample when determining frequency of detection and as two samples when determining range of detections.
2 Values presented are sample-specific quantitation limits.
3 Averages are calculated using one half the detection limit for nondetect samples.
4 The maximum detected concentration is used for screening purposes.
5 Table 3-6.

Definitions
COPC - Chemical of potential concern
NA - Not available/not applicable

Rationale Codes
ASL - Above screening level
BSL - Below screening level
NTX - No toxicity data/screening level
NUT - Essential nutrient

Associated Samples:

S36SD0010001	S36SD0070102
S36SD0020001	S36SD0080102
S36SD0030001	S36SD0090102
S36SD0040001	S36SD0100102
S36SD0050001	S36SD0110102
S36SD0060001	S36SD0120102
S36SD0060001-AVG	S36SD0120102-AVG
S36SD0060001-D	S36SD0120102-D

TABLE 4-17

ORGANIC CARBON NORMALIZED AVS/SEM CALCULATIONS
SITE 36 - CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MD

Sample ID	**S36SD0070102**	**S36SD0080102**	**S36SD0090102**	**S36SD0100102**	**S36SD0110102**	**S36SD0120102**	**S36SD0120102-AVG**	**S36DUP010102**	**S36SD0130102**	**S36SD0140102**	**S36SD0150102**
Miscellaneous Parameters (mg/kg)											
TOTAL ORGANIC CARBON	78800 J	91000 J	50300	82200 J	72300 J	57000 J	77800 J	98600 J	72400 J	108000 J	162000 J
AVS/SEM (µmol/g)											
ACID VOLATILE SULFIDE	0.091 UJ	37.7 J	21 L	14.3 J	28.4 J	0.67 J	0.3625 J	0.11 UJ	13.9 J	6.6 J	0.11 UJ
CADMIUM	0.0014 UJ	0.0077 J	0.0052 J	0.018 J	0.13 J	0.014 J	0.007425 J	0.0017 UJ	0.015 J	0.0072 J	0.0068 J
COPPER	0.014 J	0.36 J	0.63 J	0.48 J	1.3 J	0.25 J	0.12945 J	0.0089 J	0.77 J	0.34 J	0.34 J
LEAD	0.0038 J	0.27 J	0.57 J	0.28 J	0.48 J	0.12 J	0.061 J	0.002 J	0.34 J	0.15 J	0.16 J
NICKEL	0.011 J	0.19 J	0.52 J	0.2 J	0.25 J	0.094 J	0.0486 J	0.0064 UJ	0.2 J	0.14 J	0.19 J
ZINC	0.18 B	2 J	1.2 J	2.6 J	3 J	1.6 J	0.80975 J	0.039 B	3.9 J	1.7 J	2.3 J
Sum SEM	0.2095	2.8277	2.9252	3.578	5.16	2.078	1.056225	0.05715	5.225	2.3372	2.9968
Sum SEM - AVS	0.164	-34.8723	-18.0748	-10.722	-23.24	1.408	0.693725	0.00215	-8.675	-4.2628	2.9418
f_{OC}	0.0788	0.091	0.0503	0.0822	0.0723	0.057	0.0778	0.0986	0.0724	0.108	0.162
(Sum SEM - AVS)/f_{OC}	2.08	-383	-359	-130	-321	24.7	8.92	0.022	-120	-39.5	18.2

Nondetect values were summed as 1/2 the nondetect value
AVS - Acid Volatile Sulfide
SEM - Simultaneously Extracted Metals
f_{OC} - fraction organic carbon (unitless)

TABLE 4-18

SUMMARY OF BENTHIC MACROINVERTEBRATE DATA
SITE 36 - CLOSED LANDFILL
NSF-IH, INDIAN HEAD MARYLAND

			Reference Samples				Site Samples				
			Upstream		Downstream						
SPECIES	**T.V.**	**F.F.G.**	**S36SD007**	**S36SD008**	**S36SD014**	**S36SD015**	**S36SD009**	**S36SD010**	**S36SD011**	**S36SD012**	**S36SD013**
NEMATODA	**6**								2		
MOLLUSCA											
Bivalvia											
Veneroida											
Sphaeriidae	***8**	**FC**							1		
Gastropoda											
Basommatophora											
Physidae											
Physella sp.	**8.8**	**CG**		1							1
ANNELIDA											
Oligochaeta											
Tubificida											
Enchytraeidae	**9.8**	**CG**				1			34	6	16
Naididae	***8**	**CG**			10						20
Dero sp.	**10**	**CG**									4
Tubificidae w.h.c.	**7.1**	**CG**	44	4	10	4	30	28	40	12	12
Quistadrilus multisetosus	**3.9**	**CG**			67		35	16	40	12	8
Tubificidae w.o.h.c.	**7.1**	**CG**	234	49	105	22	12	24	7	54	16
Branchiura sowerbyi	**8.3**	**CG**					3	1			
Limnodrilus hoffmeisteri	**9.5**	**CG**	15	20		6	41	8	13	36	
Lumbriculida											
Lumbriculidae	**7**	**CG**						4			
Hirudinea											
Rhynchobdellida											
Glossiphoniidae		**P**									
Helobdella trisserialis	**9.2**	**P**									1
ARTHROPODA											
Crustacea											
Ostracoda			1	1	5		1			1	
Amphipoda											
Gammaridae											
Gammarus sp.	**9.1**	**SH**			1			2		4	21
Decapoda											
Palaemonidae											
Palaemonetes sp.	**7.1**	**CG**									1

TABLE 4-18

SUMMARY OF BENTHIC MACROINVERTEBRATE DATA
SITE 36 - CLOSED LANDFILL
NSF-IH, INDIAN HEAD MARYLAND

			Reference Samples				Site Samples				
			Upstream		Downstream						
SPECIES	**T.V.**	**F.F.G.**	**S36SD007**	**S36SD008**	**S36SD014**	**S36SD015**	**S36SD009**	**S36SD010**	**S36SD011**	**S36SD012**	**S36SD013**
Insecta											
Ephemeroptera											
Caenidae											
Caenis sp.	**7.4**	**CG**								1	1
Odonata											
Libellulidae		**P**						1			
Trichoptera											
Leptoceridae		**CG**									1
Diptera											
Ceratopogonidae		**P**		1		1	1	1		1	
Chironomidae											
Chironomus sp.	**9.6**	**CG**						1	1	4	5
Cladotanytarsus sp.	**4.1**	**FC**				1					
Cricotopus sylvestris			1								3
Dictotendipes modestus	**8.7**		1		14	3		2	17	10	117
Einfeldia sp.	**7.1**	**CG**						2			
Glyptotendipes sp.	**9.5**	**FC**								2	
Nanocladius sp.	**7.1**	**CG**									2
Paracladopelma sp.	**5.5**	**CG**				1				2	
Parametriocnemus sp.	**3.7**	**CG**									1
Polypedilum halterale gp.	**7.3**	**SH**			1			1	1		1
Polypedilum illinoense	**9**	**SH**							1	4	
Procladius bellus							1	2	1	2	
Procladius sp.	**9.1**	**P**			1	1					20
Tanypus carinatus			4	1	1		12	16	1	41	15
Tanytarsus sp.	**6.8**	**FC**			2	2		3	4	6	32
Muscidae							1				
Tabanidae		**PI**									
Chrysops sp.	**6.7**	**PI**			2					2	
Tipulidae		**SH**		25	40	40	3			12	
Total Number of Organisms			**300**	**102**	**259**	**82**	**140**	**112**	**163**	**212**	**298**
Totan Number of Taxa			**7**	**8**	**13**	**11**	**11**	**16**	**14**	**19**	**21**
North Carolina Biotic Index			**7.23**	**7.77**	**6.25**	**7.56**	**7.02**	**6.86**	**7.25**	**7.78**	**8.25**
Shannon Diversity Index			**1.07**	**1.91**	**2.38**	**2.20**	**2.54**	**3.08**	**2.77**	**3.29**	**3.16**

T.V. - Tolerance Value (The lower the number the more sensitive the organism)
F.F.G. - Functional Feeding Group
- CG - Collectors Gatherers
- FC - Filtering Collectors
- SH - Shredders
- P - Predators
- PI - Piercers

TABLE 4-19

ECOLOGICAL DATA EVALUATION - PORE WATER
SITE 36 - CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND]

Chemical	Frequency of Detection[1]	Range of Detections[1]	Sample with Maximum Detection	Range of Nondetects[2]	Average of All Results[3]	Concentration Used for Screening[4]	Ecological Screening Level[5]	Selected as a COPC?	Rationale
Volatiles (µg/L)									
TOLUENE	4/4	0.56 - 4	S36PW0020101	---	1.8	4	**2**	Yes	ASL
Semivolatiles (µg/L)									
4-METHYLPHENOL	1/4	1	S36PW0010101	10	4	1	543	No	BSL
ACETOPHENONE	1/4	2	S36PW0040101	10	4.25	2	NA	Yes	NTX
Explosives (µg/L)									
1,3,5-TRINITROBENZENE	1/4	0.076	S36PW0020101	0.1 - 0.2	0.07	0.076	NA	Yes	NTX
1,3-DINITROBENZENE	1/4	0.25 - 0.65	S36PW0010101-D	0.1 - 0.2	0.16	0.65	NA	Yes	NTX
2,4,6-TRINITROTOLUENE	1/4	0.077	S36PW0010101	0.1 - 0.2	0.07	0.077	100	No	BSL
4-NITROTOLUENE	1/4	0.073	S36PW0010101-D	0.5 - 1	0.27	0.073	1900	No	BSL
Metals (unfiltered) (µg/L)									
ALUMINUM	4/4	17.6 - 1930	S36PW0030101	---	823	1930	**87**	Yes	ASL
ARSENIC	4/4	2.1 - 4.9	S36PW0020101	---	3.3	4.9	5	No	BSL
BARIUM	4/4	68.4 - 280	S36PW0020101	---	142	280	**4**	Yes	ASL
CADMIUM	4/4	0.23 - 1.3	S36PW0020101	---	0.59	1.3	**0.25**	Yes	ASL
CALCIUM	4/4	18700 - 34500	S36PW0020101	---	29212	34500	116000	No	NUT
CHROMIUM	4/4	1.6 - 19.7	S36PW0010101	---	10.5	19.7	85	No	BSL
COBALT	4/4	0.55 - 8.1	S36PW0010101	---	5.1	8.1	23	No	BSL
COPPER	4/4	7.6 - 33.1	S36PW0010101	---	19.7	33.1	**9**	Yes	ASL
IRON	4/4	16600 - 82800	S36PW0020101	---	39038	82800	**300**	Yes	ASL
LEAD	4/4	1.1 - 14	S36PW0010101	---	4.6	14	**2.5**	Yes	ASL
MAGNESIUM	4/4	14800 - 27100	S36PW0020101	---	20662	27100	82000	No	NUT
MANGANESE	4/4	1440 - 2690	S36PW0010101	---	2105	2690	**120**	Yes	ASL
NICKEL	4/4	49.6 - 364	S36PW0030101	---	241	364	**52**	Yes	ASL
POTASSIUM	1/4	7130	S36PW0040101	1300 - 5100	2813	7130	53000	No	NUT
SODIUM	4/4	59100 - 166000	S36PW0020101	---	65350	166000	680000	No	NUT
VANADIUM	3/4	2.6 - 3.8	S36PW0030101	0.4	2.2	3.8	20	No	BSL
ZINC	4/4	42.5 - 70.4	S36PW0040101	2.1	53.1	70.4	120	No	BSL

Shaded cells indicate chemicals selected as COPCs and/or exceedances of criteria.

1 Sample and duplicate are counted as one sample when determining frequency of detection and as two samples when determining range of detections.
2 Values presented are sample-specific quantitation limits.
3 Averages are calculated using one half the detection limit for nondetect samples.
4 The maximum detected concentration is used for screening purposes.
5 Table 3-5.

Associated Samples

S36PW0010101
S36PW0010101-D
S36PW0020101
S36PW0030101
S36PW0040101

Definitions

COPC - chemical of potential concern
NA - Not available/not applicable

Rationale Codes

ASL - Above screening level
BSL - Below screening level
NTX - No toxicity data
NUT - Essential nutrient

TABLE 4-20

TERRESTRIAL FOOD CHAIN MODEL - CONSERVATIVE SCENARIO
INSECTIVOROUS AND HERBIVOROUS RECEPTORS
SITE 36 - CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	Herbivorous Receptors EEQs				Insectivorous Receptors EEQs			
	Bobwhite Quail		Meadow Vole		American Woodcock		Short-Tailed Shrew	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Metals								
CADMIUM	3.4E-02	7.9E-03	3.6E-01	4.0E-02	2.8E+00	6.6E-01	2.8E+00	3.2E-01
COPPER	1.2E-01	1.4E-02	4.1E-01	2.8E-02	1.6E+00	1.8E-01	4.8E-01	3.3E-02
LEAD	5.8E-01	2.1E-02	5.0E-01	1.3E-02	1.0E+01	3.7E-01	1.3E+00	3.3E-02
ZINC	3.2E-02	1.2E-02	1.7E-01	4.3E-02	1.1E+00	4.4E-01	5.2E-01	1.3E-01

Cells are shaded if the value is greater than 1.0

NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level
EEQ - Ecological Effects Quotient

TABLE 4-21

TERRESTRIAL FOOD CHAIN MODEL - CONSERVATIVE SCENARIO
PISCIVOROUS RECEPTORS
SITE 36 - CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	Piscivorous Receptors EEQs			
	Great Blue Heron		Raccoon	
	NOAEL	LOAEL	NOAEL	LOAEL
Semivolatile Organics				
ACENAPHTHYLENE	4.2E-03	4.2E-04	1.7E-04	3.2E-05
ANTHRACENE	6.1E-03	6.1E-04	2.5E-04	4.6E-05
BENZO(A)ANTHRACENE	1.7E-02	1.7E-03	7.7E-02	1.2E-03
BENZO(A)PYRENE	1.4E-02	1.4E-03	6.4E-02	1.0E-03
BENZO(B)FLUORANTHENE	3.3E-02	3.3E-03	1.5E-01	2.4E-03
BENZO(G,H,I)PERYLENE	7.1E-03	7.1E-04	3.1E-02	5.0E-04
BENZO(K)FLUORANTHENE	1.1E-02	1.1E-03	5.1E-02	8.1E-04
CHRYSENE	1.9E-02	1.9E-03	8.3E-02	1.3E-03
DIBENZO(A,H)ANTHRACENE	3.0E-03	3.0E-04	1.3E-02	2.2E-04
FLUORANTHENE	1.9E-02	1.9E-03	7.8E-04	1.4E-04
INDENO(1,2,3-CD)PYRENE	6.9E-03	6.9E-04	3.1E-02	4.9E-04
PHENANTHRENE	1.7E-03	1.7E-04	7.2E-05	1.3E-05
PYRENE	1.7E-02	1.7E-03	7.7E-02	1.2E-03
Inorganics				
ARSENIC	3.0E-01	1.5E-01	8.6E-01	2.0E-01
CADMIUM	4.6E+00	1.1E+00	1.1E+01	1.2E+00
CHROMIUM	1.1E+00	1.9E-01	1.7E+00	6.9E-02
COPPER	8.7E+00	1.0E+00	7.8E+00	5.3E-01
LEAD	8.5E+01	3.1E+00	3.9E+01	1.0E+00
MERCURY	6.9E+01	6.9E+00	1.7E+01	3.5E+00
NICKEL	1.9E+00	6.8E-01	9.4E+00	1.1E+00
SILVER	1.3E-01	4.4E-03	5.8E-02	2.9E-03
ZINC	5.1E+00	1.9E+00	5.5E+00	1.4E+00

Cells are shaded if the value is greater than 1.0

NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level
EEQ - Ecological Effects Quotient

TABLE 4-22

TERRESTRIAL FOOD CHAIN MODEL - LESS CONSERVATIVE SCENARIO
INSECTIVOROUS AND HERBIVOROUS RECEPTORS
SITE 36 - CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	Herbivorous Receptors EEQs				Insectivorous Receptors EEQs			
	Bobwhite Quail		Meadow Vole		American Woodcock		Short-Tailed Shrew	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Metals								
CADMIUM	NA	NA	NA	NA	4.7E-01	1.1E-01	6.5E-01	7.2E-02
COPPER	NA	NA	NA	NA	3.7E-01	4.3E-02	NA	NA
LEAD	NA	NA	NA	NA	1.8E+00	6.5E-02	3.9E-01	9.8E-03
ZINC	NA	NA	NA	NA	5.6E-01	2.2E-01	NA	NA

Cells are shaded if the value is greater than 1.0
NA - Not applicable
NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level
EEQ - Ecological Effects Quotient

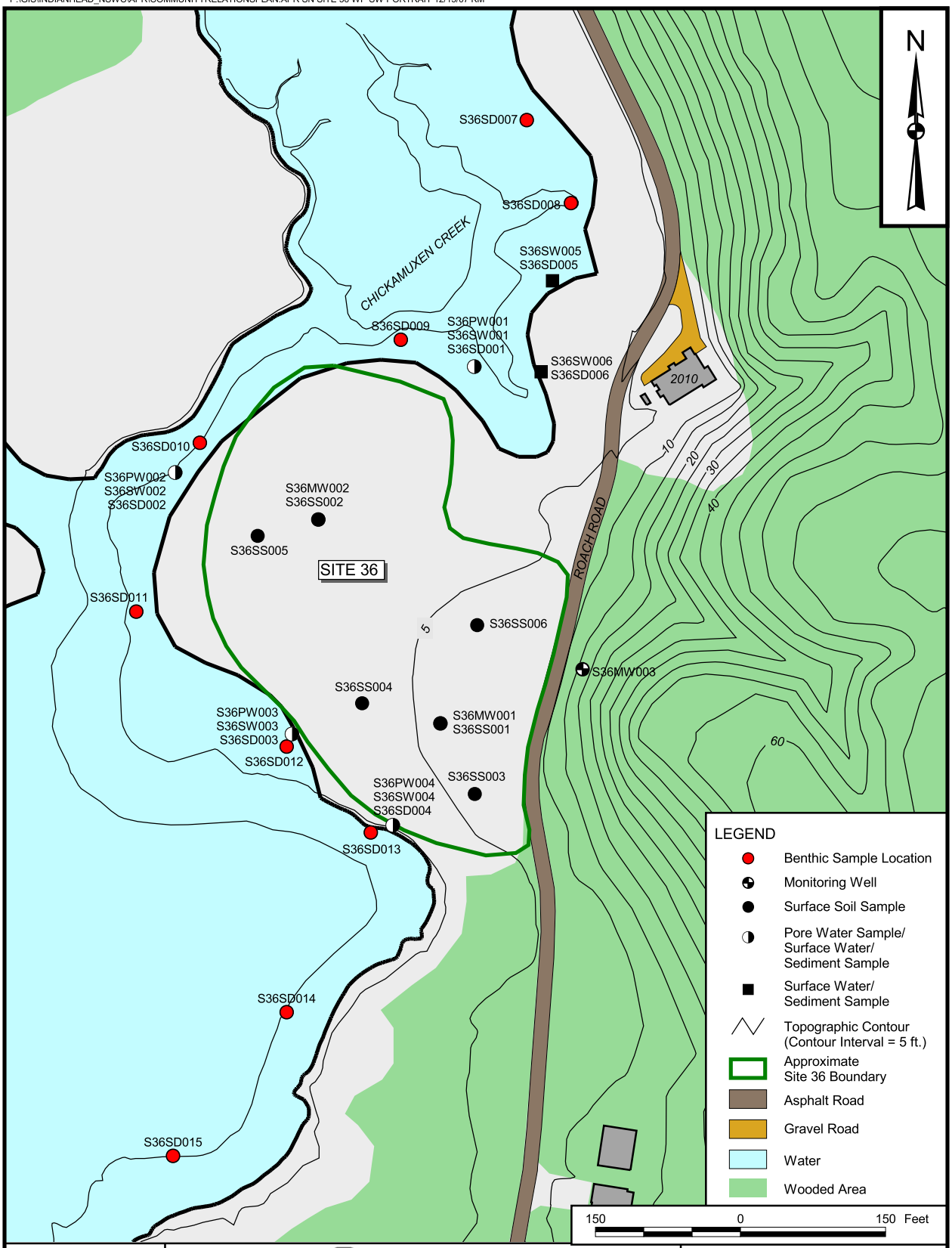
TABLE 4-23

TERRESTRIAL FOOD CHAIN MODEL - LESS CONSERVATIVE SCENARIO
PISCIVOROUS RECEPTORS
SITE 36 - CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	Piscivorous Receptors EEQs			
	Great Blue Heron		Raccoon	
	NOAEL	LOAEL	NOAEL	LOAEL
Inorganics				
CADMIUM	4.4E-02	1.0E-02	6.7E-02	7.5E-03
CHROMIUM	6.7E-02	1.1E-02	7.9E-02	3.3E-03
COPPER	8.2E-01	9.5E-02	4.4E-01	3.0E-02
LEAD	9.4E-01	3.4E-02	3.7E-01	9.4E-03
MERCURY	2.9E+00	2.9E-01	4.4E-01	8.8E-02
NICKEL	8.7E-02	3.2E-02	2.8E-01	3.2E-02
ZINC	2.7E-01	1.0E-01	1.8E-01	4.5E-02

NA - Not applicable
NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level
EEQ - Ecological Effects Quotient

P:\GIS\INDIANHEAD_NSWC\APR\COMMUNITYRELATIONSPLAN.APR SN SITE 36 WP SW PORTRAIT 12/13/07 KM



DRAWN BY K MOORE	DATE 11/21/06	Tetra Tech NUS, Inc.	CONTRACT NUMBER CTO 0005
CHECKED BY K. TURNBULL	DATE 12/13/07	SAMPLE LOCATIONS SITE 36 - CLOSED LANDFILL NAVAL SUPPORT FACILITY, INDIAN HEAD INDIAN HEAD, MARYLAND	APPROVED BY G. LATULIPPE — DATE 11/21/06
COST/SCHEDULE-AREA			APPROVED BY — DATE —
SCALE AS NOTED			DRAWING NO. FIGURE 4-1 — REV 0

FIGURE 4-2, SITE PHOTOGRAPHS

Site 36 – Looking east towards abandoned tank. (2004)

Site 36 – Looking north towards abandoned machinery. (2004)

Figure 4-3
Total Number of Organisms in Each Sample

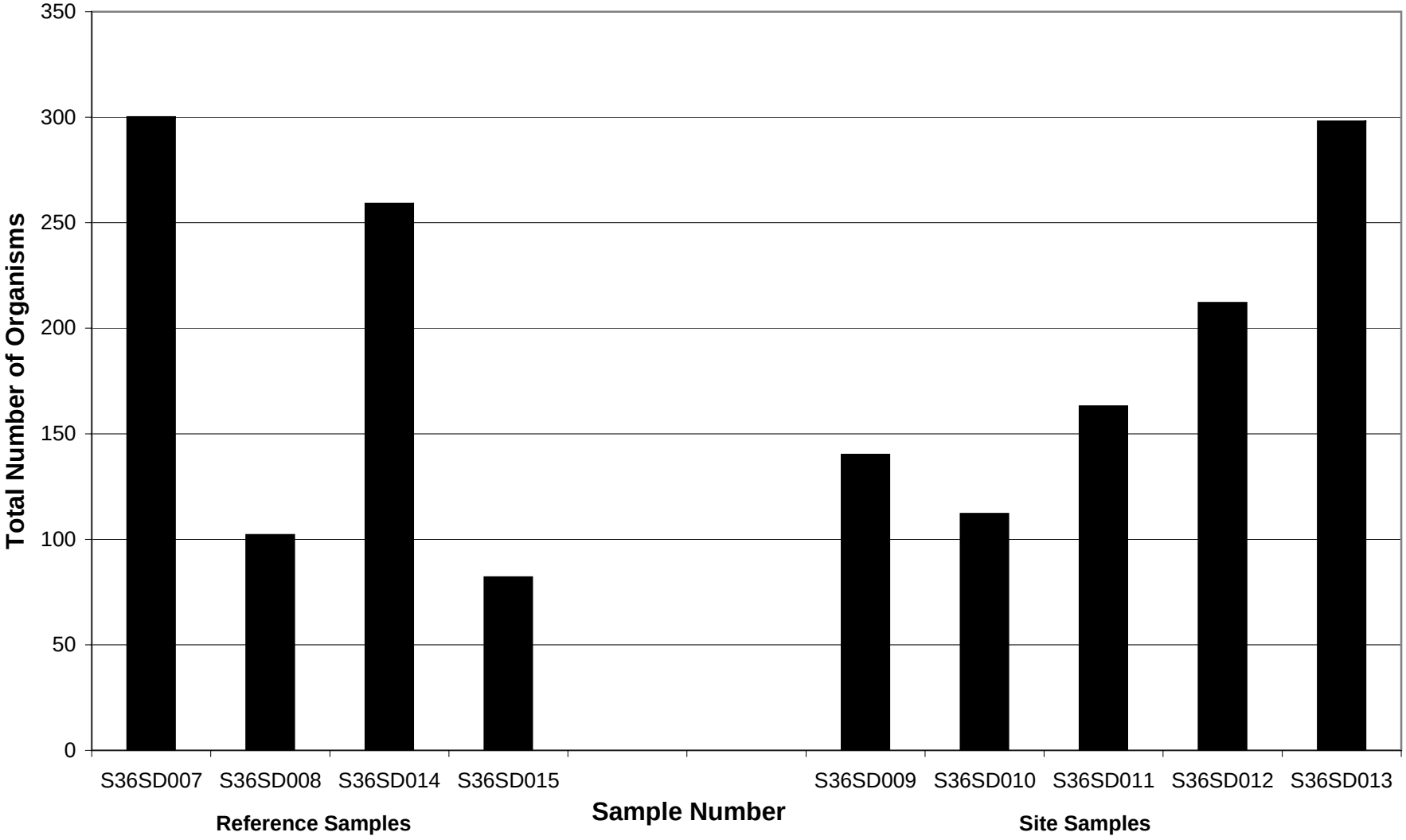


Figure 4-4
Total Number of Taxa in Each Sample

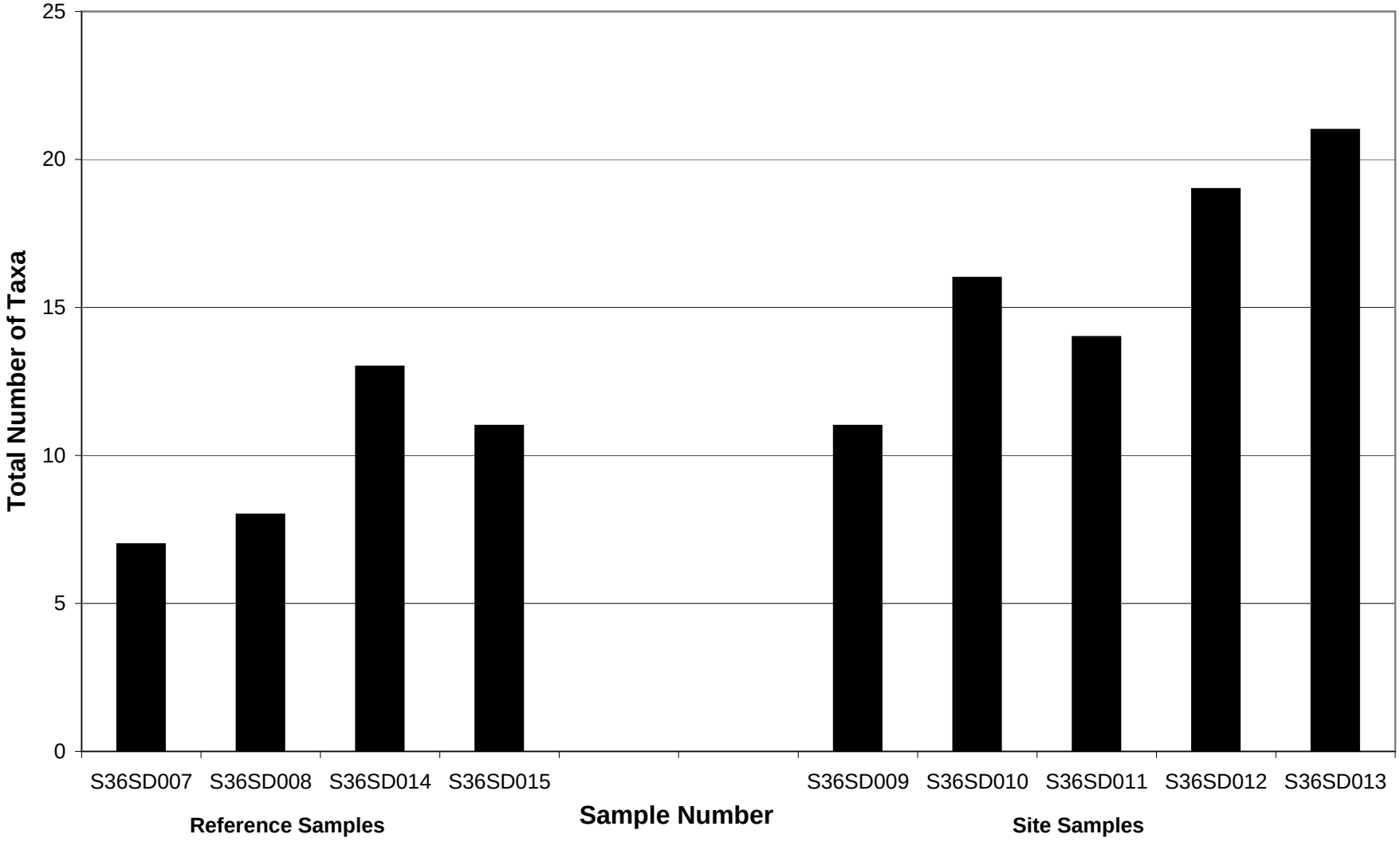


Figure 4-5
North Carolina Biotic Index for Each Sample

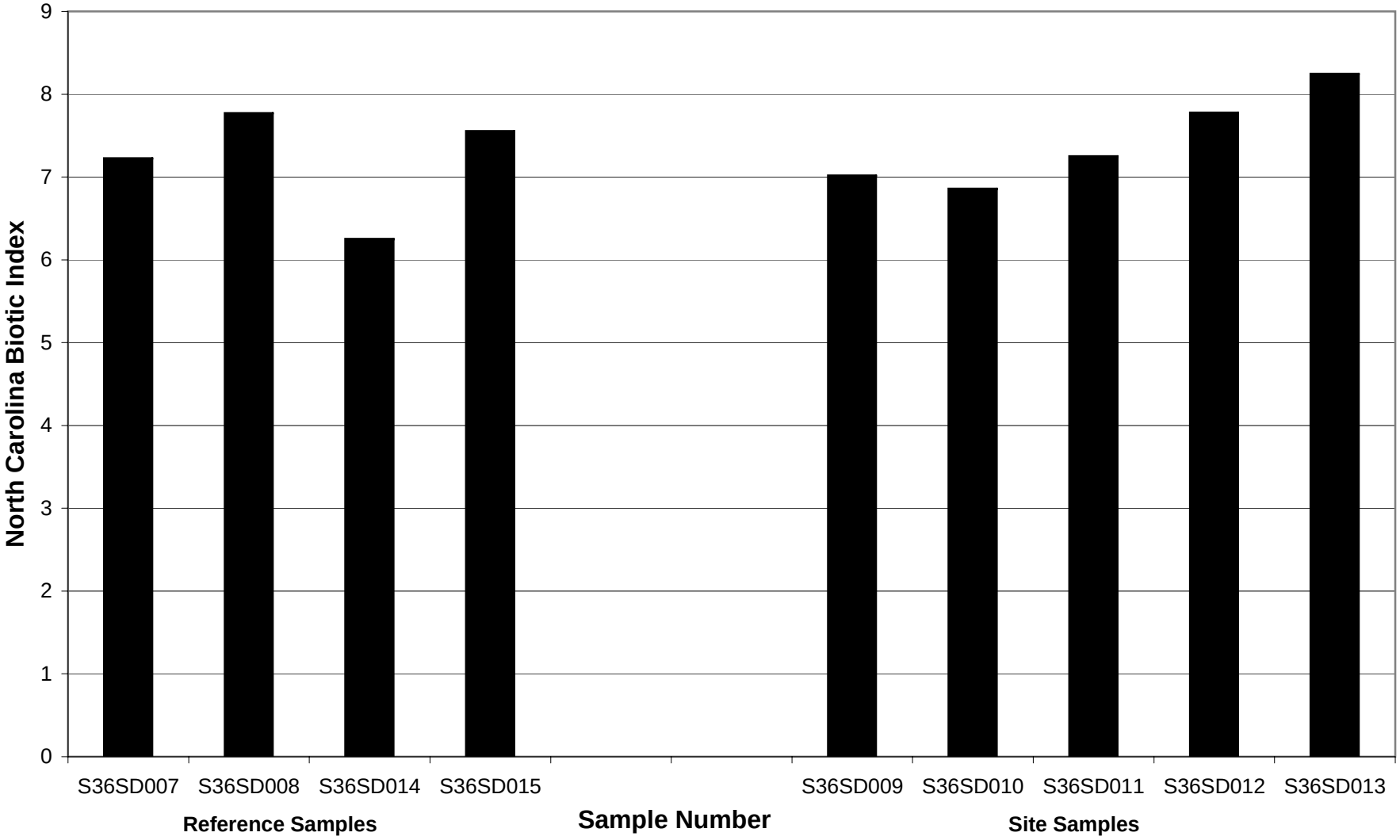
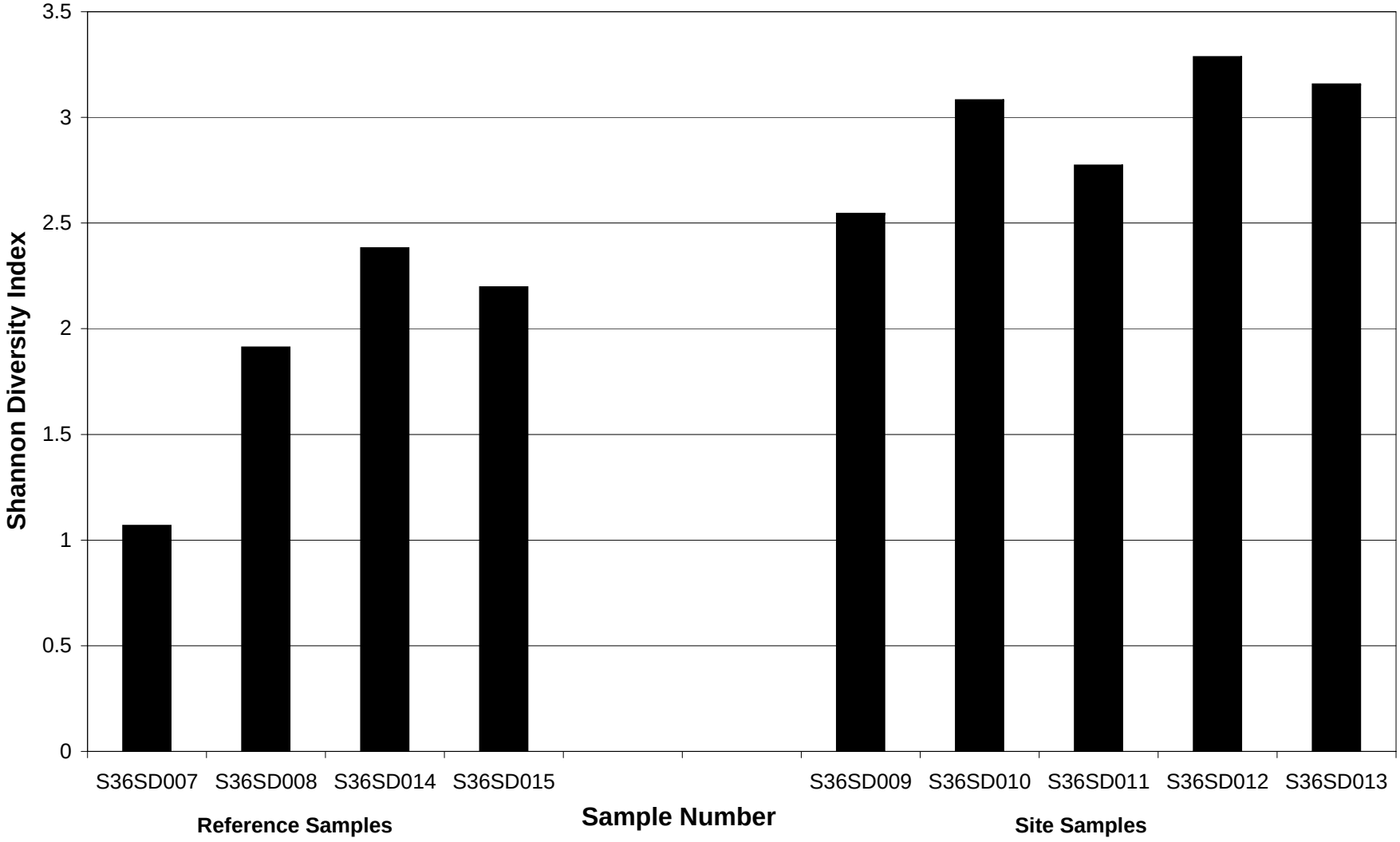


Figure 4-6
Shannon Diversity Index for Each Sample



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APPENDIX A

FIELD LOG SHEETS AND CHAIN OF CUSTODY FORMS

Tetra Tech NUS, Inc.

GROUNDWATER LEVEL MEASUREMENT SHEET

Project Name: SSP Indian Head, Stump Neck **Project No.:** N2144 CTO 0005
Location: Site 36, Closed Landfill **Personnel:** C Doolan
Weather Conditions: Sunny, Hot 90s **Measuring Device:** Dipper-T WL Indicator
Tidally Influenced: Yes ___ No ✓ **Remarks:**

Well or Piezometer Number	Date	Time	Elevation of Reference Point (feet)*	Total Well Depth (feet)*	Water Level Indicator Reading (feet)*	Thickness of Free Product (feet)*	Groundwater Elevation (feet)*	Comments
MW001	7/28/05	1030	8.90	17.54	7.01	—	1.89	
MW002	7/28/05	1350	5.84	17.30	4.61	—	1.23	
MW003	7/28/05	1015	13.76	20.18	11.55	—	2.21	

* All measurements to the nearest 0.01 foot

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head SITE 36, CTO 0005
PROJECT NUMBER: 2144
DRILLING COMPANY: Talon Drilling
DRILLING RIG: ACKER TRAC MT.

BORING No.: S36MW001
DATE: 6-28-05
GEOLOGIST: FRED W RAMSER
DRILLER: JOE D

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole**	Driller BZ**
S-1 1150		39/16					MOD BRN SAND		DRY				
	2	14/14	1.0/2.0				SILT + GRA.			0		0	
S-2 1159		18/14				BRN	SILT + CLAY		MOTTLED GREY, YEL BRN				
	4	14/12	1.5/2.0 ▽						SLIGHTLY PLASTIC				
S-3 1243		3/4					POOR RECOVER		WET CLAYEY	0		0	
	6	8/10	0.3/2.0						SAND IN SHOE				
S-4 1220		13/13					DK GREENISH GREY			0		0	
	8	14/18	0.5/2.0				MOTTLED BRN CLAY + SAND		WOOD FRAG				
S-5 1230		30/20				BRN	SILTY SAND		ABUNDANT WOOD	0.1		0	
	10	18/30	1.2/2.0				TR GRAVEL		FRAG. (LOOKS NATL)				
S-6 1236		30/5					NO RECOVERY		WET WOOD IN SHOE	0		0	
	12	5/6	0/2.0				↓		LOOKS LIKE MAN MADE				
S-7 1240		9/9			VERY SOFT		DK BRN SILT + CLAY		WET SPOON	0		0	
	14	12/6	1.8/2.0				(RIVER MUD)		LOOKS LIKE NATURAL				
S-8 1249		9/8					↓		MATL.	0.1		0	
	16	14/5	1.8/2.0				↓		↓				
							HSA TO 14'		MEASURED				
									H_2O @ 4' BGS				
									WITH BAILERS				
							WELL 4'-14'		IN THE GROUND				
							SAND 3'-14'						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm): 0

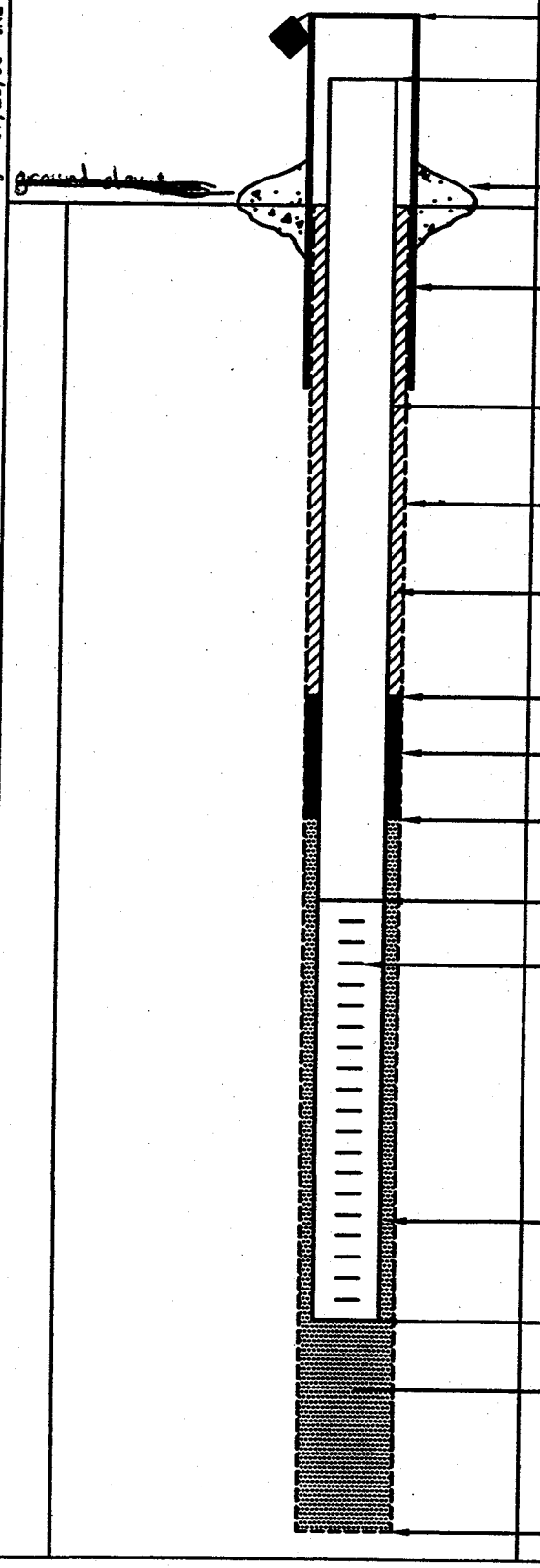
Converted to Well: Yes ✓ No _____ Well I.D. #: S36MW001

WELL NO.: 536 MW001

Tetra Tech NUS, Inc.

OVERBURDEN MONITORING WELL SHEET STICK-UP

PROJECT SSP SITE 36	LOCATION Indian Head/Stump Neck	DRILLER Joe D.
PROJECT NO. 2144	BORING 536MW001	DRILLING METHOD HSA 4 1/4 ID
DATE BEGUN 6-28-05	DATE COMPLETED 6-28-05	
FIELD GEOLOGIST Fred W. Ramser		DEVELOPMENT METHOD bailer + purge
GROUND ELEVATION 5.99'	DATUM NGVD 1929	



ELEVATION/HEIGHT OF TOP OF SURFACE CASING: 9.20', 3.21'

ELEVATION/HEIGHT OF TOP OF RISER PIPE: 8.90', 2.91'

TYPE OF SURFACE SEAL: 3' x 3' x 6" concrete pad

I.D. OF SURFACE CASING: ~~8~~

TYPE OF SURFACE CASING: steel

RISER PIPE I.D.: 2"

TYPE OF RISER PIPE: PVC SCH 40

BOREHOLE DIAMETER: ~8"

TYPE OF BACKFILL: 3/8" bentonite chips

ELEVATION/DEPTH TOP OF SEAL: 4.99', 1'

TYPE OF SEAL: 3/8" bentonite chips

DEPTH TOP OF SAND PACK: 2.99'/3'

ELEVATION/DEPTH TOP OF SCREEN: 1.99', 4'

TYPE OF SCREEN: PVC SCH 40

SLOT SIZE x LENGTH: 0.010 x 10'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: Silica sand 10/30

ELEVATION/DEPTH BOTTOM OF SCREEN: -8.01', -14'

ELEVATION/DEPTH BOTTOM OF SAND PACK: -8.01', 14'

BACKFILL MATERIAL BELOW SAND: none

ELEVATION/DEPTH OF HOLE: -8.01', 14'

ACAD: FORM_MWSU.dwg 07/20/99 INL

C 1 5987 — SEQUENCE NO. (MDE USE ONLY)

1 2 3 6 (THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT
FILL IN THIS FORM COMPLETELY
PLEASE TYPE

THIS REPORT MUST BE SUBMITTED WITHIN 45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER 34667

ST/CO USE ONLY DATE Received MM DD YY 8 13

DATE WELL COMPLETED MM DD YY 6 29 05 (15 20)

Depth of Well 22 14 26 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL" CH - 94 - 6600 (28 29 30 31 32 33 34 35 36 37)

OWNER (last name) Naval District Washington (first name)

STREET OR RFD Roach Road TOWN Indian Head, MD 20640

SUBDIVISION _____ SECTION _____ LOT _____

WELL LOG
Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
Fill	0	12	
~~Peat~~			
Peat	12	14	

NUMBER OF UNSUCCESSFUL WELLS: _____

WELL HYDROFRACTURED yes [Y] no [N]

CIRCLE APPROPRIATE LETTER
- A A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- E ELECTRIC LOG OBTAINED
- P TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS LIC. NO.: MGD 097 — Kathleen Lawrence
DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)

LIC. NO.: JGD 079 — Joseph Dettbarn Jr.
SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box) yes [Y] 44 no [N] 44

TYPE OF GROUTING MATERIAL (Circle one)

CEMENT [CM] 45 46 BENTONITE CLAY [BC] 45 46

NO. OF BAGS 2 NO. OF POUNDS 100

GALLONS OF WATER 16

DEPTH OF GROUT SEAL (to nearest foot)

from 0 (48 TOP 52) ft. to 3 (54 BOTTOM 58) ft.

(enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below

[ST] STEEL [CO] CONCRETE [PL] PLASTIC [OT] OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)!	Total depth of main casing (nearest foot)
PL (60 61)	2 (63 64)	4 (66 70)

OTHER CASING (if used) — EACH CASING

diameter inch	depth (feet) from	to

SCREEN RECORD
screen type or open hole — insert appropriate code below

[ST] STEEL [BR] BRASS BRONZE [HO] OPEN HOLE [PL] PLASTIC [OT] OTHER

C 2 — DEPTH (nearest ft.)

EACH SCREEN

1	PL (8 9)	4 to 14 (11 15 / 17 21)	
2	(23 24)	(26 30 / 32 36)	
3	(38 39)	(41 45 / 47 51)	

SLOT SIZE 1 010 2 _____ 3 _____

DIAMETER OF SCREEN 2 (56 60) (NEAREST INCH)

GRAVEL PACK IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68: from 3 to 14 (68)

MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)

T (E.R.O.S.) W Q

70 TELESCOPE CASING — 72 LOG INDICATOR — 74 75 76 OTHER DATA

C 3 — PUMPING TEST
HOURS PUMPED (nearest hour) _____ (8 9)

PUMPING RATE (gal. per min.) _____ (11 15)

METHOD USED TO MEASURE PUMPING RATE _____

WATER LEVEL (distance from land surface)

BEFORE PUMPING _____ (17 20) ft.

WHEN PUMPING _____ (22 25) ft.

TYPE OF PUMP USED (for test)

[A] air (27) [P] piston (27) [T] turbine (27)
[C] centrifugal (27) [R] rotary (27) [O] other (describe below) (27)
[J] jet (27) [S] submersible (27)

PUMP INSTALLED
DRILLER INSTALLED PUMP (CIRCLE) (YES or NO) YES NO

IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.

TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29. _____ (29)

CAPACITY: GALLONS PER MINUTE (to nearest gallon) _____ (31 35)

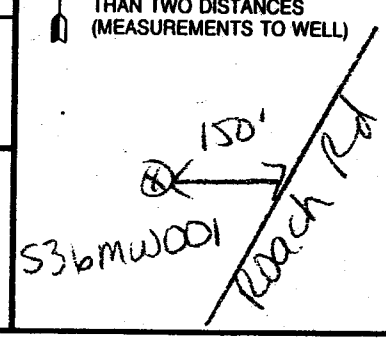
PUMP HORSE POWER _____ (37 41)

PUMP COLUMN LENGTH (nearest ft.) _____ (43 47)

CASING HEIGHT (circle appropriate box and enter casing height)

[+] above (49) / [–] below (49) LAND SURFACE _____ (50 51) (nearest foot)

LOCATION OF WELL ON LOT
SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND /OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)



DENV-CR00 SURVEY

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head SITE 36, CTO 0005
PROJECT NUMBER: 2144
DRILLING COMPANY: Talon Drilling
DRILLING RIG: ACKER TRAC MT

BORING No.: S36MW002
DATE: 6-28-05
GEOLOGIST: FRED W RAMSER
DRILLER: JOE D.

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole**	Driller BZ**
S-1 1515		38/12											
	2	10/10	0.2/2.0	?			GRAVEL + SAND	GW	DRY	0		0	
S-2 1519		12/10					NO RECOVERY						
	4	50/4"	0/2.0						SPOON REFUSAL	0		0	
S-3 1535		13/13		? (FILL)			WOOD BLACK		@ 3' DAMP SPOON				
	6	6/6	0.3/2.0				STAINED		WET SPOON WOOD FRAGS	0		0	
S-4 1540		4/4					CHARRED?		(FILL)				
	8	4/4	0.1/2.0				NO RECOVERY			0		0	
S-5 1545		3/3			VERY SOFT		RIVER MUD IN SHOR						
	10	3/3	1.8/2.0				8-10' RIVER MUD SILT + CLAY	PT	PEAT	0		0	
S-6 1600		5/1					PEAT		ABUNDANT WOOD FRAGS				
	12	4/10	0.3/2.0							0		0	
S-7 1615		9/8											
	14	4/4	1.5/2.0				GREENISH GREY SAND	SP		0		0	
							WELL SCREEN 4-14						
							SAND 3-14						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm): 0

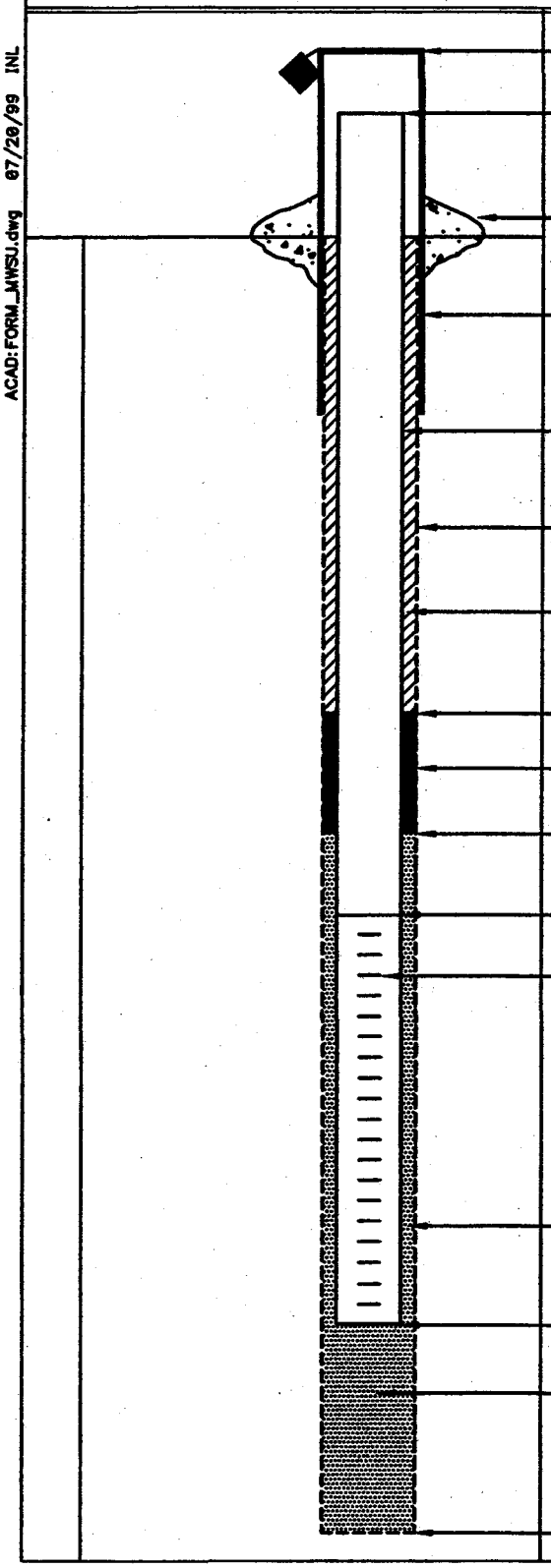
Converted to Well: Yes ✓ No _____ Well I.D. #: S36MW002

WELL NO.: S36MW002

Tetra Tech NUS, Inc.

OVERBURDEN MONITORING WELL SHEET STICK-UP

PROJECT SSP SITE 36	LOCATION Indian Head/Stump Neck	DRILLER Joe D.
PROJECT NO. 2144	BORING S36MW002	DRILLING METHOD HSA 4¼ ID
DATE BEGUN 6-28-05	DATE COMPLETED 6-28-05	
FIELD GEOLOGIST Fred W Ramser		DEVELOPMENT METHOD bailer + purge
GROUND ELEVATION 3.25'	DATUM NGVD 1929	



ELEVATION/HEIGHT OF TOP OF SURFACE CASING: 6.41', 3.16'

ELEVATION/HEIGHT OF TOP OF RISER PIPE: 5.84', 2.59'

TYPE OF SURFACE SEAL: 3' x 3' x 6" concrete pad

I.D. OF SURFACE CASING:

TYPE OF SURFACE CASING: Steel

RISER PIPE I.D.: 2"

TYPE OF RISER PIPE: PVC SCH 40

BOREHOLE DIAMETER: ~ 8"

TYPE OF BACKFILL: 3/8" Bentonite Chips

ELEVATION/DEPTH TOP OF SEAL: 2.25', 1'

TYPE OF SEAL: 3/8" Bentonite Chips

DEPTH TOP OF SAND PACK: 0.25'/3'

ELEVATION/DEPTH TOP OF SCREEN: -0.75', 4'

TYPE OF SCREEN: PVC SCH 40

SLOT SIZE x LENGTH: 0.010 x 10'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: silica Sand 10/30

ELEVATION/DEPTH BOTTOM OF SCREEN: -10.75', 14'

ELEVATION/DEPTH BOTTOM OF SAND PACK: -10.75', 14'

BACKFILL MATERIAL BELOW SAND: none

ELEVATION/DEPTH OF HOLE: -10.75', 14'

ACAD:FORM_MWSU.dwg 07/20/99 INL

C 1 5986 — SEQUENCE NO. (MDE USE ONLY)

1 2 3 6 (THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT
FILL IN THIS FORM COMPLETELY
PLEASE TYPE

THIS REPORT MUST BE SUBMITTED WITHIN 45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER 34667

ST/CO USE ONLY — DATE Received MM DD YY (8–13)

DATE WELL COMPLETED MM DD YY: 6 28 05 (15–20)

Depth of Well (22–26): 14 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL": CH - 94 - 6598 (28–37)

OWNER: Naval District Washington (last name / first name)

STREET OR RFD: Roach Road — TOWN: Indian Head, MD 20640

SUBDIVISION: ____ SECTION: ____ LOT: ____

WELL LOG
Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
Fill	0	12	
Peat	12	14	

NUMBER OF UNSUCCESSFUL WELLS: ____

WELL HYDROFRACTURED: yes [Y] no [N]

CIRCLE APPROPRIATE LETTER
- A — A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- E — ELECTRIC LOG OBTAINED
- P — TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS LIC. NO.: M6 D097

DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION): Stephen Jaworski

LIC. NO.: J6 D079

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee): Joseph Dutton

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box) (44): yes [Y] no [N]

TYPE OF GROUTING MATERIAL (Circle one): CEMENT [CM] (45–46) BENTONITE CLAY [BC] (45–46)

NO. OF BAGS: 2 NO. OF POUNDS: 188

GALLONS OF WATER: 6

DEPTH OF GROUT SEAL (to nearest foot): from 0 (48) TOP (52) ft. to 3 (54) BOTTOM (58) ft. (enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below: [ST] STEEL, [CO] CONCRETE, [PL] PLASTIC, [OT] OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)!	Total depth of main casing (nearest foot)
PL (60–61)	2 (63–64)	4 (66–70)

EACH CASING — OTHER CASING (if used)

diameter inch	depth (feet) from	to

SCREEN RECORD
screen type or open hole — insert appropriate code below: [ST] STEEL, [BR] BRASS BRONZE, [HO] OPEN HOLE, [PL] PLASTIC, [OT] OTHER

C 2

EACH SCREEN — DEPTH (nearest ft.)

1 PL (8–9) 4 (11–15) to 14 (17–21)

2 (23–24) (26–30) (32–36)

3 (38–39) (41–45) (47–51)

SLOT SIZE 1 00 2 ____ 3 ____

DIAMETER OF SCREEN 2 (56–60) (NEAREST INCH)

GRAVEL PACK IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68: from 3 to 14 (68)

MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)

T (70) (E.R.O.S.) (72) W Q (74 75 76)

TELESCOPE CASING — LOG INDICATOR — OTHER DATA

C 3

PUMPING TEST
HOURS PUMPED (nearest hour) (6–9)

PUMPING RATE (gal. per min.) (11–15)

METHOD USED TO MEASURE PUMPING RATE

WATER LEVEL (distance from land surface)

BEFORE PUMPING (17–20) ft.

WHEN PUMPING (22–25) ft.

TYPE OF PUMP USED (for test) (27)
- [A] air
- [P] piston
- [T] turbine
- [C] centrifugal
- [R] rotary
- [O] other (describe below)
- [J] jet
- [S] submersible

PUMP INSTALLED
DRILLER INSTALLED PUMP (CIRCLE) (YES or NO): YES NO

IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.

TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29. (29)

CAPACITY: GALLONS PER MINUTE (to nearest gallon) (31–35)

PUMP HORSE POWER (37–41)

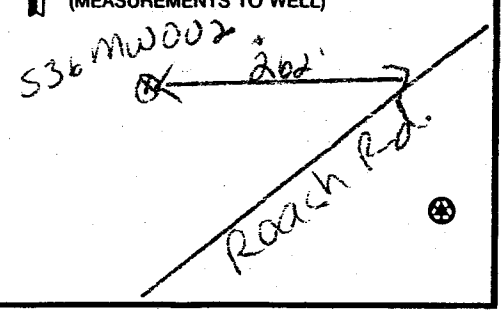
PUMP COLUMN LENGTH (nearest ft.) (43–47)

CASING HEIGHT (circle appropriate box and enter casing height)
- [+] above (49)
- [–] below (49)

LAND SURFACE (nearest foot) (50–51)

LOCATION OF WELL ON LOT
SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND /OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)

N



DENV-CR00 SURVEY

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head SITE 36, CTO 0005
PROJECT NUMBER: 2144
DRILLING COMPANY: Talon Drilling
DRILLING RIG: ACKER TRAC MT.

BORING No.: S36MW003
DATE: 6-28-05
GEOLOGIST: FRED W RAMSER
DRILLER: JOE D.

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole**	Driller BZ**
S-1 807		4/4				DK BRN	SANDY LOAM		TOP SOIL				
	2	14/20	1.5/2.0			YEL BRN	SILT + CLAY			0		0	
S-2 812		20/70				↓	SANDY CLAY		SLIGHT	0		0	
	4	88/48	2.0/2.0				↓ f-g SAND		MOTTLING				
S-3 825		15/37				DK GREENISH GREY			MOIST @ 4'				
					DENSE		CLAYEY SAND TR SILT		BLK WOOD FRAG				
	6	27/45	1.8/2.0	▽		↓	↓ f-g SAND		MOIST				
S-4 835		45/35		▽			AS ABOVE		(NO WOOD				
	8	60/62	1.8/2.0				WET		FRAGS)				
S-5 850		35/30					AS ABOVE						
	10	28/35	2.0/2.0			↓	SAND CONTENT ING DOWNWARD						
S-6 900		15/18					AS ABOVE		2" CLAY LAYER				
	12	38/30	2.0/2.0				f-g SAND + SILT + CLAY		@ 11'				
S-7 909		36/36					CLAY LAYER		MOIST				
	14	40/40	2.0/2.0		↓		↓ 4" @ 13' bgs		TO WET				
S-8 915		14/18					AS ABOVE		(POOR DRAINING				
	16	22/22	2.0/2.0		↓		SAND STRINGER MOTTLED (WET)		SOIL) LOOKS				
							OVER DRILLED		DRY TO MOIST SAND STRINGERS				
	18						TO 18'		ARE WET. PULLED AUGERS				
									LET STAND MEASURED H2O				
									@ 11'				
							INSTALL WELL						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 0

Remarks: SPL w/ 2" SPLIT SPOONS BY 2'
SAND PACK: FILPRO BRAND, US SILICA CO, BERKELEY SPRINGS

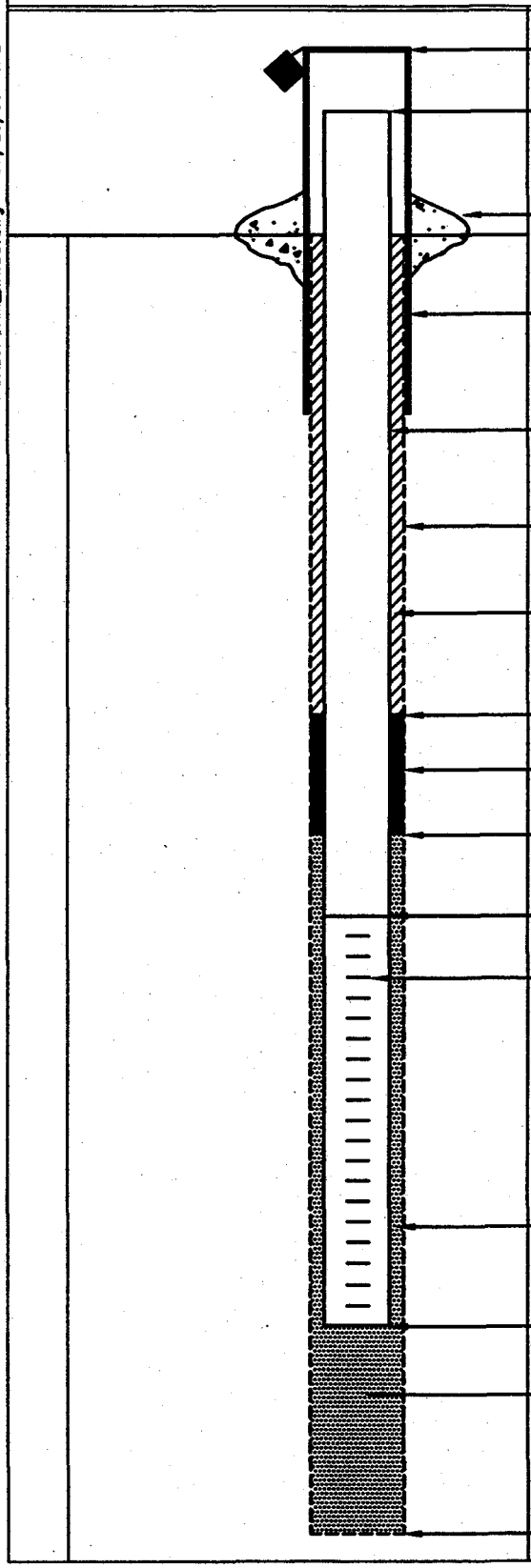
Converted to Well: Yes ✓ No _____ Well I.D. #: S36MW003

WELL NO.: S36MW003

Tetra Tech NUS, Inc.

OVERBURDEN MONITORING WELL SHEET STICK-UP

PROJECT SSP SITE 36	LOCATION INDIAN HEAD STUMP NECK	DRILLER Joe D.
PROJECT NO. 2144	BORING S36MW003	DRILLING METHOD HSA 4 1/4 ID
DATE BEGUN 6-28-05	DATE COMPLETED 6-28-05	
FIELD GEOLOGIST FRED W RAMSER		DEVELOPMENT METHOD bailer + purge
GROUND ELEVATION 11.77'	DATUM NGVD 1929	



ELEVATION/HEIGHT OF TOP OF SURFACE CASING: 14.69' / 2.92'

ELEVATION/HEIGHT OF TOP OF RISER PIPE: 13.76' / 1.99'

TYPE OF SURFACE SEAL: 3' x 3' x 6" concrete pad

I.D. OF SURFACE CASING:

TYPE OF SURFACE CASING: steel

RISER PIPE I.D.: 2"

TYPE OF RISER PIPE: ~~O.D.~~ PVC SCH 40

BOREHOLE DIAMETER: ~8"

TYPE OF BACKFILL: BENTONITE 3/8" CHIPS

ELEVATION/DEPTH TOP OF SEAL: 7.77' / 4'

TYPE OF SEAL: BENTONITE 3/8" CHIPS

DEPTH TOP OF SAND PACK: 5.77' / 6'

ELEVATION/DEPTH TOP OF SCREEN: 3.77' / 8'

TYPE OF SCREEN: PVC SCH 40

SLOT SIZE x LENGTH: 0.010 x 10'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: SILICA SAND 10/30

ELEVATION/DEPTH BOTTOM OF SCREEN: -6.23' / 18'

ELEVATION/DEPTH BOTTOM OF SAND PACK: -6.23' / 18'

BACKFILL MATERIAL BELOW SAND: NONE

ELEVATION/DEPTH OF HOLE: -6.23' / 18'

ACAD:FORM_MWSU.dwg 07/20/99 INL

C 1 5988 — SEQUENCE NO. (MDE USE ONLY)

1 2 3 6 (THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT
FILL IN THIS FORM COMPLETELY
PLEASE TYPE

THIS REPORT MUST BE SUBMITTED WITHIN 45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER 34467

ST/CO USE ONLY DATE Received MM DD YY (8–13)

DATE WELL COMPLETED MM DD YY: 6 26 05 (15–20)

Depth of Well (22–26): 18 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL": CH - 94 - 6601 (28–37)

OWNER: Naval District Washington

STREET OR RFD: Roach Road (last name / first name) TOWN: Indian Head, MD 20640

SUBDIVISION: SECTION: LOT:

WELL LOG
Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
Fine silt	0	12	
Clay with silt	12	18	

NUMBER OF UNSUCCESSFUL WELLS: —

WELL HYDROFRACTURED: yes [Y] no [N]

CIRCLE APPROPRIATE LETTER
- A — A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- E — ELECTRIC LOG OBTAINED
- P — TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS LIC. NO.: MGD097

Jeffrey Jankowski
DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)

LIC. NO.: JGD079

Joseph Nathan
SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box) yes [Y] (44) no [N] (44)

TYPE OF GROUTING MATERIAL (Circle one): CEMENT [CM] (45–46) BENTONITE CLAY [BC] (45–46)

NO. OF BAGS: 4 NO. OF POUNDS: 376

GALLONS OF WATER: 32

DEPTH OF GROUT SEAL (to nearest foot) from 0 (48) ft. TOP (52) to 6 (54) ft. BOTTOM (58) (enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below

[ST] STEEL [CO] CONCRETE [PL] PLASTIC [OT] OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)!	Total depth of main casing (nearest foot)
PL (60–61)	2 (63–64)	8 (66–70)

EACH CASING — OTHER CASING (if used)

diameter inch	depth (feet) from	to

SCREEN RECORD
screen type or open hole insert appropriate code below

[ST] STEEL [BR] BRASS BRONZE [HO] OPEN HOLE [PL] PLASTIC [OT] OTHER

C 2 (1–2)

EACH SCREEN — DEPTH (nearest ft.)

1 PL 8 (8–9) to 18 (11–15) (17–21)

2 (23–24) (26–30) (32–36)

3 (38–39) (41–45) (47–51)

SLOT SIZE 1 010 2 — 3 —

DIAMETER OF SCREEN 2 (56–60) (NEAREST INCH)

	from	to
GRAVEL PACK IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68	6	18

68

MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)

T (70) (E.R.O.S.) (72) W Q (74 75 76)

TELESCOPE CASING — LOG INDICATOR — OTHER DATA

C 3 (1–2)

PUMPING TEST
HOURS PUMPED (nearest hour) (8–9)

PUMPING RATE (gal. per min.) (11–15)

METHOD USED TO MEASURE PUMPING RATE

WATER LEVEL (distance from land surface)

BEFORE PUMPING (17–20) ft.

WHEN PUMPING (22–25) ft.

TYPE OF PUMP USED (for test)

[A] air (27) [P] piston (27) [T] turbine (27)
[C] centrifugal (27) [R] rotary (27) [O] other (describe below) (27)
[J] jet (27) [S] submersible (27)

PUMP INSTALLED
DRILLER INSTALLED PUMP (CIRCLE) (YES or NO) YES NO

IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.

TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29. (29)

CAPACITY: GALLONS PER MINUTE (to nearest gallon) (31–35)

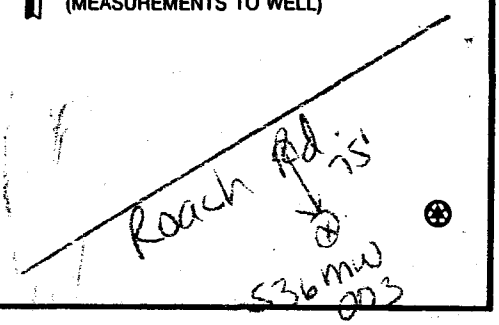
PUMP HORSE POWER (37–41)

PUMP COLUMN LENGTH (nearest ft.) (43–47)

CASING HEIGHT (circle appropriate box and enter casing height)
[+] (49) above LAND SURFACE
[–] (49) below
(50–51) (nearest) foot)

LOCATION OF WELL ON LOT
SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND /OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)

N



DENV-CR00 SURVEY

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: SSP Investigation Site 36
Project No.: CTO 0005 JOB # N2144

[x] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: S36SS0010001
Sample Location: S36SS001
Sampled By: CD
C.O.C. No.: 4320

Type of Sample:
[x] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 15 6-28-05 Time: 1500 Method: TROWELL Monitor Reading (ppm):	0-6"	YEL BRN	SAND, SILT TR GRAVEL DRY

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TCL Volatiles	3 x EnCore x2	✓	
TCL Semi-Volatiles	1 x 4oz glass x2	✓	
Explosives	1 x 4oz glass x2	✓	
Nitrocellulose, NitroQu and Nitrogly	~~1x 4oz glass~~		
Total TAL Metals plus Hexavalent Chromium + CN	1 x ~~4oz~~ glass 8oz x2	✓	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD ✓

Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: SSP Investigation Site 36
Project No.: CTO 0005 JOB # N2144

[x] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: S36SS0020001
Sample Location: S36SS002
Sampled By: FR
C.O.C. No.: 4321

Type of Sample:
[x] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6/29/05 Time: 1600 Method: disposable trowel Monitor Reading (ppm): —	0" – 6"	yellow to brown	sand and gravel, trace silt and organics, damp

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TCL Volatiles	6 ~~3~~ x EnCore	✓	
TCL Semi-Volatiles	2 ~~1~~ x 4oz glass	✓	
Explosives	2 ~~1~~ x 4oz glass	✓	
Nitrocellulose, NitroQu and Nitrogly	~~1 x 4oz glass~~		
Total TAL Metals plus Hexavalent Chromium, CN	2 ~~1~~ x ~~4oz~~ glass 8oz	✓	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD: —

Duplicate ID No.: S36SS DUP0101

Signature(s): [signature]

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: SSP Investigation Site 36
Project No.: CTO 0005 JOB # N2144

[x] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: S36SS0030001
Sample Location: S36SS003
Sampled By: CD
C.O.C. No.: 4320

Type of Sample:
[x] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6-28-05 Time: 1600 Method: TROWEL Monitor Reading (ppm): —	0-6"	YEL BRN	SAND, SILT + GRAVEL DRY

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TCL Volatiles	3 x EnCore	✓	
TCL Semi-Volatiles	1 x 4oz glass	✓	
Explosives	1 x 4oz glass	✓	
Nitrocellulose, NitroQu and Nitrogly	~~1 x 4oz glass~~		
Total TAL Metals plus Hexavalent Chromium	1 x ~~4oz~~ glass 8oz	✓	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD —

Duplicate ID No.: —

Signature(s): Colin Deaton

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: SSP Investigation Site 36
Project No.: CTO 0005 JOB # N2144

[x] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: S36SS0040001
Sample Location: S36SS004
Sampled By: CD
C.O.C. No.: 4320

Type of Sample:
[x] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6-28-05 Time: 1520 Method: TROWEL Monitor Reading (ppm): —	0-6"	YEL BRN	SAND, SILT TR GRAVEL DRY

COMPOSITE SAMPLE DATA:

	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date:				
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TCL Volatiles	3 x EnCore	✓	
TCL Semi-Volatiles	1 x 4oz glass	✓	
Explosives	1 x 4oz glass	✓	
Nitrocellulose, NitroQu and Nitrogly	~~1 x 4oz glass~~		
Total TAL Metals plus Hexavalent Chromium +CN	1 x ~~4oz~~ glass 8oz	✓	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: SSP Investigation Site 36
Project No.: CTO 0005 JOB # N2144

[x] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: S36SS0050001
Sample Location: S36SS005
Sampled By: FR
C.O.C. No.: 4321

Type of Sample:
[x] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 6/29/05
Time: 1630
Method: disposable trowel
Monitor Reading (ppm): —

Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
0" - 6"	yellow to brown	sand and gravel, trace silt and organic, damp.

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TCL Volatiles	3 x EnCore	✓	
TCL Semi-Volatiles	1 x 4oz glass	✓	
Explosives	1 x 4oz glass	✓	
Nitrocellulose, NitroQu and Nitrogly	~~1 x 4oz glass~~		
Total TAL Metals plus Hexavalent Chromium, CN	1 x ~~4oz~~ glass 8oz	✓	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD —

Duplicate ID No.: —

Signature(s): [signature]

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: SSP Investigation Site 36
Project No.: CTO 0005 JOB # N2144

[x] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: S36SS0060001
Sample Location: S36SS006
Sampled By: CD
C.O.C. No.: 4320

Type of Sample:
[x] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6-28-05 Time: 1730 Method: TROWEL Monitor Reading (ppm): —	0-6"	YEL BRN	SAND, SILT + GRAVEL

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TCL Volatiles	3 x EnCore	✓	
TCL Semi-Volatiles	1 x 4oz glass	✓	
Explosives	1 x 4oz glass	✓	
Nitrocellulose, NitroQu and Nitrogly	~~1 x 4oz glass~~		
Total TAL Metals plus Hexavalent Chromium	1 x ~~4oz~~ glass 8oz	✓	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD —

Duplicate ID No.: —

Signature(s): [signature]

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: SSP Investigation Site 36
Project No.: CTO 0005 JOB # N2144

[] Domestic Well Data
[x] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: S36MW~~0020~~101 (001)
Sample Location: S36MW~~002~~ 001
Sampled By: C Doolan
C.O.C. No.: 4328
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/l	ORP mV	TDS
Date: 7/28/05								
Time: 1135								
Method: peristaltic	Clear	6.27	1.26	19.09	7.2	0.00	-103	—

PURGE DATA:

	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	TDS
Date: 7/28/05								
Method: peristaltic			See	purge	sheet			
Monitor Reading (ppm): —								
Well Casing Diameter & Material								
Type: 2" PVC								
Total Well Depth (TD): 17.54'								
Static Water Level (WL): 7.01								
One Casing Volume(gal/L): 10.55'								
Start Purge (hrs): 1030								
End Purge (hrs): 1130								
Total Purge Time (min): 60								
Total Vol. Purged (gal/L): 15.90								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL Volatiles	HCL	2 ~~3~~ x 40 ml vial	✓
TCL Semi-Volatiles	4°C	2 x 1l amb glass	✓
Explosives	4°C	3 ~~2~~ x 1l amb glass	✓
~~Nitrocellulose, NitroQu and Nitrogly~~	~~4°C~~	~~2 x 1l amb glass~~	
Total TAL Metals ~~plus Hexavalent Chromium~~	HNO_3	1 x ~~500~~ ml hdpe 250	✓
Dissolved TAL Metals ~~plus Hexavalent Chromium~~	HNO_3	1 x ~~500~~ ml hdpe 250	no
Hexavalent Chrome	4°C	1X 250 ml hdpe	✓
Cyanide	NaOH	1X 250 ml hdpe	✓

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
yes	S36MWDUP0101

Signature(s): Chris Doolan

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: SSP Investigation Site 36
PROJECT NUMBER: CTO 005 Job# N2144

WELL ID.: S36MW001
DATE: 7/28/05

Time (Hrs.)	Water Level (Ft. below TOC)		Flow (mL/Min.)	pH (S.U.)	Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celsius)	ORP (mV)	Comments
1030	7.01	Volume(L)	—	—	—	—	—	—	—	start purge; clear
1040	7.10	3.40	340	6.23	1.33	3.0	10.10	19.00	-102	clear
1050	7.13	5.90	250	6.28	1.31	1.8	4.96	19.10	-106	clear
1100	7.15	8.40	250	6.28	1.32	1.9	1.57	19.30	-105	clear
1110	7.16	10.90	250	6.27	1.31	4.4	0.21	18.94	-104	clear
1120	7.17	13.40	250	6.27	1.29	0.95	0.00	19.11	-103	clear
1125	7.18	14.65	250	6.27	1.27	4.2	0.00	19.12	-103	clear
1130	7.19	15.90	250	6.27	1.26	7.2	0.00	19.09	-103	clear; end purge
1135	—	—	—	—	—	—	—	—	—	Start sample

SIGNATURE(S): [illegible]

Tetra Tech NUS, Inc.

MONITORING WELL DEVELOPMENT RECORD

Well: 536MW001
Site: 36
Date Installed: 6/28/05
Date Developed: 7/12, 7/13
Dev. Method: Bailer/Pump
Pump Type: 12v Whale

Depth to Bottom (ft.): 17.54 TOC
Static Water Level Before (ft.): 6.6
Static Water Level After (ft.): —
Screen Length (ft.): 10
Specific Capacity: —
Casing ID (in.): 2"

Responsible Personnel: CONT.
Drilling Co.: Talon
Project Name: Indian Head SITE 36, CTO 005
Project Number: 2144

	Time	Estimated Sediment Thickness (Ft.)	Cumulative Water Volume (Gal.)	Water Level Readings (Ft. below TOC)	Temperature (Degrees C)	pH	Specific Conductance (Units ____) mS/cm	Turbidity (NTU) HDR/LaMotte	Remarks (odor, color, etc.)
7/12	1000	< 2"							No Parameters during bailing
	1010	—	2						Bailer (S.S) To Remove Sed.
	1020	—	4						Gr Brn - Turbid
	1030	—	6						" "
	1040	—	8						" "
	1050	—	10						" "
7/13	1413	0	—	6.6	—	—	—	—	Start Whale Pump
	1418	—	10	—	19.66	6.03	1.18	336/320	~2 GPM Org odor
	1428	—	30	—	19.15	5.89	0.98	367/310	Brn - Turbid "
	1438	—	50	—	17.73	6.00	1.05	—/450	Brn - V. Turbid Became more turbid.
	1448	—	70	—	19.00	6.20	.949	106/100	LT BN - SL " → Clear
	1458	—	90	—	18.95	6.28	.926	58/55	
	1508	—	110	—	18.94	6.23	.907	40/70	CLEAR Org Odor.

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: SSP Investigation Site 36
Project No.: CTO 0005 JOB # N2144

[] Domestic Well Data
[x] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: S36MW~~0010~~101 002
Sample Location: S36MW~~001~~ 002
Sampled By: T. Rojahn
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 7/28/05	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	TDS
Time: 1530	Visual	Standard	mS/cm	°C	NTU	mg/l	mV	
Method: peristaltic	CLEAR	6.31	1.06	19.69	8.3	7.84	-99	—

PURGE DATA:

Date: 7/28/05	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	TDS
Method: peristaltic			see	purge	sheet			
Monitor Reading (ppm): —								
Well Casing Diameter & Material Type: 2" PVC								
Total Well Depth (TD): 17.3'								
Static Water Level (WL): 4.61								
One Casing Volume(gal/L): 7.8								
Start Purge (hrs): 1350								
End Purge (hrs): 1525								
Total Purge Time (min): 95								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL Volatiles	HCL	2 ~~3~~ x 40 ml vial	YES
TCL Semi-Volatiles	4°C	2 x 1l amb glass	↓
Explosives	4°C	3 ~~2~~ x 1l amb glass	↓
~~Nitrocellulose, NitroQu and Nitrogly~~	~~4°C~~	~~2 x 1l amb glass~~	—
Total TAL Metals ~~plus Hexavalent Chromium~~	HNO_3	1 x ~~500~~ ml hdpe 250	YES
Dissolved TAL Metals ~~plus Hexavalent Chromium~~	HNO_3	1 x ~~500~~ ml hdpe 250	NO
Hexavalent Chrome	4°C	1 x 250 ml hdpe	YES
Cyanide	NaOH	1 x 250 ml hdpe	YES

OBSERVATIONS / NOTES:

Circle If Applicable:

MS/MSD

Duplicate ID No.:

Signature(s): Terry Rojahn

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: SSP Investigation Site 36
PROJECT NUMBER: CTO 005 JOB# N2144
WELL ID.: S36MW002
DATE: 7/28/05

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celsius)	ORP (mV)	Comments
1350	4.61	—	—	—	—	—	—	—	Start DEV.
1400	4.91	170	6.30	0.993	10	1.09	19.67	-112	1700 CLEAR
1410	4.94	130	6.34	1.12	12	3.49	19.15	-113	3000 "
1420	4.96	130	6.35	1.11	10	6.64	19.68	-112	4300 "
1430	4.98	130	6.36	1.11	7.3	7.43	19.22	-110	5600 "
1440	4.98	130	6.35	1.09	11	7.74	19.37	-106	6900 "
1450	5.00	130	6.33	1.07	12	7.88	19.48	-104	8200 "
1500	5.01	130	6.33	1.07	7.0	7.89	19.59	-102	9500 "
1510	5.01	130	6.32	1.06	9.8	7.85	19.59	-101	10800 "
1520	5.01	130	6.32	1.06	9.5	7.90	19.57	-100	12100 "
1525	5.01	130	6.31	1.06	8.3	7.84	19.69	-99	12750 "
1530	—	—	—	—	—	—	—	—	SAMPLE TIME

SIGNATURE(S): Tony Rogal

Tetra Tech NUS, Inc.

MONITORING WELL DEVELOPMENT RECORD

Well: S36SW002
Site: 36
Date Installed: 6/28/05
Date Developed: 7/12 - 7-13
Dev. Method: Bailer & pump
Pump Type: 12 v. Whale

Depth to Bottom (ft.): 17.3 (TPVC)
Static Water Level Before (ft.): 4.4±
Static Water Level After (ft.):
Screen Length (ft.): 10
Specific Capacity: —
Casing ID (in.): 2"

Responsible Personnel: C. Doolan
Drilling Co.: Talon
Project Name: SSP Site 36 stump neck
Project Number: 3144

	Time	Estimated Sediment Thickness (Ft.)	Cumulative Water Volume (Gal.)	Water Level Readings (Ft. below TOC)	Temperature (Degrees C)	pH	Specific Conductance (Units mS/cm)	Turbidity (NTU)	Remarks (odor, color, etc.)
7/12	1015	~ .3	~ 4	—	—	—	—	—	Surged + bailed ~4 gal
7/13	1539	—	—	4.4±	—	—	—	—	for 30 min, light grey
	1549	—	20	—	22.22	5.96	.432	957/700	7/12/05
	1559	—	40	—	21.04	5.58	.388	390/500	LT BRN - Turbid slight sulfur ODOR
	1609	—	55	—	20.83	5.78	.378	252/340	" " "
	1619	—	70	—	20.83	5.98	.375	164/220	" "
	1629	—	85	—	20.79	5.95	.375	130/140	CLEAR
	1639	—	100	—	20.96	5.99	.372	111/140	"
									≈ 2 gpm
									↓
									1.5 gpm.

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: SSP Investigation Site 36
Project No.: CTO 0005 JOB # N2144

[] Domestic Well Data
[x] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: S36MW0030101
Sample Location: S36MW003
Sampled By: T. ROJAHN
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 7/28/05	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	TDS
Time: 1220	Visual	Standard	mS/cm	°C	NTU	mg/l	mV	
Method: SAME	CLEAR	5.62	0.134	16.95	6.9	2.15	260	—

PURGE DATA:

Date: 7/28/05	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	TDS
Method: Peristaltic								
Monitor Reading (ppm): —								
Well Casing Diameter & Material								
Type: 2" Ø PVC								
Total Well Depth (TD): 20.18		SEE	Low	Flow	Data	SHEET		
Static Water Level (WL): 11.55								
One Casing Volume(gal/L): 5.3								
Start Purge (hrs): 10.15								
End Purge (hrs): 1215								
Total Purge Time (min): 120								
Total Vol. Purged (gal/L): 11.1								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL Volatiles	HCL	2 ~~3~~ x 40 ml vial	YES
TCL Semi-Volatiles	4°C	2 x 1l amb glass	↓
Explosives	4°C	3 ~~2~~ x 1l amb glass	
~~Nitrocellulose, NitroQu and Nitrogly~~	~~4°C~~	~~2 x 1l amb glass~~	—
Total TAL Metals ~~plus Hexavalent Chromium~~	HNO_3	1 x ~~500~~ ml hdpe 250 ml (Hg)	YES
Dissolved TAL Metals plus Hexavalent Chromium	HNO_3	1 x ~~500~~ 250 ml hdpe	NO
CYANIDE	4°C/NaOH	1 x 250 ml HDPE	YES
HEX. CHROMIUM	4°C	1 x 250 ml HDPE	YES

OBSERVATIONS / NOTES:

20.18
−11.55
8.63 x 0.163 = 1.4 gal or 5.3 L
Pump Intake @ 15'
Min. Vol = 10.6 L

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): [signature]

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: INDIAN HEAD
PROJECT NUMBER: 2144

WELL ID.: S36MW003
DATE: 7/28/05

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celsius)	ORP (mV)	Comments
1015	11.55	—	—	—	—	—	—	—	Start Purge
1025	11.90	140	5.88	0.182	4.5	4.00	17.06	298	1400 CLEAR
1035	12.01	90	5.90	0.187	3.9	3.83	17.09	295	2300 "
1045	12.13	100	5.91	0.189	3.4	3.91	17.05	294	3300 "
1055	12.24	100	5.89	0.181	5.7	3.86	16.86	294	4300 "
1105	12.31	90	5.84	0.168	9.5	3.41	16.81	292	5200 "
1115	12.40	110	5.77	0.159	10	2.97	16.77	288	6300 "
1125	12.42	70	5.70	0.147	9.8	2.52	17.49	281	7000 "
1135	12.44	75	5.72	0.148	9.9	2.59	16.96	276	7750 "
1145	12.47	80	5.65	0.138	9.8	2.48	17.02	271	8550 "
1155	12.51	80	5.61	0.133	8.3	2.37	16.91	267	9350 "
1205	12.54	90	5.68	0.141	7.8	2.28	16.81	262	10250 "
1210	12.56	80	5.61	0.136	7.2	2.12	16.96	262	10650 "
1215	12.56	80	5.62	0.134	6.9	2.15	16.95	260	11050 "
1220	—	—	—	—	—	—	—	—	Sample Time

SIGNATURE(S): Terry Rajeh

Tetra Tech NUS, Inc.

MONITORING WELL DEVELOPMENT RECORD

Well: S36SW003
Site: 36
Date Installed: 6/28/05
Date Developed: 7/12, 7/13
Dev. Method: bailer + pump
Pump Type: 12v whale

Depth to Bottom (ft.): 20.18
Static Water Level Before (ft.): 11.20
Static Water Level After (ft.): —
Screen Length (ft.): 10
Specific Capacity: —
Casing ID (in.): 2"

Responsible Personnel: C. Doolan
Drilling Co.: Talon
Project Name: SSP Site 36 Stump neck
Project Number: 2144

	Time	Estimated Sediment Thickness (Ft.)	Cumulative Water Volume (Gal.)	Water Level Readings (Ft. below TOC)	Temperature (Degrees C)	pH	Specific Conductance (Units mS/cm)	Turbidity (NTU) V22/Lamotte	Remarks (odor, color, etc.)
7/12	1100	< .1	~ 4.5	—	—	—	—	—	Surged + bailed ~ 4.5 gal for 25 min, light brown 7/12/05
7/13	1705	—	—	11.20	—	—	—	—	
	1715	—	8	—	19.28	6.08	.167	—/—	Went Dry @ 5 mins Put valve on - to slow down rate
	1725	—	10	—	18.47	5.44	.099	—/—	Lt Brn - Turbid.
	1735	—	12	—	18.90	5.01	.088	—/—	LT tan Brn - Turbid
	1745	—	14	—	19.67*	4.93	.083	881/850	" " " "
	1755	—	16	—	20.26	5.12	.080	646/600	" " "
	1805	—	18	—	19.85	5.43	.080	524/500	" " "
	1815	—	20	—	19.94	5.37	.078	/370	" " "
									* Due to strain on pump. - ?
									≈ 0.2 gpm water level near bottom - just above pump

Tetra Tech NUS, Inc.

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: Indian Head SITE 36, CTO 000 5
Project No.: JOB #N2144

[x] Stream
[] Spring
[] Pond
[] Lake
[] Other:
[] QA Sample Type:

Sample ID No.: S36SW0010101
Sample Location: S36SW001
Sampled By: C. DOUN
C.O.C. No.: 4322

Type of Sample:
[x] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Salinity %	Other ~~NA~~ ORP
Date: 7/20/05 Time: 0950 Depth: SURFACE Method: DIRECT COLLECT	clear	6.56	0.331	28.27	2.8	6.30	N/A	78

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL Volatiles	HCL	4 ~~2~~ x 40 ml vial	✓
TCL Semi-Volatiles	4°C	2 ~~1~~ x 1l amb glass	✓
Explosives	4°C	6 ~~3~~ ~~2~~ x 1l amb glass	✓
~~Nitrocellulose, NitroQu and Nitrogly~~	~~4°C~~	~~2 x 1l amb glass~~	NO
Total TAL Metals ~~plus Hexavalent Chromium~~	HNO_3	2x250 ~~500~~ ml HDPE	✓
~~Dissolved TAL Metals plus Hexavalent Chromium~~	~~HNO_3~~	~~250 500 ml HDPE~~	NO
Hexavalent Chromium	4°C	2x 250ml HDPE	✓
CN	NaOH	2x 250 ml HDPE	✓

OBSERVATIONS / NOTES:

DUPLICATES COLLECTED

MAP:

Circle if Applicable:

MS/MSD —

Duplicate ID No.: S36SWDUP0101

Signature(s): Colin Jordan

Tetra Tech NUS, Inc.

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: Indian Head SITE 36, CTO 0005
Project No.: JOB #N2144

[x] Stream
[] Spring
[] Pond
[] Lake
[] Other:
[] QA Sample Type:

Sample ID No.: S36SW0020101
Sample Location: S36SW002
Sampled By: C. Doolan
C.O.C. No.: 4322

Type of Sample:
[x] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Salinity %	Other NA
Date: 7/20/05 Time: 1230 Depth: surface Method: direct fill	clear	6.86	0.251	28.95	5.2	5.57	—	—

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL Volatiles	HCL	2 ~~2~~x 40 ml vial	✓
TCL Semi-Volatiles	4°C	1 ~~2~~x 1l amb glass	✓
Explosives	4°C	3 ~~2~~x 1l amb glass	✓
~~Nitrocellulose, NitroQu and Nitrogly~~	~~4°C~~	~~2 x 1l amb glass~~	
Total TAL Metals ~~plus Hexavalent Chromium~~	HNO_3	250 ~~500~~ ml HDPE	✓
~~Dissolved TAL Metals plus Hexavalent Chromium~~	~~HNO_3~~	~~500 ml HDPE~~	
Hexavalent Chromium	4°C	250 ml HDPE	✓
CN	NaOH	250 ml HDPE	✓

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD —

Duplicate ID No.: —

Signature(s): [signature]

Tetra Tech NUS, Inc.

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: Indian Head SITE 36, CTO 000 5
Project No.: JOB #N2144

[x] Stream
[] Spring
[] Pond
[] Lake
[] Other:
[] QA Sample Type:

Sample ID No.: S36SW0030101
Sample Location: S36SW003
Sampled By: C. Doolan
C.O.C. No.: 4322

Type of Sample:
[x] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Salinity %	Other NA
Date: 7/20/05 Time: 1355 Depth: surface Method: direct fill	clear	6.50	0.263	28.15	8.2	3.75	—	—

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL Volatiles	HCL	2 ~~3~~ x 40 ml vial	✓
TCL Semi-Volatiles	4°C	1 ~~2~~ x 1l amb glass	✓
Explosives	4°C	3 ~~2~~ x 1l amb glass	✓
~~Nitrocellulose, NitroQu and Nitrogly~~	~~4°C~~	~~2 x 1l amb glass~~	
Total TAL Metals ~~plus Hexavalent Chromium~~	HNO_3	250 ~~500 ml~~ HDPE	✓
~~Dissolved TAL Metals plus Hexavalent Chromium~~	~~HNO_3~~	~~250 500 ml HDPE~~	
CN	NaOH	250 ml HDPE	✓
Hexavalent Chromium	4°C	250 ml HDPE	✓

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD —

Duplicate ID No.: —

Signature(s): Colin Doolan

Tetra Tech NUS, Inc.

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: Indian Head SITE 36, CTO 000 5
Project No.: JOB #N2144

[x] Stream
[] Spring
[] Pond
[] Lake
[] Other:
[] QA Sample Type:

Sample ID No.: S36SW0040101
Sample Location: S36SW004
Sampled By: C DOUN
C.O.C. No.: 4353

Type of Sample:
[x] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Salinity %	Other NA
Date: 7/20/05 Time: 0900 Depth: — Method: direct All	clear	6.35	0.310	27.89	1.6	8.38	—	—

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL Volatiles	HCL	2 ~~3~~ x 40 ml vial	✓
TCL Semi-Volatiles	4°C	1 ~~2~~ x 1l amb glass	✓
Explosives	4°C	3 ~~2~~ x 1l amb glass	✓
~~Nitrocellulose, NitroQu and Nitrogly~~	~~4°C~~	~~2 x 1l amb glass~~	
Total TAL Metals ~~plus Hexavalent Chromium~~	HNO_3	~~250~~ 500 ml HDPE	✓
~~Dissolved TAL Metals plus Hexavalent Chromium~~	HNO_3	~~250~~ ~~500~~ ml HDPE	
Hexavalent Chromium	4°C	250 ml HDPE	✓
CN	NaOH	250 ml HDPE	✓

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD —

Duplicate ID No.: —

Signature(s): [signature]

Tetra Tech NUS, Inc.

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: Indian Head SITE 36, CTO 0005
Project No.: JOB #N2144

[x] Stream
[] Spring
[] Pond
[] Lake
[] Other:
[] QA Sample Type:

Sample ID No.: S36SW0050101
Sample Location: S36SW005
Sampled By: C. Doolan
C.O.C. No.: 4322

Type of Sample:
[x] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Salinity %	Other NA
Date: 7/20/05 Time: 1520 Depth: surface Method: direct fill	clear	7.05	0.252	29.48	2.8	8.00	—	—

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL Volatiles	HCL	6 ~~3~~ x 40 ml vial	✓
TCL Semi-Volatiles	4°C	3 ~~2~~ x 1l amb glass	✓
Explosives	4°C	9 ~~2~~ x 1l amb glass	✓
~~Nitrocellulose, NitroGu and Nitrogly~~	~~4°C~~	~~2 x 1l amb glass~~	
Total TAL Metals ~~plus Hexavalent Chromium~~	HNO_3	3 x ~~500~~ ml HDPE 250 ml	✓
~~Dissolved TAL Metals plus Hexavalent Chromium~~	~~HNO_3~~	~~500 ml HDPE~~	
Hexavalent Chromium	4°C	3X 250 ml HDPE	✓
CN	NaOH	3X 250 ml HDPE	✓

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD: yes

Duplicate ID No.:

Signature(s): [signature]

Tetra Tech NUS, Inc.

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: Indian Head SITE 36, CTO 0005
Project No.: JOB #N2144

[x] Stream
[] Spring
[] Pond
[] Lake
[] Other:
[] QA Sample Type:

Sample ID No.: S36SW0060101
Sample Location: S36SW006
Sampled By: C. Doolan
C.O.C. No.: 4353

Type of Sample:
[x] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Salinity %	Other NA
Date: 7/21/05 Time: 0930 Depth: surface Method: direct fill	clear	6.58	0.283	26.95	5.5	3.22	—	—

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL Volatiles	HCL	2 ~~3~~ x 40 ml vial	✓
TCL Semi-Volatiles	4°C	1 ~~2~~ x 1l amb glass	✓
Explosives	4°C	3 ~~2~~ x 1l amb glass	✓
~~Nitrocellulose, NitroQu and Nitrogly~~	~~4°C~~	~~2 x 1l amb glass~~	
Total TAL Metals ~~plus Hexavalent Chromium~~	HNO_3	250 ~~500~~ ml HDPE	✓
~~Dissolved TAL Metals plus Hexavalent Chromium~~	~~HNO_3~~	~~500 ml HDPE~~	
Hexavalent Chromium	4°C	250 ml HDPE	✓
CN	NaOH	250 ml HDPE	✓

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Colin Doolan

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: SSP Investigation Site 36
Project No.: CTO 0005 JOB # N2144

[] Surface Soil
[] Subsurface Soil
[x] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: S36SD0010001
Sample Location: S36SD001
Sampled By: D. WESTERHOFF
C.O.C. No.: 4323

Type of Sample:
[x] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 7/20/05 Time: 1000 Method: DIRECT COLLECT Monitor Reading (ppm): —	0"-3"	LT/MED BROWN W/ GREY @ >1"	SANDY SILT, SATURATED. DEBRIS IN AREA (CERAMIC PIPE?, METAL, FARM EQUIP) VEGETATION

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TCL Volatiles	3 x EnCore	✓	
TCL Semi-Volatiles	1 x 4oz glass	✓	
Explosives	1 x 4oz glass	✓	
Nitrocellulose, NitroQu and Nitrogly	~~1 x 4oz glass~~		
Total TAL Metals plus Hexavalent Chromium + CN	1 x 8oz glass	✓	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): D. Westerhoff

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: SSP Investigation Site 36
Project No.: CTO 0005 JOB # N2144

[] Surface Soil
[] Subsurface Soil
[x] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: S36SD0020001
Sample Location: S36SD002
Sampled By: C. Doolan
C.O.C. No.: 4323

Type of Sample:
[x] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 7/20/05 Time: 1220 Method: disposable trowel Monitor Reading (ppm): —	0"-6"	dark brown	silty fine sand, some coarse sand abundant organics and pebbles, wet to saturated

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TCL Volatiles	~~6~~ 8 x EnCore	✓	
TCL Semi-Volatiles	~~2~~ 1 x 4oz glass	✓	
Explosives	~~2~~ 1 x 4oz glass	✓	
~~Nitrocellulose, NitroGu and Nitrogly~~	~~1 x 4oz glass~~		
Total TAL Metals plus Hexavalent Chromium + CN	~~2 1 x 4oz~~ glass 8oz	✓	

OBSERVATIONS / NOTES:

MAP:

Circle If Applicable:

MS/MSD	Duplicate ID No.:
yes	

Signature(s): Colin Doolan

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: SSP Investigation Site 36
Project No.: CTO 0005 JOB # N2144

[] Surface Soil
[] Subsurface Soil
[x] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: S36SD0030001
Sample Location: S36SD003
Sampled By: C. Doolan
C.O.C. No.: 4323

Type of Sample:
[x] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 7/20/05 Time: 1345 Method: disposable trowel Monitor Reading (ppm): —	0" - 6"	very dk. brown	Silt and clay, trace sand, abundant organic material, wet to saturated

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TCL Volatiles	3 x EnCore	✓	
TCL Semi-Volatiles	1 x 4oz glass	✓	
Explosives	1 x 4oz glass	✓	
~~Nitrocellulose, NitroGu and Nitrogly~~	~~1 x 4oz glass~~		
Total TAL Metals plus Hexavalent Chromium + CN	1 x ~~4oz~~ glass 8oz	✓	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: SSP Investigation Site 36
Project No.: CTO 0005 JOB # N2144

[] Surface Soil
[] Subsurface Soil
[x] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: S36SD0040001
Sample Location: S36SD004
Sampled By: C. DOLIN
C.O.C. No.: 4323

Type of Sample:
[x] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 7/20/05 Time: 0915 Method: disposable trowel Monitor Reading (ppm): —	0"-6"	dark brown	silt, some sand and pebbles wet to saturated, abundant roots

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TCL Volatiles	3 x EnCore	✓	
TCL Semi-Volatiles	1 x 4oz glass	✓	
Explosives	1 x 4oz glass	✓	
~~Nitrocellulose, NitroQu and Nitrogly~~	~~1 x 4oz glass~~		
Total TAL Metals plus Hexavalent Chromium + CN	1 x ~~4oz~~ glass 8oz	✓	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s): [illegible]

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: SSP Investigation Site 36
Project No.: CTO 0005 JOB # N2144

[] Surface Soil
[] Subsurface Soil
[x] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: S36SD0050001
Sample Location: S36SD005
Sampled By: C. Doolan
C.O.C. No.: 4323

Type of Sample:
[x] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 7/20/05 Time: 1515 Method: disposable trowel Monitor Reading (ppm): —	0" - 6"	brown	Sandy silt and clay, some pebbles, abundant roots, wet

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TCL Volatiles	3 x EnCore	✓	
TCL Semi-Volatiles	1 x 4oz glass	✓	
Explosives	1 x 4oz glass	✓	
~~Nitrocellulose, NitroQu and Nitrogly~~	~~1 x 4oz glass~~		
Total TAL Metals plus Hexavalent Chromium + CN	1 x ~~4oz~~ glass 8 oz	✓	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: SSP Investigation Site 36
Project No.: CTO 0005 JOB # N2144

[] Surface Soil
[] Subsurface Soil
[x] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: S36SD0060001
Sample Location: S36SD006
Sampled By: C. Doolan
C.O.C. No.: 4353

Type of Sample:
[x] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 7/21/05 Time: 0940 Method: disposable trowel Monitor Reading (ppm): –	0"-6"	brown	silt and clay, some fine sand, abundant organic matter, trace pebble, wet to saturated.

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TCL Volatiles	3 x EnCore + 1x4oz glass	✓	
TCL Semi-Volatiles	2~~1~~x 4oz glass	✓	
Explosives	2~~1~~x 4oz glass	✓	
~~Nitrocellulose, NitroQu and Nitrogly~~	~~1x4oz glass~~		
Total TAL Metals plus Hexavalent Chromium + CN	2~~1~~x~~4oz~~ glass 8oz	✓	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	S36SDDUP0101

Signature(s): [signature]

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Page___ of ___

Project Site Name: NSF-IH Site 36 SSP Benthic Study
Project No.: 112GN2144

[] Surface Soil
[] Subsurface Soil
[X] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: S36SD0070102
Sample Location: S36SD007
Sampled By: FRED W RAUSER
C.O.C. No.: 4658 + 4659

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 4-11-07 Time: 1345 Method: Ponar Dredge Monitor Reading (ppm): 0.0	0-6"	BLK	ORGANIC MATL.

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
Macro-invertibrate	Plastic Bag	✓	
Inorganics/TOC/AVS/SEM	4 oz Glass Jar	✓	
Grain Size Analysis	16 oz Glass Jar	✓	
PAH	4 oz Glass Jar	✓	

OBSERVATIONS / NOTES:

MAP:

pH: 7.76
COND: 0.298 mS/cm
TURB = 18
DO = 11.55 mg/L
TEMP = 10.9°C
SAL = 0.01

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Fred W Rauser

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Page___ of ___

Project Site Name: NSF-IH Site 36 SSP Benthic Study
Project No.: 112GN2144

[] Surface Soil
[] Subsurface Soil
[X] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: S36SD0080102
Sample Location: S36SD008
Sampled By: FRED W. RAMSER
C.O.C. No.: 4658 + 4659

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 4-11-07 Time: 1310 Method: Ponar Dredge Monitor Reading (ppm): 0.0	0-6"	BLK	ORGANIC MATL. STICKS LEAVES + MUD

COMPOSITE SAMPLE DATA:

	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date:				
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
Macro-invertibrate	Plastic Bag	✓	
Inorganics/TOC/AVS/SEM	4 oz Glass Jar	✓	
Grain Size Analysis	16 oz Glass Jar	✓	
PAH	4 oz Glass Jar	✓	

OBSERVATIONS / NOTES:

MAP:

pH: 7.66
COND: 0.301 mS/cm
TURB: 21
DO = 11.25
TEMP = 10.6
SAL = 0.01%

Circle if Applicable:

MS/MSD —

Duplicate ID No.: —

Signature(s):

Fred W. Ramser

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Page___ of ___

Project Site Name: NSF-IH Site 36 SSP Benthic Study
Project No.: 112GN2144

[] Surface Soil
[] Subsurface Soil
[X] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: S36SD0090102
Sample Location: S36SD009
Sampled By: FRED W. RAMSER
C.O.C. No.: 4658 + 4659

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 4-11-07 Time: 1150 Method: Ponar Dredge Monitor Reading (ppm): 0.0	0-6"	BLK	ABUNDANT ORGANIC MATL, GRASS, STICKS, TR SILT/CLAY (MUD)

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
Macro-invertibrate	Plastic Bag	✓	
Inorganics/TOC/AVS/SEM	4 oz Glass Jar	✓	
Grain Size Analysis	16 oz Glass Jar	✓	
PAH	4 oz Glass Jar	✓	

OBSERVATIONS / NOTES:

MAP:

pH: 7.54
COND: .301 mS/cm
DO: 10.67 mg/l
TURB: 27
TEMP: 10.1°C
SAL: 0.01%

Circle if Applicable:

MS/MSD —

Duplicate ID No.: —

Signature(s): Fred W Ramser

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Page___ of ___

Project Site Name: NSF-IH Site 36 SSP Benthic Study
Project No.: 112GN2144

[] Surface Soil
[] Subsurface Soil
[X] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: S36SD0100102
Sample Location: S36SD010
Sampled By: RWC
C.O.C. No.: 4658 + 4659

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 4-11-07 Time: 1115 Method: Ponar Dredge Monitor Reading (ppm):	0-6"	BLK	SILT + CLAY ABUNDANT TRE g SAND ORGANIC MATL.

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
Macro-invertibrate	Plastic Bag	✓	
Inorganics/TOC/AVS/SEM	4 oz Glass Jar	✓	
Grain Size Analysis	16 oz Glass Jar	✓	
PAH	4 oz Glass Jar	✓	

OBSERVATIONS / NOTES:

MAP:

pH = 7.55
COND = 3.02 mS/cm
TURB = 27
DO = 10.57
TEMP = 9.8°C
SAL = 0.01%

Circle if Applicable:

MS/MSD —

Duplicate ID No.: —

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Page___ of ___

Project Site Name: NSF-IH Site 36 SSP Benthic Study
Project No.: 112GN2144

[] Surface Soil
[] Subsurface Soil
[X] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: S36SD0110102
Sample Location: S36SD011
Sampled By: F.W. RAMSER
C.O.C. No.: 4659 + 4658

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 4-11-07 Time: 1045 Method: Ponar Dredge Monitor Reading (ppm): 0.0	0-6"	BLK	ORGANIC MATL. STICKS LEAVES ETC.

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
Macro-invertibrate	Plastic Bag	✓	
Inorganics/TOC/AVS/SEM	4 oz Glass Jar	✓	
Grain Size Analysis	16 oz Glass Jar	✓	
PAH	4 oz Glass Jar	✓	

OBSERVATIONS / NOTES:

MAP:

pH: 7.55
COND: .305 mS/cm
TURB = 22
DO = 10.66
TEMP = 9.4°C
SAL = 0.01%

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Fred W Ramser

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Page___ of ___

Project Site Name: NSF-IH Site 36 SSP Benthic Study
Project No.: 112GN2144

[] Surface Soil
[] Subsurface Soil
[X] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: S36SD0120102
Sample Location: S36SD012
Sampled By: FW RAMSER
C.O.C. No.: 4658 + 4659

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 4-11-07 Time: 0955 Method: Ponar Dredge Monitor Reading (ppm):	0-6"	BLK	LEAVE, STICKS ORGANIC MATL. MUD

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
Macro-invertibrate	Plastic Bag	✓	
Inorganics/TOC/AVS/SEM	4 oz Glass Jar	✓	
Grain Size Analysis	16 oz Glass Jar	✓	
PAH	4 oz Glass Jar	✓	

OBSERVATIONS / NOTES:

MAP:

pH: 7.35
COND: 0.303 mS/cm
TURB: 20
DO: 10.10 mg/l
TEMP: 9.0 °C
SAL: 0.01 %

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	S36DUP010102

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Page___ of ___

Project Site Name: NSF-IH Site 36 SSP Benthic Study
Project No.: 112GN2144

[] Surface Soil
[] Subsurface Soil
[X] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: S36SD0130102
Sample Location: S36SD013
Sampled By: FWR
C.O.C. No.: 4658 + 4659

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 4-11-07 Time: 0910 Method: Ponar Dredge Monitor Reading (ppm): 0.0	0-6"	BLK	ABUNDANT LEAVES, WOOD MATL, TR MUD

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
Macro-invertibrate	Plastic Bag	SIEVED w/ 30 MESH	
Inorganics/TOC/AVS/SEM	4 oz Glass Jar	✓	
Grain Size Analysis	16 oz Glass Jar	✓	
PAH	4 oz Glass Jar	✓	

OBSERVATIONS / NOTES:

- LEAVE MATL, STICKS/TWIGS MANY BENTHIC ORGANISMS SEEN. 6 TO 8 OZ MATL.
- COLLECTED THREE ALIQUOTS FOR MACRO-INVERTIBRATE ANALYSIS
- WATER DEPTH @ ~2'

MAP:

pH: 6.85
COND: 0.310 mS/cm
TURB: 23
DO: 9.18 mg/l
TEMP: 8.5 °C
SAL: 0.0

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Page___ of ___

Project Site Name: NSF-IH Site 36 SSP Benthic Study
Project No.: 112GN2144

[] Surface Soil
[] Subsurface Soil
[X] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: S36SD0140102
Sample Location: S36SD014
Sampled By: FWR
C.O.C. No.: 4657 4656

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 4-12-07 Time: 1000 Method: Ponar Dredge Monitor Reading (ppm): 0.0	0-6"	BLK	ORGANIC MATL: LEAVES, STICKS, ETC.

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
Macro-invertibrate	Plastic Bag	✓	
Inorganics/TOC/AVS/SEM	4 oz Glass Jar	✓MS/MSD	
Grain Size Analysis	16 oz Glass Jar	✓	
PAH	4 oz Glass Jar	✓MS/MSD	

OBSERVATIONS / NOTES:

DOUBLE VOL FOR MS/MSD

MAP:

PH: 7.50
COND: 0.256 mS/cm
TURB: 13
DO: 9.44
TEMP: 9.8
SAL: 0.00

Circle if Applicable:

MS/MSD ✓

Duplicate ID No.: —

Signature(s):

Fred W Rouse

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Page___ of ___

Project Site Name: NSF-IH Site 36 SSP Benthic Study
Project No.: 112GN2144

[] Surface Soil
[] Subsurface Soil
[X] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: S36SD0150102
Sample Location: S36SD015
Sampled By: FW RAMSER
C.O.C. No.: 4657
4656

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 4-12-07 Time: 1030 Method: Ponar Dredge Monitor Reading (ppm): 0.0	0-6"	BLK	ORGANIC MATL STICK/STEMS/GRASS/TR MUD

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
Macro-invertibrate	Plastic Bag	✓	
Inorganics/TOC/AVS/SEM	4 oz Glass Jar	✓	
Grain Size Analysis	16 oz Glass Jar	✓	
PAH	4 oz Glass Jar	✓	

OBSERVATIONS / NOTES:

MAP:

PH = 7.39
COND = .219 mS/cm
TURB = 19
DO = 9.82
TEMP = 10.0
SAL = 0.00

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Fred W Ramser

Tetra Tech NUS, Inc.

~~SURFACE~~ Pore WATER SAMPLE LOG SHEET

Project Site Name: Indian Head SITE 36, CTO 0005
Project No.: JOB #N2144

[x] Stream
[] Spring
[] Pond
[] Lake
[X] Other: Pore water
[] QA Sample Type:

Sample ID No.: S36PW0010101
Sample Location: S36PW001
Sampled By: D. WESTERHOFF
C.O.C. No.: 4353

Type of Sample:
[x] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 7/21/05
Time: 0920
Depth: ~2'
Method: PERISTALTIC

Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Salinity %	Other NA
CLEAR	6.02	.733	24.70	60 (1)	9.54	-	-

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL Volatiles	HCL	4 ~~2~~ ~~3~~ x 40 ml vial	✓
TCL Semi-Volatiles	4°C	2 ~~1~~ ~~2~~ x 1l amb glass	✓
Explosives	4°C	6 ~~3~~ ~~2~~ x 1l amb glass	✓
~~Nitrocellulose, NitroQu and Nitrogly~~	4°C	2 x 1l amb glass	N/A
Total TAL Metals ~~plus Hexavalent Chromium~~	HNO_3	2x ~~250~~ ~~500~~ ml HDPE	✓
Dissolved TAL Metals ~~plus Hexavalent Chromium~~	HNO_3	2 x ~~250~~ ~~500~~ ml HDPE	✓
Cr^{+6}	4°C	2x 250ml HDPE	✓
CN	NaOH / 4°C	2x " " "	✓

OBSERVATIONS / NOTES:

(1)

DUPLICATE PARAMETERS @ 1/2 WAY POINT OF SAMPLING (DUPLICATE)

pH - 6.03
SC. - .614
TEMP. - 24.07
TURB. - 8.8
DO - 9.63

MAP:

Circle if Applicable:

MS/MSD

Duplicate ID No.: S36PWDUP0101

Signature(s):

Tetra Tech NUS, Inc.

~~SURFACE~~ Pore WATER SAMPLE LOG SHEET

Project Site Name: Indian Head SITE 36, CTO 0005
Project No.: JOB #N2144

[x] Stream
[] Spring
[] Pond
[] Lake
[X] Other: Pore water
[] QA Sample Type:

Sample ID No.: S36PW0020101
Sample Location: S36PW002
Sampled By: D. WESTERHOFF
C.O.C. No.: 4353

Type of Sample:
[x] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Salinity %	Other NA
Date: 7/21/05								
Time: 1130								
Depth: ~ 2'								
Method: PERISTALTIC	CLEAR	6.40	1.38	25.35	55	3.64	-	-135

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL Volatiles	HCL	2 ~~3~~ x 40 ml vial	✓
TCL Semi-Volatiles	4°C	1 ~~2~~ x 1l amb glass	✓
Explosives	4°C	3 ~~2~~ x 1l amb glass	✓
~~Nitrocellulose, NitroQu and Nitrogly~~	~~4°C~~	~~2 x 1l amb glass~~	NA
Total TAL Metals plus ~~Hexavalent Chromium~~	HNO_3	250 ~~500~~ ml HDPE	✓
Dissolved TAL Metals plus ~~Hexavalent Chromium~~	HNO_3	250 ~~500~~ ml HDPE	✓
Cr^{+6}	4°C	250 ml HDPE	✓
CN	NaOH/4°C	250 ml HDPE	✓

OBSERVATIONS / NOTES:

PARAMETERS @ MIDWAY PT.

pH - 6.50
S.C - 1.27
D.O - 4.79
TEMP - 25.94
TURB - 30 NTU

MAP:

Circle if Applicable:

MS/MSD —

Duplicate ID No.: —

Signature(s):

Tetra Tech NUS, Inc.

~~SURFACE~~ Pore WATER SAMPLE LOG SHEET

Project Site Name: Indian Head SITE 36, CTO 0005
Project No.: JOB #N2144

[x] Stream
[] Spring
[] Pond
[] Lake
[X] Other: Pore water
[] QA Sample Type:

Sample ID No.: S36PW0030101
Sample Location: S36PW003
Sampled By: D. WESTERHOFF
C.O.C. No.: 4322

Type of Sample:
[x] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Salinity %	Other NA
Date: 7/20/05 Time: 1350 Depth: ~2' Method: PERISTALTIC	CLEAR	6.44	0.563	26.48	65	4.71	N/A	—

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL Volatiles	HCL	3 x 40 ml vial	✓
TCL Semi-Volatiles	4°C	1 ~~2~~ x 1l amb glass	✓
Explosives	4°C	3 ~~2~~ x 1l amb glass	✓
~~Nitrocellulose, NitroGu and Nitrogly~~	~~4°C~~	~~2 x 1l amb glass~~	N/A
Total TAL Metals ~~plus Hexavalent Chromium~~	HNO_3	500 ml HDPE	✓
Dissolved TAL Metals plus Hexavalent Chromium	HNO_3	500 ml HDPE	✓
Cr+6	4°C	250 ml HDPE	✓

OBSERVATIONS / NOTES:

CAPACITY ~ 2.5 LITERS, SAMPLED DRY @ 1405, RESUMED SAMPLING @ 1440 ~ DRY AT 1455 (2.5 l)

MAP:

Circle if Applicable:

MS/MSD ✓

Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

~~SURFACE~~ Pore WATER SAMPLE LOG SHEET

Project Site Name:
Project No.:

[] Stream
[] Spring
[] Pond
[] Lake
[] Other:
[] QA Sample Type:

Sample ID No.: S36PW0040101
Sample Location: S36PW004
Sampled By: D. WOESTHOFF
C.O.C. No.: 4322

Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 7/20/05	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Salinity %	Other NA
Time: 0910								
Depth: ~ 2'	CLEAR	7.02	0.673	26.44	26	9.05	—	—
Method: PERISTALTIC PUMP								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL Volatiles	HCL	2 x 40 ml vial	✓
TCL Semi-Volatiles	4°C	1 x 1l amb glass	✓
Explosives	4°C	3 x 1l amb glass	✓
Total TAL Metals	HNO_3	250 ml HDPE	✓
Dissolved TAL Metals	HNO_3	250 ml HDPE	
Hexavalent Chromium	4°C	250 ml HDPE	✓
CN	NaOH	250 ml HDPE	✓

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

CHAIN OF CUSTODY FORMS

TETRA TECH NUS, INC. | CHAIN OF CUSTODY | NUMBER 4328 | PAGE 1 OF 1

PROJECT NO:	FACILITY:	PROJECT MANAGER	PHONE NUMBER	LABORATORY NAME AND CONTACT:
2144 CTO 005	Indian Head	Kim Turnbull	412-921-7090	MITKEM Corp., Ben Dodge
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER	PHONE NUMBER	ADDRESS
Colin Doolan		Colin Doolan	412-921-7090	175 Metro Central Blvd.
		CARRIER/WAYBILL NUMBER		CITY, STATE
		Fed Ex 8447 8135 6910		Warwick, RI 02886

STANDARD TAT ☒
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

CONTAINER TYPE PLASTIC (P) or GLASS (G): G G G P P P P

PRESERVATIVE USED: HCl | None | None | HNO_3 | HNO_3 | None | NaOH

DATE YEAR 2005	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	TCL Volatiles	TCL Semi-Volatiles	Explosives	Total TAL Metals	Dissolved TAL Metals	Hexavalent Chrome	Cyanide	COMMENTS
7/27	1650	S38MW0040102D	—	—	—	GW	G	~~10~~ 9	2	2	3	1	~~1~~ —	—	1	
7/28	0740	S38MW0020102	—	—	—	GW	G	9	2	2	3	1	—	—	1	
7/28	0750	S38MW0010102	—	—	—	GW	G	10	2	2	3	1	—	1	1	
7/28	0750	S38MW0010102-F	—	—	—	GW	G	1	—	—	—	—	1	—	—	
7/27	1650	S38MW0040102D-F	—	—	—	GW	G	1	—	—	—	—	1	—	—	
7/28	1000	S38MW0020102	—	—	—	GW	G	1	—	—	—	—	—	1	—	
7/28	1135	S36MW0010101	—	—	—	GW	G	30	6	6	9	3	—	3	3	Run MS/MSD
7/28	1220	S36MW0030101	—	—	—	GW	G	10	2	2	3	1	—	1	1	
7/28	1530	S36MW0020101	—	—	—	GW	G	10	2	2	3	1	—	1	1	
7/28	0000	S36MWDUP0101	—	—	—	GW	G	10	2	2	3	1	—	1	1	DUP of S36MW0010101
7/28	1500	S36TB0040001	—	—	—	QA	QA	1	1							

1. RELINQUISHED BY	DATE	TIME	1. RECEIVED BY	DATE	TIME
Colin Doolan	7/28/05	1830	Fed Ex		
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY	DATE	TIME

COMMENTS

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TtNUS-001

TETRA TECH NUS, INC. | CHAIN OF CUSTODY | NUMBER 4353 | PAGE 1 OF 1

PROJECT NO: 2144 CTO 005	FACILITY: Indian Head	PROJECT MANAGER: Kirk Turnbull	PHONE NUMBER: 412-921-7090	LABORATORY NAME AND CONTACT: MITKEM Corp., Ben Dodge
SAMPLERS (SIGNATURE): Colin Doolan		FIELD OPERATIONS LEADER: Colin Doolan	PHONE NUMBER: 412-921-7090	ADDRESS: 175 Metro Central Blvd
		CARRIER/WAYBILL NUMBER: FedEx		CITY, STATE: Warwick, RI 02886

STANDARD TAT ☒
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

CONTAINER TYPE PLASTIC (P) or GLASS (G): SD=P SW=G; G G P P G P P

PRESERVATIVE USED: SD=None SW=HCL; None; None; HNO_3; HNO_3; None; None; NaOH

DATE YEAR 2005	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	TCL Volatiles	TCL Semi-Volatiles	Explosives	Total TAL Metals	Dissolved TAL Metals	Total TAL Metals, Hex Chromium	Hex Chromium	CN	COMMENTS
7/21	0920	S36PW0010101	—	—	—	W	G	10	2	1	3	1	1	—	1	1	
7/21	0930	S36SW0060101	—	—	—	SW	G	9	2	1	3	1	—	—	1	1	
7/21	0940	S36SD0060001	—	—	—	SD	G	6	3	1	1	—	—	1	—	—	
7/21	1130	S36PW0020101	—	—	—	W	G	10	2	1	3	1	1	—	1	1	
7/21	0000	S36PWDUP0101	—	—	—	W	G	10	2	1	3	1	1	—	1	1	DUP of PW0010101
7/21	0000	S36SDDUP0101	—	—	—	SD	G	4	1*	1	1	—	—	1	—	—	* 4 oz glass jar used for Volatiles
7/21	1130	S36RB0020001	—	—	—	QA	QA	9	2	1	3	1	—	—	1	1	↑ DUP of SD0060001
7/21	1205	S36TB0030001	—	—	—	QA	QA	1	1								

1. RELINQUISHED BY: Colin Doolan	DATE: 7/21/05	TIME: 1420	1. RECEIVED BY: FED-EX	DATE / TIME
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE / TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY	DATE / TIME

COMMENTS

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TtNUS-001

TETRA TECH NUS, INC. CHAIN OF CUSTODY NUMBER 4322 PAGE 1 OF 2

PROJECT NO: 2144 CTO 005	FACILITY: Indian Head	PROJECT MANAGER Kim Turnbull	PHONE NUMBER 412-921-7090	LABORATORY NAME AND CONTACT: MITKEM Corp., Ben Dodge
SAMPLERS (SIGNATURE) Colin Doolan, Dale Wolfe		FIELD OPERATIONS LEADER Colin Doolan	PHONE NUMBER 412-921-7090	ADDRESS 175 METRO CENTRAL BLVD.
		CARRIER/WAYBILL NUMBER Fed Ex 8169 3433 6757		CITY, STATE Warwick, RI 02886

STANDARD TAT ☒
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

DATE YEAR 2005	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	TCL Volatiles	TCL Semi-Volatiles	Explosives	Total TAL Metals	Dissolved TAL Metals	Hexavalent Chrome	CN	COMMENTS
CONTAINER TYPE PLASTIC (P) or GLASS (G)									G	G	G	P	P	P	P	
PRESERVATIVE USED									HCl	none	none	HNO3	HNO3	none	NaOH	
7/20	0900	S36SW0040101	—	—	—	SW	G	9	2	1	3	1	—	1	1	
7/20	0910	S36PW0040101	—	—	—	W	G	10	2	1	3	1	1	1	1	
7/20	0950	S36SW0010101	—	—	—	SW	G	9	2	1	3	1	—	1	1	
7/20	1230	S36SW0020101	—	—	—	SW	G	9	2	1	3	1	—	1	1	
7/20	1350	S36PW0030101	—	—	—	W	G	10	2	1	3	1	1	1	1	
7/20	1355	S36SW0030101	—	—	—	SW	G	9	2	1	3	1	—	1	1	
7/20	1520	S36SW0050101	—	—	—	SW	G	27	6	3	9	3	—	3	3	do MS/MSD
7/20	0000	S36SWDUP0101	—	—	—	SW	G	9	2	1	3	1	—	1	1	DUP of S36SW0010101
7/20	1615	S36TB0030001	—	—	—	QA	QA	1	1							

1. RELINQUISHED BY Colin Doolan	DATE 7/20/05	TIME 1800	1. RECEIVED BY Fed Ex	DATE	TIME
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY	DATE	TIME

COMMENTS

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TtNUS-001

TETRA TECH NUS, INC. | CHAIN OF CUSTODY | NUMBER 4323 | PAGE 2 OF 2

PROJECT NO: 2144 CTO 005	FACILITY: Indian Head	PROJECT MANAGER: Kim Turnbull	PHONE NUMBER: 412-921-7090
LABORATORY NAME AND CONTACT: MITKEM Corp., Ben Dodge			
SAMPLERS (SIGNATURE): Colin Doolan		FIELD OPERATIONS LEADER: Colin Doolan	PHONE NUMBER: 412-921-7090
ADDRESS: 175 Metro Central Blvd.			
CARRIER/WAYBILL NUMBER: Fed Ex 8169 3433 6757		CITY, STATE: Warwick, RI 02886	

STANDARD TAT ☒
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

CONTAINER TYPE PLASTIC (P) or GLASS (G): P G G G

PRESERVATIVE USED: none none none none

DATE YEAR 2005	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	TCL Volatiles	TCL Semi-Volatiles	Explosives	Total TAL Metals, Hex. Chrome, CN					COMMENTS
7/20	0915	S365D0040001	—	—	—	SD	G	6	3	1	1	1					
7/20	1000	S365D0010001	—	—	—	SD	G	6	3	1	1	1					
7/20	1220	S365D0020001	—	—	—	SD	G	12	6	2	2	2					do MS/MSD
7/20	1345	S365D0030001	—	—	—	SD	G	6	3	1	1	1					
7/20	1515	S365D0050001	—	—	—	SD	G	6	3	1	1	1					

1. RELINQUISHED BY: Colin Doolan	DATE: 7/20/05	TIME: 1800	1. RECEIVED BY: Fed Ex	DATE	TIME
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY	DATE	TIME

COMMENTS:

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TtNUS-001

TETRA TECH NUS, INC. | CHAIN OF CUSTODY | NUMBER 4321 | PAGE 1 OF 1

PROJECT NO:	FACILITY:	PROJECT MANAGER	PHONE NUMBER	LABORATORY NAME AND CONTACT:
2144 CTO 005	Indian Head	Kim Turnbull	412-921-7090	MITKEM Corp. Ben Dodge
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER	PHONE NUMBER	ADDRESS
Fred Ramser		Fred Ramser	412-921-8838	175 Metro Central Blvd.
		CARRIER/WAYBILL NUMBER		CITY, STATE
		Fed Ex 8492 7852 5297		Warwick RI 02886

STANDARD TAT ☒
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

CONTAINER TYPE PLASTIC (P) or GLASS (G)
PRESERVATIVE USED

DATE YEAR 2005	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	TCL VOA (*HCl)	TCL S-VOA (None)	Explosives (None)	TAL Metals (HNO3 **)	Hex Chrom (None)	CN* (None)			COMMENTS
6/29	1600	S36SS0020001	—	—	—	SO	G	6	✓	✓	✓	✓	✓	✓			
6/29	1630	S36SS0050001	—	—	—	SO	G	6	✓	✓	✓	✓	✓	✓			
6/29	1710	S36RB0010001	—	—	—	QA	QA	8	✓	✓	✓	✓	✓	✓			
6/29	0000	S36SSDUP0101	—	—	—	SO	G	6	✓	✓	✓	✓	✓	✓			DUP of SS0020001
6/29	1400	S36TB0020001	—	—	—	QA	FROM LAB	1	✓								

1. RELINQUISHED BY	DATE	TIME	1. RECEIVED BY	DATE	TIME
Fred Ramser	6/29/05	1900	Fed Ex		
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY	DATE	TIME

COMMENTS * Please preserve upon receipt ** No preservative for soils

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TtNUS-001

TETRA TECH NUS, INC. | CHAIN OF CUSTODY | NUMBER 4320 | PAGE ___ OF ___

PROJECT NO: Z144 CTO 005	FACILITY: INDIAN HEAD	PROJECT MANAGER: KIM TURNBULL	PHONE NUMBER: 412-921-7090
SAMPLERS (SIGNATURE): [signature]		FIELD OPERATIONS LEADER: FRED W RAMSER	PHONE NUMBER: 412-921-8838
		CARRIER/WAYBILL NUMBER: FEDEX # 8492 7852 5301	

LABORATORY NAME AND CONTACT: MITKEM CORP, BEN PORCE
ADDRESS: 175 METRO CENTRAL BLVD
CITY, STATE: WARWICK RI 02886

STANDARD TAT [X]
RUSH TAT [ ]
[ ] 24 hr. [ ] 48 hr. [ ] 72 hr. [ ] 7 day [ ] 14 day

DATE YEAR 2005	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	TCL VOA	TCL S-VOA	EKP	TAL METALS	HEX CHROM	CN			COMMENTS
CONTAINER TYPE PLASTIC (P) or GLASS (G)									G	G	G	G	G	G			
PRESERVATIVE USED																	
6/28	1500	S36SS0010001	—	—	—	SO	G	12	✓	✓	✓	✓	✓	✓			RUN MS/MSD
6/28	1520	S36SS0040001	—	—	—	SO	G	6	✓	✓	✓	✓	✓	✓			
6/28	1600	S36SS0030001	—	—	—	SO	G	6	✓	✓	✓	✓	✓	✓			
6/28	1730	S36SS0060001	—	—	—	SO	G	6	✓	✓	✓	✓	✓	✓			DUP of SS001001
6/28	1400	S36TB0010001	—	—	—	QA	FROM CNO	81	✓								

1. RELINQUISHED BY: [signature]	DATE: 6-28-05	TIME: 1900	1. RECEIVED BY	DATE	TIME
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY	DATE	TIME

COMMENTS

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TtNUS-001

TETRA TECH NUS, INC.

CHAIN OF CUSTODY

NUMBER 4659

PAGE ____ OF _____

PROJECT NO:	FACILITY:	PROJECT MANAGER	PHONE NUMBER	LABORATORY NAME AND CONTACT: 615-207-9918
1126N2144	INDIAN HEAD	GEORGE LATUSPE	412-921-7090	MARCIA McGINNITY, EMPIRICAL LAB
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER	PHONE NUMBER	ADDRESS
Fred W Ramser		FRED W. RAMSER	412-921-8838	227 FRENCH LANDING DR, SUITE 550
		CARRIER/WAYBILL NUMBER		CITY, STATE
		FED EX 8545 6732 9139		NASHVILLE, TN 37228

STANDARD TAT ☐
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

CONTAINER TYPE PLASTIC (P) or GLASS (G): 4oz G, 4oz G, 16oz G, 1L Amb

PRESERVATIVE USED: 4°C, 4°C, 4°C, 4°, HNO3 4°C, NaOH 4°C, H2SO4 4°C

DATE YEAR 2007	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	TYPE OF ANALYSIS: PAH/AVS/SEM	INORGANICS + TOC (TAL METALS, CN, PAH)	G.S.D	PAH LOW CONC	TAL METALS + AVS SEM	CYANIDE	TOC 9060	COMMENTS
4/11	0955	S36SD012 0102	S36SD012	0	6"	SD	G	3	1	1	1					
	0910	S36SD013 0102	S36SD013	0	6"	SD	G	3	1	1	1					
	1045	S36SD011 0102	S36SD011	0	6"	SD	G	3	1	1	1					
	1115	S36SD010 0102	S36SD010	0	6"	SD	G	3	1	1	1					
	1150	S36SD009 0102	S36SD009	0	6"	SD	G	3	1	1	1					
	1310	S36SD008 0102	S36SD008	0	6"	SD	G	3	1	1	1					
	1345	S36SD007 0102	S36SD007	0	6"	SD	G	3	1	1	1					
	0000	S36DUP01 0102	DUP	0	6"	SD	G	3	1	1	1					COLLECTED @ S36SD012 0102
	1600	S36RB001 0102	–	–	–	QC	G	5				2	1	1	1	

1. RELINQUISHED BY	DATE 4-11-07	TIME 1000	1. RECEIVED BY FEDEX	DATE	TIME
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY	DATE	TIME

COMMENTS: AVS/SEM Analysis should be conducted from bottle labeled PAHs – PAHs can be analyzed from metals bottle

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TtNUS-001

TETRA TECH NUS, INC.

CHAIN OF CUSTODY | NUMBER 4658 | PAGE ____ OF _____

PROJECT NO: 112GN2144	FACILITY: INDIANHEAD	PROJECT MANAGER GEORGE LATULIPPE	PHONE NUMBER 412-921-7090	LABORATORY NAME AND CONTACT: WENDELL P. PENNINGTON & ASSOC.
SAMPLERS (SIGNATURE) Fred W Ramser		FIELD OPERATIONS LEADER FRED W RAMSER	PHONE NUMBER 412-921-8838	ADDRESS 570 EAST 10th STREET
		CARRIER/WAYBILL NUMBER FED EX 8545 6732 9140		CITY, STATE COOKEVILLE, TN 38501

STANDARD TAT ☒
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

CONTAINER TYPE PLASTIC (P) or GLASS (G): P

PRESERVATIVE USED: 4°C

TYPE OF ANALYSIS: MACRO-INVERTEBRATE ANALYSIS

DATE YEAR 2007	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	MACRO-INVERTEBRATE ANALYSIS								COMMENTS
4/11	0955	S36SD0120102	S36SD012	0	-6"	SD	C	1	✓								
	0910	S36SD0130102	S36SD013	0	6"	SD	C	1	✓								
	1045	S36SD0110102	S36SD011	0	6"	SD	C	1	✓								
	1115	S36SD0100102	S36SD010	0	6"	SD	C	1	✓								
	1150	S36SD0090102	S36SD009	0	6"	SD	C	1	✓								
	1310	S36SD0080102	S36SD008	0	6"	SD	C	1	✓								
4/11	1345	S36SD0070102	S36SD007	0	6"	SD	C	1	✓								

1. RELINQUISHED BY Fred W Ramser	DATE 4-11-07	TIME 1800	1. RECEIVED BY FED EX	DATE	TIME
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY	DATE	TIME

COMMENTS

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TtNUS-001

TETRA TECH NUS, INC. CHAIN OF CUSTODY | NUMBER 4656 | PAGE ___ OF ___

PROJECT NO:	FACILITY:	PROJECT MANAGER	PHONE NUMBER	LABORATORY NAME AND CONTACT:
112GN2144	INDIAN HEAD	GEORGE LATULIPPE	412-921-7090	WENDELL P. PENNINGTON & ASSOC.
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER	PHONE NUMBER	ADDRESS
Fred W Ramser		FRED W RAMSER	412-921-8838	570 EAST 10TH ST.
		CARRIER/WAYBILL NUMBER		CITY, STATE
		FEDEX 8545 6732 9231		COOKEVILLE, TN 38501

STANDARD TAT ☒
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

CONTAINER TYPE PLASTIC (P) or GLASS (G): P
PRESERVATIVE USED: 4°C

DATE YEAR 2007	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	TYPE OF ANALYSIS: MACRO-INVERTEBRATE ANALYSIS	COMMENTS
4/12	1000	S36SD0140102	S36SD014	0"	6"	SD	C	1	✓	
4/12	1030	S36SD0150102	S36SD015	0"	6"	SD	C	1	✓	
	1245									

1. RELINQUISHED BY	DATE	TIME	1. RECEIVED BY	DATE	TIME
Fred W Ramser	4-12-07	1730	FEDEX		
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY	DATE	TIME

COMMENTS

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TtNUS-001

TETRA TECH NUS, INC. CHAIN OF CUSTODY | NUMBER 4657 | PAGE ___ OF ___

PROJECT NO:	FACILITY:	PROJECT MANAGER	PHONE NUMBER	LABORATORY NAME AND CONTACT: 615-207-9918
112GN2144	INDIANHEAD	GEORGE LATULIPPE	412-921-7090	MARCIA McGINNITY, EMPIRICAL LAB
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER	PHONE NUMBER	ADDRESS
Fred W Ramser		FRED W. RAMSER	412-921-8838	227 FRENCH LANDING DR SUITE 550
		CARRIER/WAYBILL NUMBER		CITY, STATE
		FED EX 8545 6732 9242		NASHVILLE TN 37228

STANDARD TAT ☒
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

CONTAINER TYPE PLASTIC (P) or GLASS (G): 4oz G, 4oz G, 16oz G, 1L Amb, .5L PE, .5L PE, .25L PE

PRESERVATIVE USED: 4°C, 4°C, ., 4°C, 4°C, 4°C, 4°C

DATE YEAR 2007	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	AVS/SEM	TAL METALS, CN, PAH + TOC	G.S.D	PAH (LOW CONC)	TAL METALS	CYANIDE	TOC 9060	COMMENTS
4/12	1000	S36SD0140102	S36SD014	0"	6"	SD	G	5	2*	2*	1					*RUN MS/MSD
4/12	1030	S36SD0150102	S36SD015	0	6"	SD	G	3	1	1	1					
4/12	1245	S36RB0020102	—	—	—	QC	G	5				2	1	1	1	

	DATE	TIME		DATE	TIME
1. RELINQUISHED BY Fred W Ramser	4-12-07	1730	1. RECEIVED BY FED EX		
2. RELINQUISHED BY			2. RECEIVED BY		
3. RELINQUISHED BY			3. RECEIVED BY		

COMMENTS

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TtNUS-001

APPENDIX B

ANALYTICAL DATA

order	001	002	003	004	005	006	007	008
site	36	36	36	36	36	36	36	36
location	S36SB001	S36SB002	S36SB002	S36SB002	S36SB003	S36SB004	S36SB005	S36SB006
nsample	S36SS0010001	S36SS0020001	S36SS0020001-AVG	S36SS0020001-D	S36SS0030001	S36SS0040001	S36SS0050001	S36SS0060001
sample	S36SS0010001	S36SS0020001	S36SS0020001-AVG	S36SSDUP0101	S36SS0030001	S36SS0040001	S36SS0050001	S36SS0060001
matrix	SS	SS	SS	SS	SS	SS	SS	SS
sacode	NORMAL	ORIG	AVG	DUP	NORMAL	NORMAL	NORMAL	NORMAL
top_depth	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
bottom_dep	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
gis_date	20050628	20050629	20050629	20050629	20050628	20050628	20050629	20050628
qc_type	NM	NM	NM	FD	NM	NM	NM	NM
sample_dat	06/28/05	06/29/05	06/29/05	06/29/05	06/28/05	06/28/05	06/29/05	06/28/05
validated	Y	Y	Y	Y	Y	Y	Y	Y
cto_proj	2144	2144	2144	2144	2144	2144	2144	2144
sort	**c_001**	**c_002**	**c_003**	**c_004**	**c_005**	**c_006**	**c_007**	**c_008**
Volatile Organics (ug/kg)								
1,1,1-TRICHLOROETHANE	13 U	11 U	11.5 U	12 U	15 U	16 U	11 U	13 U
1,1,2,2-TETRACHLOROETHANE	13 U	11 U	11.5 U	12 U	15 U	16 U	11 U	13 U
1,1,2-TRICHLOROETHANE	13 U	11 U	11.5 U	12 U	15 U	16 U	11 U	13 U
1,1,2-TRICHLOROTRIFLUOROETHANE	13 U	11 U	11.5 U	12 U	15 U	16 U	11 U	13 U
1,1-DICHLOROETHANE	13 U	11 U	11.5 U	12 U	15 U	16 U	11 U	13 U
1,1-DICHLOROETHENE	13 U	11 U	11.5 U	12 U	15 U	16 U	11 U	13 U
1,2,4-TRICHLOROBENZENE	13 U	11 U	11.5 U	12 U	15 U	16 U	11 U	13 U
1,2-DIBROMO-3-CHLOROPROPANE	13 UR	11 UR	11.5 UR	12 UR	15 UR	16 UR	11 UR	13 UR
1,2-DIBROMOETHANE	13 U	11 U	11.5 U	12 U	15 U	16 U	11 U	13 U
1,2-DICHLOROBENZENE	13 U	11 U	11.5 U	12 U	15 U	16 U	11 U	13 U
1,2-DICHLOROETHANE	13 U	11 U	11.5 U	12 U	15 U	16 U	11 U	13 U
1,2-DICHLOROPROPANE	13 U	11 U	11.5 U	12 U	15 U	16 U	11 U	13 U
1,3-DICHLOROBENZENE	13 U	11 U	11.5 U	12 U	15 U	16 U	11 U	13 U
1,4-DICHLOROBENZENE	13 U	11 U	11.5 U	12 U	15 U	16 U	11 U	13 U
2-BUTANONE	13 U	11 U	11.5 U	12 U	15 U	16 U	11 U	13 U
2-HEXANONE	13 U	11 U	11.5 U	12 U	15 U	16 U	11 U	13 U
4-METHYL-2-PENTANONE	13 U	11 U	11.5 U	12 U	15 U	16 U	11 U	13 U
ACETONE	23 J	32 J	19 J	12 UJ	100 J	170 J	16 J	9 J
BENZENE	13 U	11 U	11.5 U	12 U	15 U	16 U	11 U	13 U
BROMODICHLOROMETHANE	13 U	11 U	11.5 U	12 U	15 U	16 U	11 U	13 U
BROMOFORM	13 U	11 U	11.5 U	12 U	15 U	16 U	11 U	13 U
BROMOMETHANE	13 U	11 U	11.5 U	12 U	15 U	16 U	11 U	13 U
CARBON DISULFIDE	13 U	11 U	11.5 U	12 U	15 U	16 U	11 U	13 U
CARBON TETRACHLORIDE	13 U	11 U	11.5 U	12 U	15 U	16 U	11 U	13 U
CHLOROBENZENE	13 U	11 U	11.5 U	12 U	15 U	16 U	11 U	13 U
CHLORODIBROMOMETHANE	13 U	11 U	11.5 U	12 U	15 U	16 U	11 U	13 U
CHLOROETHANE	13 U	11 U	11.5 U	12 U	15 U	16 U	11 U	13 U
CHLOROFORM	13 U	11 U	11.5 U	12 U	15 U	16 U	11 U	13 U
CHLOROMETHANE	13 U	11 U	11.5 U	12 U	15 U	16 U	11 U	13 U
CIS-1,2-DICHLOROETHENE	13 U	11 U	11.5 U	12 U	15 U	16 U	11 U	13 U
CIS-1,3-DICHLOROPROPENE	13 U	11 U	11.5 U	12 U	15 U	16 U	11 U	13 U
CYCLOHEXANE	13 U	11 U	11.5 U	12 U	15 U	16 U	11 U	13 U
DICHLORODIFLUOROMETHANE	13 U	11 U	11.5 U	12 U	15 U	16 U	11 U	13 U
ETHYLBENZENE	13 U	11 U	11.5 U	12 U	15 U	16 U	11 U	13 U
ISOPROPYLBENZENE	13 U	11 U	11.5 U	12 U	20	16 U	11 U	13 U
METHYL ACETATE	13 U	11 J	11 J	12 U	15 U	16 U	11 U	13 U
METHYL CYCLOHEXANE	13 U	11 U	11.5 U	12 U	15 U	16 U	11 U	13 U
METHYL TERT-BUTYL ETHER	13 U	11 U	11.5 U	12 U	15 U	16 U	11 U	13 U
METHYLENE CHLORIDE	3 B	11 U	11.5 U	12 U	15 U	16 U	11 U	13 U
STYRENE	13 U	11 U	11.5 U	12 U	2 J	16 U	11 U	13 U
TETRACHLOROETHENE	12 J	8 J	7.5 J	7 J	6 J	11 J	10 J	7 J

order	001	002	003	004	005	006	007	008
site	36	36	36	36	36	36	36	36
location	S36SB001	S36SB002	S36SB002	S36SB002	S36SB003	S36SB004	S36SB005	S36SB006
nsample	S36SS0010001	S36SS0020001	S36SS0020001-AVG	S36SS0020001-D	S36SS0030001	S36SS0040001	S36SS0050001	S36SS0060001
sample	S36SS0010001	S36SS0020001	S36SS0020001-AVG	S36SSDUP0101	S36SS0030001	S36SS0040001	S36SS0050001	S36SS0060001
matrix	SS	SS	SS	SS	SS	SS	SS	SS
sacode	NORMAL	ORIG	AVG	DUP	NORMAL	NORMAL	NORMAL	NORMAL
top_depth	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
bottom_dep	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
gis_date	20050628	20050629	20050629	20050629	20050628	20050628	20050629	20050628
qc_type	NM	NM	NM	FD	NM	NM	NM	NM
sample_dat	06/28/05	06/29/05	06/29/05	06/29/05	06/28/05	06/28/05	06/29/05	06/28/05
validated	Y	Y	Y	Y	Y	Y	Y	Y
cto_proj	2144	2144	2144	2144	2144	2144	2144	2144
sort	**c_001**	**c_002**	**c_003**	**c_004**	**c_005**	**c_006**	**c_007**	**c_008**
TOLUENE	13 U	11 U	11.5 U	12 U	15 U	16 U	11 U	13 U
TOTAL XYLENES	13 U	11 U	11.5 U	12 U	15 U	16 U	11 U	13 U
TRANS-1,2-DICHLOROETHENE	13 U	11 U	11.5 U	12 U	15 U	16 U	11 U	13 U
TRANS-1,3-DICHLOROPROPENE	13 U	11 U	11.5 U	12 U	15 U	16 U	11 U	13 U
TRICHLOROETHENE	13 U	11 U	11.5 U	12 U	15 U	16 U	11 U	13 U
TRICHLOROFLUOROMETHANE	13 U	11 U	11.5 U	12 U	15 U	16 U	11 U	13 U
VINYL CHLORIDE	13 U	11 U	11.5 U	12 U	15 U	16 U	11 U	13 U
Semivolatile Organics (ug/kg)								
1,1-BIPHENYL	350 U	350 U	355 U	360 U	360 U	370 U	380 U	350 U
2,2'-OXYBIS(1-CHLOROPROPANE)	350 U	350 U	355 U	360 U	360 U	370 U	380 U	350 U
2,4,5-TRICHLOROPHENOL	870 U	880 U	890 U	900 U	910 U	920 U	950 U	890 U
2,4,6-TRICHLOROPHENOL	350 U	350 U	355 U	360 U	360 U	370 U	380 U	350 U
2,4-DICHLOROPHENOL	350 U	350 U	355 U	360 U	360 U	370 U	380 U	350 U
2,4-DIMETHYLPHENOL	350 U	350 U	355 U	360 U	360 U	370 U	380 U	350 U
2,4-DINITROPHENOL	870 U	880 U	890 U	900 U	910 U	920 U	950 U	890 U
2,4-DINITROTOLUENE	350 U	350 U	355 U	360 U	360 U	370 U	380 U	350 U
2,6-DINITROTOLUENE	350 U	350 U	355 U	360 U	360 U	370 U	380 U	350 U
2-CHLORONAPHTHALENE	350 U	350 U	355 U	360 U	360 U	370 U	380 U	350 U
2-CHLOROPHENOL	350 U	350 U	355 U	360 U	360 U	370 U	380 U	350 U
2-METHYLNAPHTHALENE	350 U	350 U	355 U	360 U	360 U	200 J	380 U	350 U
2-METHYLPHENOL	350 U	350 U	355 U	360 U	360 U	370 U	380 U	350 U
2-NITROANILINE	870 U	880 U	890 U	900 U	910 U	920 U	950 U	890 U
2-NITROPHENOL	350 U	350 U	355 U	360 U	360 U	370 U	380 U	350 U
3,3'-DICHLOROBENZIDINE	350 U	350 U	355 U	360 U	360 U	370 U	380 U	350 U
3-NITROANILINE	870 U	880 U	890 U	900 U	910 U	920 U	950 U	890 U
4,6-DINITRO-2-METHYLPHENOL	870 U	880 U	890 U	900 U	910 U	920 U	950 U	890 U
4-BROMOPHENYL PHENYL ETHER	350 U	350 U	355 U	360 U	360 U	370 U	380 U	350 U
4-CHLORO-3-METHYLPHENOL	350 U	350 U	355 U	360 U	360 U	370 U	380 U	350 U
4-CHLOROANILINE	350 U	350 U	355 U	360 U	360 U	370 U	380 U	350 U
4-CHLOROPHENYL PHENYL ETHER	350 U	350 U	355 U	360 U	360 U	370 U	380 U	350 U
4-METHYLPHENOL	350 U	350 U	355 U	360 U	360 U	370 U	380 U	350 U
4-NITROANILINE	870 U	880 U	890 U	900 U	910 U	920 U	950 U	890 U
4-NITROPHENOL	870 U	880 U	890 U	900 U	910 U	920 U	950 U	890 U
ACENAPHTHENE	350 U	350 U	355 U	360 U	360 U	370 U	380 U	350 U
ACENAPHTHYLENE	56 J	350 U	355 U	360 U	360 U	370 U	380 U	350 U
ACETOPHENONE	350 U	350 U	355 U	360 U	360 U	370 U	380 U	350 U
ANTHRACENE	89 J	350 U	355 U	360 U	360 U	370 U	380 U	350 U
ATRAZINE	350 U	350 U	355 U	360 U	360 U	370 U	380 U	350 U
BENZALDEHYDE	350 U	350 U	59 J	59 J	67 J	58 J	98 J	350 U
BENZO(A)ANTHRACENE	250 J	350 U	355 U	360 U	360 U	370 U	380 U	87 J
BENZO(A)PYRENE	240 J	350 U	355 U	360 U	52 J	370 U	56 J	93 J
BENZO(B)FLUORANTHENE	470	44 J	44 J	44 J	60 J	370 U	66 J	140 J

order	001	002	003	004	005	006	007	008
site	36	36	36	36	36	36	36	36
location	S36SB001	S36SB002	S36SB002	S36SB002	S36SB003	S36SB004	S36SB005	S36SB006
nsample	S36SS0010001	S36SS0020001	S36SS0020001-AVG	S36SS0020001-D	S36SS0030001	S36SS0040001	S36SS0050001	S36SS0060001
sample	S36SS0010001	S36SS0020001	S36SS0020001-AVG	S36SSDUP0101	S36SS0030001	S36SS0040001	S36SS0050001	S36SS0060001
matrix	SS	SS	SS	SS	SS	SS	SS	SS
sacode	NORMAL	ORIG	AVG	DUP	NORMAL	NORMAL	NORMAL	NORMAL
top_depth	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
bottom_dep	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
gis_date	20050628	20050629	20050629	20050629	20050628	20050628	20050629	20050628
qc_type	NM	NM	NM	FD	NM	NM	NM	NM
sample_dat	06/28/05	06/29/05	06/29/05	06/29/05	06/28/05	06/28/05	06/29/05	06/28/05
validated	Y	Y	Y	Y	Y	Y	Y	Y
cto_proj	2144	2144	2144	2144	2144	2144	2144	2144
sort	**c_001**	**c_002**	**c_003**	**c_004**	**c_005**	**c_006**	**c_007**	**c_008**
BENZO(G,H,I)PERYLENE	110 J	350 U	355 U	360 U	38 J	370 U	45 J	55 J
BENZO(K)FLUORANTHENE	190 J	350 U	355 U	360 U	360 U	370 U	380 U	80 J
BIS(2-CHLOROETHOXY)METHANE	350 U	350 U	355 U	360 U	360 U	370 U	380 U	350 U
BIS(2-CHLOROETHYL)ETHER	350 U	350 U	355 U	360 U	360 U	370 U	380 U	350 U
BIS(2-ETHYLHEXYL)PHTHALATE	78 B	37 B	173.5 B	310 B	270 B	550	56 B	140 B
BUTYL BENZYL PHTHALATE	350 U	350 U	355 U	360 U	360 U	370 U	380 U	350 U
CAPROLACTAM	350 U	350 U	355 U	360 U	360 U	370 U	380 U	350 U
CARBAZOLE	350 U	350 U	355 U	360 U	360 U	370 U	380 U	350 U
CHRYSENE	330 J	350 U	355 U	360 U	37 J	370 U	50 J	130 J
DI-N-BUTYL PHTHALATE	49 J	350 U	355 U	360 U	360 U	370 U	41 J	37 J
DI-N-OCTYL PHTHALATE	350 U	350 U	355 U	360 U	360 U	370 U	380 U	350 U
DIBENZO(A,H)ANTHRACENE	42 J	350 U	355 U	360 U	360 U	370 U	380 U	350 U
DIBENZOFURAN	350 U	350 U	355 U	360 U	360 U	370 U	380 U	350 U
DIETHYL PHTHALATE	350 U	350 U	355 U	360 U	360 U	370 U	380 U	350 U
DIMETHYL PHTHALATE	350 U	350 U	355 U	360 U	360 U	370 U	380 U	350 U
FLUORANTHENE	370	44 J	44 J	360 U	48 J	370 U	53 J	160 J
FLUORENE	350 U	350 U	355 U	360 U	360 U	370 U	380 U	350 U
HEXACHLOROBENZENE	350 U	350 U	355 U	360 U	360 U	370 U	380 U	350 U
HEXACHLOROBUTADIENE	350 U	350 U	355 U	360 U	360 U	370 U	380 U	350 U
HEXACHLOROCYCLOPENTADIENE	350 U	350 U	355 U	360 U	360 U	370 U	380 U	350 U
HEXACHLOROETHANE	350 U	350 U	355 U	360 U	360 U	370 U	380 U	350 U
INDENO(1,2,3-CD)PYRENE	120 J	350 U	355 U	360 U	360 U	370 U	380 U	51 J
ISOPHORONE	350 U	350 U	355 U	360 U	360 U	370 U	380 U	350 U
N-NITROSO-DI-N-PROPYLAMINE	350 U	350 U	355 U	360 U	360 U	370 U	380 U	350 U
N-NITROSODIPHENYLAMINE	350 U	350 U	355 U	360 U	360 U	370 U	380 U	350 U
NAPHTHALENE	350 U	350 U	355 U	360 U	360 U	82 J	380 U	350 U
NITROBENZENE	350 U	350 U	355 U	360 U	360 U	370 U	380 U	350 U
PENTACHLOROPHENOL	870 U	880 U	890 U	900 U	910 U	920 U	950 U	890 U
PHENANTHRENE	110 J	350 U	355 U	360 U	360 U	370 U	380 U	52 J
PHENOL	350 U	350 U	355 U	360 U	360 U	370 U	380 U	350 U
PYRENE	370	39 J	39 J	360 U	54 J	370 U	53 J	140 J
Explosives (mg/kg)								
1,3,5-TRINITROBENZENE	0.19 U	0.20 U	0.195 U	0.19 U	0.19 U	0.20 U	0.20 U	0.19 U
1,3-DINITROBENZENE	0.19 U	0.20 U	0.195 U	0.19 U	0.19 U	0.20 U	0.20 U	0.19 U
2,4,6-TRINITROTOLUENE	0.19 U	0.20 U	0.195 U	0.19 U	0.19 U	0.20 U	0.20 U	0.19 U
2,4-DINITROTOLUENE	0.19 U	0.20 U	0.195 U	0.19 U	0.19 U	0.20 U	0.20 U	0.19 U
2,6-DINITROTOLUENE	0.19 U	0.20 U	0.195 U	0.19 U	0.19 U	0.20 U	0.20 U	0.19 U
2-AMINO-4,6-DINITROTOLUENE	0.19 U	0.20 U	0.195 U	0.19 U	0.19 U	0.20 U	0.20 U	0.19 U
2-NITROTOLUENE	0.19 U	0.20 U	0.195 U	0.19 U	0.19 U	0.20 U	0.20 U	0.19 U
3-NITROTOLUENE	0.19 U	0.20 U	0.195 U	0.19 U	0.19 U	0.20 U	0.20 U	0.19 U
4-AMINO-2,6-DINITROTOLUENE	0.19 U	0.20 U	0.195 U	0.19 U	0.19 U	0.20 U	0.20 U	0.19 U
4-NITROTOLUENE	0.19 U	0.20 U	0.195 U	0.19 U	0.19 U	0.20 U	0.20 U	0.19 U

order	001	002	003	004	005	006	007	008
site	36	36	36	36	36	36	36	36
location	S36SB001	S36SB002	S36SB002	S36SB002	S36SB003	S36SB004	S36SB005	S36SB006
nsample	S36SS0010001	S36SS0020001	S36SS0020001-AVG	S36SS0020001-D	S36SS0030001	S36SS0040001	S36SS0050001	S36SS0060001
sample	S36SS0010001	S36SS0020001	S36SS0020001-AVG	S36SSDUP0101	S36SS0030001	S36SS0040001	S36SS0050001	S36SS0060001
matrix	SS	SS	SS	SS	SS	SS	SS	SS
sacode	NORMAL	ORIG	AVG	DUP	NORMAL	NORMAL	NORMAL	NORMAL
top_depth	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
bottom_dep	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
gis_date	20050628	20050629	20050629	20050629	20050628	20050628	20050629	20050628
qc_type	NM	NM	NM	FD	NM	NM	NM	NM
sample_dat	06/28/05	06/29/05	06/29/05	06/29/05	06/28/05	06/28/05	06/29/05	06/28/05
validated	Y	Y	Y	Y	Y	Y	Y	Y
cto_proj	2144	2144	2144	2144	2144	2144	2144	2144
sort	**c_001**	**c_002**	**c_003**	**c_004**	**c_005**	**c_006**	**c_007**	**c_008**
HMX	0.19 U	0.20 U	0.195 U	0.19 U	0.19 U	0.20 U	0.20 U	0.19 U
NITROBENZENE	0.19 U	0.20 U	0.195 U	0.19 U	0.19 U	0.20 U	0.20 U	0.19 U
NITROCELLULOSE	2 J	1.7 J	1.6 J	1.5 J	2.1 J	3.7 J	2 J	1.2 J
NITROGLYCERIN	0.50 U	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
NITROGUANIDINE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
RDX	0.19 U	0.20 U	0.195 U	0.19 U	0.19 U	0.20 U	0.20 U	0.19 U
TETRYL	0.19 U	0.20 U	0.195 U	0.19 U	0.19 U	0.20 U	0.20 U	0.19 U
Inorganics (mg/kg)								
ALUMINUM	4470	4710	4670	4630	4860	6290	4340	4820
ANTIMONY	0.43 B	0.38 B	0.395 B	0.41 B	0.44 B	0.32 B	0.38 B	0.58 B
ARSENIC	6.2	3.6	3.7	3.8	2.9	5.3	3.7	2.6
BARIUM	29.6	48.3	38.7	29.1	36.4	44.4	29.4	39.4
BERYLLIUM	0.28	0.35	0.335	0.32	0.37	0.44	0.24	0.35
CADMIUM	0.032 U	0.38	0.365	0.35	0.03 U	0.031 U	3.1	0.15
CALCIUM	321	354	359	364	1060	789	779	696
CHROMIUM	12.2	8.7	9.35	10	9	11	10.4	9.5
COBALT	5.3	5.6	5.85	6.1	4.7	11.7	3	4.7
COPPER	12.4	10.8	10.6	10.4	11.8	17	46.6	27.9
IRON	12800	14200	14600	15000	12300	16000	12200	10900
LEAD	27.7	17.6	18.15	18.7	16.4	27.9	53.8	178
MAGNESIUM	526	511	510.5	510	592	856	429	480
MANGANESE	187 K	289 K	259.5 K	230 K	184 K	298 K	146 K	171 K
MERCURY	0.089 K	0.07 K	0.0685 K	0.067 K	0.077 K	0.073 K	0.074 K	0.097 K
NICKEL	10.4	4.2	4.2	4.2	6.2	8	4.3	6.9
POTASSIUM	263	359	354	349	432	428	256	319
SELENIUM	0.47 UR	0.44 UR	0.435 UR	0.43 UR	0.45 UR	0.46 UR	0.48 UR	0.44 UR
SILVER	0.55 B	0.52 B	0.51 B	0.50 B	0.44 B	0.59 B	0.53 B	0.56 B
SODIUM	35.5 B	38.1 B	34.8 B	31.5 B	46.9	37.6 B	66.8	41.7
THALLIUM	0.32 U	0.30 U	0.295 U	0.29 U	0.30 U	0.31 U	0.32 U	0.29 U
VANADIUM	18.2	16.2	16.9	17.6	19.6	19.1	18.5	18.3
ZINC	45.8	27.1	27.05	27	31.6	44	81	37.6
Miscellaneous Parameters (mg/kg)								
CYANIDE	0.19 B	0.21 B	0.22 B	0.23 B	0.40 B	0.37 B	0.27 B	0.18 B
HEXAVALENT CHROMIUM	4.13 U	4.14 U	4.27 U	4.4 U	4.26 U	4.29 U	4.54 U	4.32 U

order	001	002	003	004	005
site	36	36	36	36	36
location	S36MW001	S36MW001	S36MW001	S36MW002	S36MW003
nsample	S36MW0010101	S36MW0010101-AVG	S36MW0010101-D	S36MW0020101	S36MW0030101
sample	S36MW0010101	S36MW0010101-AVG	S36MWDUP0101	S36MW0020101	S36MW0030101
matrix	GW	GW	GW	GW	GW
sacode	ORIG	AVG	DUP	NORMAL	NORMAL
gis_date	20050728	20050728	20050728	20050728	20050728
sample_dat	07/28/05	07/28/05	07/28/05	07/28/05	07/28/05
validated	Y	Y	Y	Y	Y
cto_proj	2144	2144	2144	2144	2144
sort	**c_001**	**c_002**	**c_003**	**c_004**	**c_005**
Volatile Organics (ug/L)					
1,1,1-TRICHLOROETHANE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U
1,1,2,2-TETRACHLOROETHANE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U
1,1,2-TRICHLOROETHANE	0.50 U	0.5 UJ	0.50 UJ	0.50 U	0.50 U
1,1,2-TRICHLOROTRIFLUOROETHANE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U
1,1-DICHLOROETHANE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U
1,1-DICHLOROETHENE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U
1,2,3-TRICHLOROBENZENE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U
1,2,4-TRICHLOROBENZENE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U
1,2-DIBROMO-3-CHLOROPROPANE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U
1,2-DIBROMOETHANE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U
1,2-DICHLOROBENZENE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U
1,2-DICHLOROETHANE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U
1,2-DICHLOROPROPANE	0.50 U	0.5 UJ	0.50 UJ	0.50 U	0.50 U
1,3-DICHLOROBENZENE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U
1,4-DICHLOROBENZENE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U
2-BUTANONE	5 U	5 U	5 U	5 U	5 U
2-HEXANONE	5 U	5 U	5 U	5 U	5 U
4-METHYL-2-PENTANONE	5 U	5 U	5 U	5 U	5 U
ACETONE	5 UJ	5 UJ	5 UJ	5 UJ	5 UJ
BENZENE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U
BROMOCHLOROMETHANE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U
BROMODICHLOROMETHANE	0.50 U	0.5 UJ	0.50 UJ	0.50 U	0.50 U
BROMOFORM	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U
BROMOMETHANE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U
CARBON DISULFIDE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U
CARBON TETRACHLORIDE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U
CHLOROBENZENE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U
CHLORODIBROMOMETHANE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U
CHLOROETHANE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U
CHLOROFORM	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U
CHLOROMETHANE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U
CIS-1,2-DICHLOROETHENE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U
CIS-1,3-DICHLOROPROPENE	0.50 U	0.5 UJ	0.50 UJ	0.50 U	0.50 U
CYCLOHEXANE	0.50 U	0.5 UJ	0.50 UJ	0.50 U	0.50 U
DICHLORODIFLUOROMETHANE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U
ETHYLBENZENE	0.50 U	0.5 U	0.50 U	0.99	0.50 U
ISOPROPYLBENZENE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U
METHYL ACETATE	0.50 U	0.5 U	0.50 UR	0.50 U	0.50 U
METHYL CYCLOHEXANE	0.50 U	0.5 UJ	0.50 UJ	0.50 U	0.50 U
METHYL TERT-BUTYL ETHER	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U
METHYLENE CHLORIDE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U
STYRENE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U
TETRACHLOROETHENE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U
TOLUENE	1.2	1.09	0.98	55	0.50 U

order	001	002	003	004	005
site	36	36	36	36	36
location	S36MW001	S36MW001	S36MW001	S36MW002	S36MW003
nsample	S36MW0010101	S36MW0010101-AVG	S36MW0010101-D	S36MW0020101	S36MW0030101
sample	S36MW0010101	S36MW0010101-AVG	S36MWDUP0101	S36MW0020101	S36MW0030101
matrix	GW	GW	GW	GW	GW
sacode	ORIG	AVG	DUP	NORMAL	NORMAL
gis_date	20050728	20050728	20050728	20050728	20050728
sample_dat	07/28/05	07/28/05	07/28/05	07/28/05	07/28/05
validated	Y	Y	Y	Y	Y
cto_proj	2144	2144	2144	2144	2144
sort	**c_001**	**c_002**	**c_003**	**c_004**	**c_005**
TOTAL XYLENES	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U
TRANS-1,2-DICHLOROETHENE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U
TRANS-1,3-DICHLOROPROPENE	0.50 U	0.5 UJ	0.50 UJ	0.50 U	0.50 U
TRICHLOROETHENE	0.6	0.58	0.56	0.50 U	0.50 U
TRICHLOROFLUOROMETHANE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U
VINYL CHLORIDE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U
Semivolatile Organics (ug/L)					
1,1-BIPHENYL	10 U	10 U	10 U	10 U	10 U
2,2'-OXYBIS(1-CHLOROPROPANE)	10 U	10 U	10 U	10 U	10 U
2,4,5-TRICHLOROPHENOL	25 U	25 U	25 U	25 U	25 U
2,4,6-TRICHLOROPHENOL	10 U	10 U	10 U	10 U	10 U
2,4-DICHLOROPHENOL	10 U	10 U	10 U	10 U	10 U
2,4-DIMETHYLPHENOL	10 U	10 U	10 U	10 U	10 U
2,4-DINITROPHENOL	25 U	25 U	25 U	25 U	25 U
2,4-DINITROTOLUENE	10 U	10 U	10 U	10 U	10 U
2,6-DINITROTOLUENE	10 U	10 U	10 U	10 U	10 U
2-CHLORONAPHTHALENE	10 U	10 U	10 U	10 U	10 U
2-CHLOROPHENOL	10 U	10 U	10 U	10 U	10 U
2-METHYLNAPHTHALENE	10 U	10 U	10 U	10 U	10 U
2-METHYLPHENOL	10 U	10 U	10 U	10 U	10 U
2-NITROANILINE	25 U	25 U	25 U	25 U	25 U
2-NITROPHENOL	10 U	10 U	10 U	10 U	10 U
3,3'-DICHLOROBENZIDINE	10 U	10 U	10 U	10 U	10 U
3-NITROANILINE	25 U	25 U	25 U	25 U	25 U
4,6-DINITRO-2-METHYLPHENOL	25 U	25 U	25 U	25 U	25 U
4-BROMOPHENYL PHENYL ETHER	10 U	10 U	10 U	10 U	10 U
4-CHLORO-3-METHYLPHENOL	10 U	10 U	10 U	10 U	10 U
4-CHLOROANILINE	10 U	10 U	10 U	10 U	10 U
4-CHLOROPHENYL PHENYL ETHER	10 U	10 U	10 U	10 U	10 U
4-METHYLPHENOL	4 J	4.5 J	5 J	93	10 U
4-NITROANILINE	25 U	25 U	25 U	25 U	25 U
4-NITROPHENOL	25 U	25 U	25 U	25 U	25 U
ACENAPHTHENE	10 U	10 U	10 U	10 U	10 U
ACENAPHTHYLENE	10 U	10 U	10 U	10 U	10 U
ACETOPHENONE	10 U	10 U	10 U	2 J	10 U
ANTHRACENE	10 U	10 U	10 U	10 U	10 U
ATRAZINE	10 U	10 U	10 U	10 U	10 U
BENZALDEHYDE	2 J	1.5 J	1 J	2 J	10 U
BENZO(A)ANTHRACENE	10 U	10 U	10 U	10 U	10 U
BENZO(A)PYRENE	10 U	10 U	10 U	10 U	10 U
BENZO(B)FLUORANTHENE	10 U	10 U	10 U	10 U	10 U
BENZO(G,H,I)PERYLENE	10 U	10 U	10 U	10 U	10 U
BENZO(K)FLUORANTHENE	10 U	10 U	10 U	10 U	10 U
BIS(2-CHLOROETHOXY)METHANE	10 U	10 U	10 U	10 U	10 U
BIS(2-CHLOROETHYL)ETHER	10 U	10 U	10 U	10 U	10 U

order	001	002	003	004	005
site	36	36	36	36	36
location	S36MW001	S36MW001	S36MW001	S36MW002	S36MW003
nsample	S36MW0010101	S36MW0010101-AVG	S36MW0010101-D	S36MW0020101	S36MW0030101
sample	S36MW0010101	S36MW0010101-AVG	S36MWDUP0101	S36MW0020101	S36MW0030101
matrix	GW	GW	GW	GW	GW
sacode	ORIG	AVG	DUP	NORMAL	NORMAL
gis_date	20050728	20050728	20050728	20050728	20050728
sample_dat	07/28/05	07/28/05	07/28/05	07/28/05	07/28/05
validated	Y	Y	Y	Y	Y
cto_proj	2144	2144	2144	2144	2144
sort	**c_001**	**c_002**	**c_003**	**c_004**	**c_005**
BIS(2-ETHYLHEXYL)PHTHALATE	10 U	10 U	10 U	10 U	10 U
BUTYL BENZYL PHTHALATE	10 U	10 U	10 U	10 U	10 U
CAPROLACTAM	10 U	10 U	10 U	10 U	10 U
CARBAZOLE	10 U	10 U	10 U	10 U	10 U
CHRYSENE	10 U	10 U	10 U	10 U	10 U
DI-N-BUTYL PHTHALATE	10 U	10 U	10 U	10 U	10 U
DI-N-OCTYL PHTHALATE	10 U	10 U	10 U	10 U	10 U
DIBENZO(A,H)ANTHRACENE	10 U	10 U	10 U	10 U	10 U
DIBENZOFURAN	10 U	10 U	10 U	10 U	10 U
DIETHYL PHTHALATE	10 U	10 U	10 U	10 U	10 U
DIMETHYL PHTHALATE	10 U	10 U	10 U	10 U	10 U
FLUORANTHENE	10 U	10 U	10 U	10 U	10 U
FLUORENE	10 U	10 U	10 U	10 U	10 U
HEXACHLOROBENZENE	10 U	10 U	10 U	10 U	10 U
HEXACHLOROBUTADIENE	10 U	10 U	10 U	10 U	10 U
HEXACHLOROCYCLOPENTADIENE	10 U	10 U	10 U	10 U	10 U
HEXACHLOROETHANE	10 U	10 U	10 U	10 U	10 U
INDENO(1,2,3-CD)PYRENE	10 U	10 U	10 U	10 U	10 U
ISOPHORONE	10 U	10 U	10 U	10 U	10 U
N-NITROSO-DI-N-PROPYLAMINE	10 U	10 U	10 U	10 U	10 U
N-NITROSODIPHENYLAMINE	10 U	10 U	10 U	10 U	10 U
NAPHTHALENE	10 U	10 U	10 U	10 U	10 U
NITROBENZENE	10 U	10 U	10 U	10 U	10 U
PENTACHLOROPHENOL	25 U	25 U	25 U	25 U	25 U
PHENANTHRENE	10 U	10 U	10 U	10 U	10 U
PHENOL	2 J	1.5 J	1 J	8 J	10 U
PYRENE	10 U	10 U	10 U	10 U	10 U
Explosives (ug/L)					
1,3,5-TRINITROBENZENE	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
1,3-DINITROBENZENE	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
2,4,6-TRINITROTOLUENE	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
2,4-DINITROTOLUENE	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
2,6-DINITROTOLUENE	0.10 U	0.165	0.28	0.10 U	1.4
2-AMINO-4,6-DINITROTOLUENE	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
2-NITROTOLUENE	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
3-NITROTOLUENE	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
4-AMINO-2,6-DINITROTOLUENE	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
4-NITROTOLUENE	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
HMX	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
NITROBENZENE	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
NITROCELLULOSE					
NITROGLYCERIN	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U
NITROGUANIDINE					
RDX	0.69	0.67	0.65	0.10 U	0.58
TETRYL	0.31	0.18	0.10 U	0.10 U	0.10 U

order	001	002	003	004	005
site	36	36	36	36	36
location	S36MW001	S36MW001	S36MW001	S36MW002	S36MW003
nsample	S36MW0010101	S36MW0010101-AVG	S36MW0010101-D	S36MW0020101	S36MW0030101
sample	S36MW0010101	S36MW0010101-AVG	S36MWDUP0101	S36MW0020101	S36MW0030101
matrix	GW	GW	GW	GW	GW
sacode	ORIG	AVG	DUP	NORMAL	NORMAL
gis_date	20050728	20050728	20050728	20050728	20050728
sample_dat	07/28/05	07/28/05	07/28/05	07/28/05	07/28/05
validated	Y	Y	Y	Y	Y
cto_proj	2144	2144	2144	2144	2144
sort	**c_001**	**c_002**	**c_003**	**c_004**	**c_005**
Inorganics (ug/L)					
ALUMINUM	63.2 B	43.4 B	23.6 B	839	65 B
ANTIMONY	2.1 L	1.55 L	2 UL	2 U	2 U
ARSENIC	4.4	5.8	7.2	22.4	2 U
BARIUM	1530	1550	1570	131	51.4
BERYLLIUM	0.20 U	0.2 U	0.20 U	0.20 U	0.20 U
CADMIUM	1.1 K	1.05 K	1 K	0.98	0.21
CALCIUM	121000	119500	118000	22400	4700
CHROMIUM	0.75 B	0.7 B	0.65 B	1.4 B	0.50 B
COBALT	0.40 UL	0.4 UL	0.40 UL	1.3	8.4
COPPER	14.1 B	13.9 B	13.7 B	14 B	2.1 B
IRON	67400	67550	67700	64700	101
LEAD	7.7 K	7.9 K	8.1 K	5.6 L	0.90 UL
MAGNESIUM	32600	32000	31400	21100	2720
MANGANESE	805	790.5	776	1560	132
MERCURY	0.13 U	0.135 U	0.14 U	0.13 U	0.13 U
NICKEL	0.70 U	0.7 U	0.70 U	0.70 U	6.9
POTASSIUM	16600	16350	16100	6840	3580
SELENIUM	3 UL	3 UL	3 UL	3 UL	3 UL
SILVER	0.70 U	0.7 U	0.70 U	0.70 U	0.70 U
SODIUM	59900	58900	57900	98500	11800
THALLIUM	2 U	2 U	2 U	2 U	2 U
VANADIUM	0.40 UL	0.4 UL	0.40 UL	1.7 B	0.40 U
ZINC	7 B	6.15 B	5.3 B	3.9 B	25.6 B
Miscellaneous Parameters (ug/L)					
CYANIDE	2 U	2 U	2 U	2 U	2 U
HEXAVALENT CHROMIU(mg/L)	0.03 U	0.03 UJ	0.03 UJ	0.03 U	0.03 U

order	001	002	003	004	005	006	007	008
site	36	36	36	36	36	36	36	36
location	S36SW001	S36SW001	S36SW001	S36SW002	S36SW003	S36SW004	S36SW005	S36SW006
nsample	S36SW0010101	S36SW0010101-AVG	S36SW0010101-D	S36SW0020101	S36SW0030101	S36SW0040101	S36SW0050101	S36SW0060101
sample	S36SW0010101	S36SW0010101-AVG	S36SWDUP0101	S36SW0020101	S36SW0030101	S36SW0040101	S36SW0050101	S36SW0060101
matrix	SW	SW	SW	SW	SW	SW	SW	SW
sacode	ORIG	AVG	DUP	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
top_depth	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
bottom_dep	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
gis_date	20050720	20050720	20050720	20050720	20050720	20050720	20050720	20050721
qc_type	NM	NM	FD	NM	NM	NM	NM	NM
sample_dat	07/20/05	07/20/05	07/20/05	07/20/05	07/20/05	07/20/05	07/20/05	07/21/05
validated	Y	Y	Y	Y	Y	Y	Y	Y
cto_proj	2144	2144	2144	2144	2144	2144	2144	2144
sort	**c_001**	**c_002**	**c_003**	**c_004**	**c_005**	**c_006**	**c_007**	**c_008**
Volatile Organics (ug/L)								
1,1,1-TRICHLOROETHANE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,1,2,2-TETRACHLOROETHANE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,1,2-TRICHLOROETHANE	0.50 UJ	0.5 UJ	0.50 UJ	0.50 UJ	0.50 UJ	0.50 U	0.50 UJ	0.50 UJ
1,1,2-TRICHLOROTRIFLUOROETHANE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 UJ
1,1-DICHLOROETHANE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 UJ	0.50 U	0.50 U
1,1-DICHLOROETHENE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,2,3-TRICHLOROBENZENE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 UJ	0.50 U	0.50 U	0.50 U
1,2,4-TRICHLOROBENZENE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 UJ	0.50 U	0.50 U	0.50 U
1,2-DIBROMO-3-CHLOROPROPANE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 UJ	0.50 U	0.50 U	0.50 U
1,2-DIBROMOETHANE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,2-DICHLOROBENZENE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 UJ	0.50 U	0.50 U	0.50 U
1,2-DICHLOROETHANE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,2-DICHLOROPROPANE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,3-DICHLOROBENZENE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 UJ	0.50 U	0.50 U	0.50 U
1,4-DICHLOROBENZENE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 UJ	0.50 U	0.50 U	0.50 U
2-BUTANONE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
2-HEXANONE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
4-METHYL-2-PENTANONE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
ACETONE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BENZENE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
BROMOCHLOROMETHANE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 UJ	0.50 U	0.50 U
BROMODICHLOROMETHANE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
BROMOFORM	0.50 U	0.5 U	0.50 U	0.50 U	0.50 UJ	0.50 U	0.50 U	0.50 U
BROMOMETHANE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
CARBON DISULFIDE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
CARBON TETRACHLORIDE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
CHLOROBENZENE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
CHLORODIBROMOMETHANE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
CHLOROETHANE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
CHLOROFORM	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 UJ	0.50 U	0.50 U
CHLOROMETHANE	0.50 U	0.515	0.78	0.69	0.50 U	0.50 U	0.89	0.50 U
CIS-1,2-DICHLOROETHENE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
CIS-1,3-DICHLOROPROPENE	0.50 UJ	0.5 UJ	0.50 UJ	0.50 UJ	0.50 UJ	0.50 U	0.50 UJ	0.50 UJ
CYCLOHEXANE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
DICHLORODIFLUOROMETHANE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
ETHYLBENZENE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
ISOPROPYLBENZENE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
METHYL ACETATE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
METHYL CYCLOHEXANE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
METHYL TERT-BUTYL ETHER	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
METHYLENE CHLORIDE	0.50 U	0.49 U	0.48 B	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U

order	001	002	003	004	005	006	007	008
site	36	36	36	36	36	36	36	36
location	S36SW001	S36SW001	S36SW001	S36SW002	S36SW003	S36SW004	S36SW005	S36SW006
nsample	S36SW0010101	S36SW0010101-AVG	S36SW0010101-D	S36SW0020101	S36SW0030101	S36SW0040101	S36SW0050101	S36SW0060101
sample	S36SW0010101	S36SW0010101-AVG	S36SWDUP0101	S36SW0020101	S36SW0030101	S36SW0040101	S36SW0050101	S36SW0060101
matrix	SW	SW	SW	SW	SW	SW	SW	SW
sacode	ORIG	AVG	DUP	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
top_depth	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
bottom_dep	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
gis_date	20050720	20050720	20050720	20050720	20050720	20050720	20050720	20050721
qc_type	NM	NM	FD	NM	NM	NM	NM	NM
sample_dat	07/20/05	07/20/05	07/20/05	07/20/05	07/20/05	07/20/05	07/20/05	07/21/05
validated	Y	Y	Y	Y	Y	Y	Y	Y
cto_proj	2144	2144	2144	2144	2144	2144	2144	2144
sort	**c_001**	**c_002**	**c_003**	**c_004**	**c_005**	**c_006**	**c_007**	**c_008**
STYRENE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
TETRACHLOROETHENE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
TOLUENE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
TOTAL XYLENES	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
TRANS-1,2-DICHLOROETHENE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
TRANS-1,3-DICHLOROPROPENE	0.50 UJ	0.5 UJ	0.50 UJ	0.50 UJ	0.50 UJ	0.50 U	0.50 UJ	0.50 UJ
TRICHLOROETHENE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
TRICHLOROFLUOROMETHANE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
VINYL CHLORIDE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Semivolatile Organics (ug/L)								
1,1-BIPHENYL	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2,2'-OXYBIS(1-CHLOROPROPANE)	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2,4,5-TRICHLOROPHENOL	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U
2,4,6-TRICHLOROPHENOL	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2,4-DICHLOROPHENOL	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2,4-DIMETHYLPHENOL	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2,4-DINITROPHENOL	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U
2,4-DINITROTOLUENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2,6-DINITROTOLUENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-CHLORONAPHTHALENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-CHLOROPHENOL	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-METHYLNAPHTHALENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-METHYLPHENOL	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-NITROANILINE	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U
2-NITROPHENOL	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
3,3'-DICHLOROBENZIDINE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
3-NITROANILINE	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U
4,6-DINITRO-2-METHYLPHENOL	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U
4-BROMOPHENYL PHENYL ETHER	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-CHLORO-3-METHYLPHENOL	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-CHLOROANILINE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-CHLOROPHENYL PHENYL ETHER	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-METHYLPHENOL	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-NITROANILINE	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U
4-NITROPHENOL	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U
ACENAPHTHENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
ACENAPHTHYLENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
ACETOPHENONE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
ANTHRACENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
ATRAZINE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
BENZALDEHYDE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
BENZO(A)ANTHRACENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U

order	001	002	003	004	005	006	007	008
site	36	36	36	36	36	36	36	36
location	S36SW001	S36SW001	S36SW001	S36SW002	S36SW003	S36SW004	S36SW005	S36SW006
nsample	S36SW0010101	S36SW0010101-AVG	S36SW0010101-D	S36SW0020101	S36SW0030101	S36SW0040101	S36SW0050101	S36SW0060101
sample	S36SW0010101	S36SW0010101-AVG	S36SWDUP0101	S36SW0020101	S36SW0030101	S36SW0040101	S36SW0050101	S36SW0060101
matrix	SW	SW	SW	SW	SW	SW	SW	SW
sacode	ORIG	AVG	DUP	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
top_depth	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
bottom_dep	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
gis_date	20050720	20050720	20050720	20050720	20050720	20050720	20050720	20050721
qc_type	NM	NM	FD	NM	NM	NM	NM	NM
sample_dat	07/20/05	07/20/05	07/20/05	07/20/05	07/20/05	07/20/05	07/20/05	07/21/05
validated	Y	Y	Y	Y	Y	Y	Y	Y
cto_proj	2144	2144	2144	2144	2144	2144	2144	2144
sort	**c_001**	**c_002**	**c_003**	**c_004**	**c_005**	**c_006**	**c_007**	**c_008**
BENZO(A)PYRENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
BENZO(B)FLUORANTHENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
BENZO(G,H,I)PERYLENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
BENZO(K)FLUORANTHENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
BIS(2-CHLOROETHOXY)METHANE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
BIS(2-CHLOROETHYL)ETHER	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
BIS(2-ETHYLHEXYL)PHTHALATE	2 B	6 B	10 U	10 U	10 U	2 B	1 B	10 U
BUTYL BENZYL PHTHALATE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
CAPROLACTAM	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
CARBAZOLE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
CHRYSENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
DI-N-BUTYL PHTHALATE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
DI-N-OCTYL PHTHALATE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
DIBENZO(A,H)ANTHRACENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
DIBENZOFURAN	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
DIETHYL PHTHALATE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
DIMETHYL PHTHALATE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
FLUORANTHENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
FLUORENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
HEXACHLOROBENZENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
HEXACHLOROBUTADIENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
HEXACHLOROCYCLOPENTADIENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
HEXACHLOROETHANE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
INDENO(1,2,3-CD)PYRENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
ISOPHORONE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
N-NITROSO-DI-N-PROPYLAMINE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
N-NITROSODIPHENYLAMINE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
NAPHTHALENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
NITROBENZENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
PENTACHLOROPHENOL	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U
PHENANTHRENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
PHENOL	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
PYRENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Explosives (ug/L)								
1,3,5-TRINITROBENZENE	0.10 U	0.1 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 UJ	0.10 U
1,3-DINITROBENZENE	0.10 U	0.1 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
2,4,6-TRINITROTOLUENE	0.10 U	0.1 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 UJ	0.10 U
2,4-DINITROTOLUENE	0.10 U	0.1 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
2,6-DINITROTOLUENE	0.10 U	0.1 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
2-AMINO-4,6-DINITROTOLUENE	0.10 U	0.1 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
2-NITROTOLUENE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 UJ	0.50 U
3-NITROTOLUENE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U

order	001	002	003	004	005	006	007	008
site	36	36	36	36	36	36	36	36
location	S36SW001	S36SW001	S36SW001	S36SW002	S36SW003	S36SW004	S36SW005	S36SW006
nsample	S36SW0010101	S36SW0010101-AVG	S36SW0010101-D	S36SW0020101	S36SW0030101	S36SW0040101	S36SW0050101	S36SW0060101
sample	S36SW0010101	S36SW0010101-AVG	S36SWDUP0101	S36SW0020101	S36SW0030101	S36SW0040101	S36SW0050101	S36SW0060101
matrix	SW	SW	SW	SW	SW	SW	SW	SW
sacode	ORIG	AVG	DUP	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
top_depth	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
bottom_dep	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
gis_date	20050720	20050720	20050720	20050720	20050720	20050720	20050720	20050721
qc_type	NM	NM	FD	NM	NM	NM	NM	NM
sample_dat	07/20/05	07/20/05	07/20/05	07/20/05	07/20/05	07/20/05	07/20/05	07/21/05
validated	Y	Y	Y	Y	Y	Y	Y	Y
cto_proj	2144	2144	2144	2144	2144	2144	2144	2144
sort	**c_001**	**c_002**	**c_003**	**c_004**	**c_005**	**c_006**	**c_007**	**c_008**
4-AMINO-2,6-DINITROTOLUENE	0.10 U	0.1 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
4-NITROTOLUENE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
HMX	0.10 U	0.1 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
NITROBENZENE	0.10 U	0.1 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
NITROCELLULOSE	120 B	125 B	130 B	120 B	500 U	500 U	120 B	500 U
NITROGLYCERIN	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U
NITROGUANIDINE	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
RDX	0.10 U	0.1 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 UJ	0.10 U
TETRYL	0.10 U	0.1 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 UJ	0.10 U
Inorganics (ug/L)								
ALUMINUM	53.8 J	500.9 J	948 J	78 J	475 J	504 J	113 J	67.3 J
ANTIMONY	2 U	2.25 U	2.5 B	2 U	2 U	2 U	2 U	2 U
ARSENIC	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
BARIUM	23.3	29.45	35.6	18.3	28.6	28.5	26.4	30.9
BERYLLIUM	0.20 U	0.2 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
CADMIUM	0.20 U	0.2 U	0.20 U	0.20 U	0.71	0.20 U	0.20 U	0.20 U
CALCIUM	19100	18950	18800	18200	18300	18100	20900	19300
CHROMIUM	0.61	1.055	1.5	0.50 U	0.94	1.1	0.50 U	0.50 U
COBALT	0.40 U	0.425	0.65	0.40 U	0.40 U	0.55	0.40 U	0.40 U
COPPER	4 B	4.25 B	4.5 B	1 U	1.2 B	7.5	1 U	1 U
IRON	1010 J	2315 J	3620 J	466 J	2790 J	1080 J	1520 J	1470 J
LEAD	0.90 U	0.825 K	1.2 K	0.90 U	13.6	4.6 K	0.90 U	0.90 U
MAGNESIUM	8570	8480	8390	8460	8480	8560	8560	8450
MANGANESE	62.8 J	121.4 J	180 J	44.8	141	93.6	492	194
MERCURY	0.14 UL	0.14 UL	0.14 UL	0.14 UL	0.14 UL	0.14 UL	0.13 UL	0.14 UL
NICKEL	1.4	1.7	2	0.93	1.8	1.7	1.1	1.1
POTASSIUM	1900 B	1960 B	2020 B	1660 B	1330 B	2170 B	2260 B	2470 B
SELENIUM	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U
SILVER	0.70 UL	0.7 UL	0.70 UL	0.70 UL	0.70 UL	0.70 UL	0.70 UL	0.70 UL
SODIUM	24600	25000	25400	24500	24200	24700	26000	26300
THALLIUM	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
VANADIUM	0.40 U	1.25	2.3	0.40 U	2	1.9	0.71	0.40 U
ZINC	7.8 B	12.8 B	17.8 B	2.9 B	11.4 B	25.3 B	5.8 B	7.7 B
Miscellaneous Parameters (ug/L)								
CYANIDE	2 U	2 U	2 U	5.1	2 U	2 U	2 U	2 U
HEXAVALENT CHROMIU(mg/L)	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U

order	001	002	003	004	005	006	007	008	009	010	011
nsample	S36SD0010001	S36SD0020001	S36SD0030001	S36SD0040001	S36SD0050001	S36SD0060001	S36SD0060001-AVG	S36SD0060001-D	S36SD0070102	S36SD0080102	S36SD0090102
location	S36SD001	S36SD002	S36SD003	S36SD004	S36SD005	S36SD006	S36SD006	S36SD006	S36SD007	S36SD008	S36SD009
project_no	2144_20060824	2144_20060824	2144_20060824	2144_20060824	2144_20060824	2144_20060824	2144_20060824	2144_20060824	2144_20070817	2144_20070817	2144_20070817
sample_coc	S36SD0010001	S36SD0020001	S36SD0030001	S36SD0040001	S36SD0050001	S36SD0060001	S36SD0060001-AVG	S36SDDUP0101	S36SD0070102	S36SD0080102	S36SD0090102
sample_dat	20050720	20050720	20050720	20050720	20050720	20050721	20050721	20050721	20070411	20070411	20070411
top_depth	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	1	1	1
bottom_dep	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	2	2	2
sort	**c_001**	**c_002**	**c_003**	**c_004**	**c_005**	**c_006**	**c_007**	**c_008**	**c_009**	**c_010**	**c_011**
Volatile Organics (ug/kg)											
1,1,1-TRICHLOROETHANE	22 U	12 U	23 U	18 U	12 U	13 U	14.5 U	16 U			
1,1,2,2-TETRACHLOROETHANE	22 U	12 U	23 U	18 U	12 U	13 U	14.5 U	16 U			
1,1,2-TRICHLOROETHANE	22 U	12 U	23 U	18 U	12 U	13 U	14.5 U	16 U			
1,1,2-TRICHLOROTRIFLUOROETHANE	22 U	12 U	23 U	18 U	12 U	13 U	14.5 U	16 U			
1,1-DICHLOROETHANE	22 U	12 U	23 U	18 U	12 U	13 U	14.5 U	16 U			
1,1-DICHLOROETHENE	22 U	12 U	23 U	18 U	12 U	13 U	14.5 U	16 U			
1,2,4-TRICHLOROBENZENE	22 U	12 U	23 U	18 U	12 U	13 U	14.5 U	16 U			
1,2-DIBROMO-3-CHLOROPROPANE	22 UR	12 UR	23 UR	18 UR	12 UR	13 UR	14.5 UR	16 UR			
1,2-DIBROMOETHANE	22 U	12 U	23 U	18 U	12 U	13 U	14.5 U	16 U			
1,2-DICHLOROBENZENE	22 U	12 U	23 U	18 U	12 U	13 U	14.5 U	16 U			
1,2-DICHLOROETHANE	22 U	12 U	23 U	18 U	12 U	13 U	14.5 U	16 U			
1,2-DICHLOROPROPANE	22 U	12 U	23 U	18 U	12 U	13 U	14.5 U	16 U			
1,3-DICHLOROBENZENE	22 U	12 U	23 U	18 U	12 U	13 U	14.5 U	16 U			
1,4-DICHLOROBENZENE	22 U	12 U	23 U	18 U	12 U	13 U	14.5 U	16 U			
2-BUTANONE	19 J	6 J	14 J	28	12 U	13 U	14.75	23			
2-HEXANONE	22 U	12 U	23 U	18 U	12 U	13 U	14.5 U	16 U			
4-METHYL-2-PENTANONE	22 U	12 U	23 U	18 U	12 U	13 U	14.5 U	16 U			
ACETONE	47 J	19 J	25 J	35 J	8 J	10 J	24.5 J	39 J			
BENZENE	22 U	12 U	23 U	18 U	12 U	13 U	14.5 U	16 U			
BROMODICHLOROMETHANE	22 U	12 U	23 U	18 U	12 U	13 U	14.5 U	16 U			
BROMOFORM	22 U	12 U	23 U	18 U	12 U	13 U	14.5 U	16 U			
BROMOMETHANE	22 U	12 U	23 U	18 U	12 U	13 U	14.5 U	16 U			
CARBON DISULFIDE	22 U	12 U	23 U	18 U	12 U	13 U	14.5 U	16 U			
CARBON TETRACHLORIDE	22 U	12 U	23 U	18 U	12 U	13 U	14.5 U	16 U			
CHLOROBENZENE	22 U	12 U	23 U	18 U	12 U	13 U	14.5 U	16 U			
CHLORODIBROMOMETHANE	22 U	12 U	23 U	18 U	12 U	13 U	14.5 U	16 U			
CHLOROETHANE	22 U	12 U	23 U	18 U	12 U	13 U	14.5 U	16 U			
CHLOROFORM	22 U	12 U	23 U	18 U	12 U	13 U	14.5 U	16 U			
CHLOROMETHANE	22 U	12 U	23 U	18 U	12 U	13 U	14.5 U	16 U			
CIS-1,2-DICHLOROETHENE	22 U	12 U	23 U	18 U	12 U	13 U	14.5 U	16 U			
CIS-1,3-DICHLOROPROPENE	22 U	12 U	23 U	18 U	12 U	13 U	14.5 U	16 U			
CYCLOHEXANE	22 U	12 U	23 U	18 U	12 U	13 U	14.5 U	16 U			
DICHLORODIFLUOROMETHANE	22 U	12 U	23 U	18 U	12 U	13 U	14.5 U	16 U			
ETHYLBENZENE	22 U	12 U	23 U	18 U	12 U	13 U	14.5 U	16 U			
ISOPROPYLBENZENE	22 U	12 U	23 U	18 U	12 U	13 U	14.5 U	16 U			
METHYL ACETATE	22 U	12 U	23 U	18 U	12 U	13 U	14.5 U	16 U			
METHYL CYCLOHEXANE	22 U	12 U	23 U	18 U	12 U	13 U	14.5 U	16 U			
METHYL TERT-BUTYL ETHER	22 U	12 U	23 U	18 U	12 U	13 U	14.5 U	16 U			
METHYLENE CHLORIDE	14 B	6 B	13 B	16 B	8 B	7 B	10 B	13 B			
STYRENE	22 U	12 U	23 U	18 U	12 U	13 U	14.5 U	16 U			
TETRACHLOROETHENE	22 U	12 U	23 U	18 U	12 U	13 U	14.5 U	16 U			
TOLUENE	22 U	12 U	23 U	18 U	12 U	13 U	14.5 U	16 U			
TOTAL XYLENES	22 U	12 U	23 U	18 U	12 U	13 U	14.5 U	16 U			
TRANS-1,2-DICHLOROETHENE	22 U	12 U	23 U	18 U	12 U	13 U	14.5 U	16 U			
TRANS-1,3-DICHLOROPROPENE	22 U	12 U	23 U	18 U	12 U	13 U	14.5 U	16 U			
TRICHLOROETHENE	22 U	12 U	23 U	18 U	12 U	13 U	14.5 U	16 U			
TRICHLOROFLUOROMETHANE	22 U	12 U	23 U	3 J	12 U	13 U	14.5 U	16 U			
VINYL CHLORIDE	22 U	12 U	23 U	18 U	12 U	13 U	14.5 U	16 U			

order	001	002	003	004	005	006	007	008	009	010	011
nsample	S36SD0010001	S36SD0020001	S36SD0030001	S36SD0040001	S36SD0050001	S36SD0060001	S36SD0060001-AVG	S36SD0060001-D	S36SD0070102	S36SD0080102	S36SD0090102
location	S36SD001	S36SD002	S36SD003	S36SD004	S36SD005	S36SD006	S36SD006	S36SD006	S36SD007	S36SD008	S36SD009
project_no	2144_20060824	2144_20060824	2144_20060824	2144_20060824	2144_20060824	2144_20060824	2144_20060824	2144_20060824	2144_20070817	2144_20070817	2144_20070817
sample_coc	S36SD0010001	S36SD0020001	S36SD0030001	S36SD0040001	S36SD0050001	S36SD0060001	S36SD0060001-AVG	S36SDDUP0101	S36SD0070102	S36SD0080102	S36SD0090102
sample_dat	20050720	20050720	20050720	20050720	20050720	20050721	20050721	20050721	20070411	20070411	20070411
top_depth	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	1	1	1
bottom_dep	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	2	2	2
sort	c_001	c_002	c_003	c_004	c_005	c_006	c_007	c_008	c_009	c_010	c_011
Semivolatile Organics (ug/kg)											
1,1-BIPHENYL	600 U	420 U	600 U	270 U	430 U	480 U	510 U	540 U			
1-METHYLNAPHTHALENE									200 UJ	220 UJ	83 U
2,2'-OXYBIS(1-CHLOROPROPANE)	600 U	420 U	600 U	270 U	430 U	480 U	510 U	540 U			
2,4,5-TRICHLOROPHENOL	1500 U	1100 U	1500 U	680 U	1100 U	1200 U	1300 U	1400 U			
2,4,6-TRICHLOROPHENOL	600 U	420 U	600 U	270 U	430 U	480 U	510 U	540 U			
2,4-DICHLOROPHENOL	600 U	420 U	600 U	270 U	430 U	480 U	510 U	540 U			
2,4-DIMETHYLPHENOL	600 U	420 U	600 U	270 U	430 U	480 U	510 U	540 U			
2,4-DINITROPHENOL	1500 U	1100 U	1500 U	680 U	1100 U	1200 U	1300 U	1400 U			
2,4-DINITROTOLUENE	600 U	420 U	600 U	270 U	430 U	480 U	510 U	540 U			
2,6-DINITROTOLUENE	600 U	420 U	600 U	270 U	430 U	480 U	510 U	540 U			
2-CHLORONAPHTHALENE	600 U	420 U	600 U	270 U	430 U	480 U	510 U	540 U			
2-CHLOROPHENOL	600 U	420 U	600 U	270 U	430 U	480 U	510 U	540 U			
2-METHYLNAPHTHALENE	600 U	420 U	600 U	270 U	430 U	480 U	510 U	540 U	200 UJ	220 UJ	83 U
2-METHYLPHENOL	600 U	420 U	600 U	270 U	430 U	480 U	510 U	540 U			
2-NITROANILINE	1500 U	1100 U	1500 U	680 U	1100 U	1200 U	1300 U	1400 U			
2-NITROPHENOL	600 U	420 U	600 U	270 U	430 U	480 U	510 U	540 U			
3,3'-DICHLOROBENZIDINE	600 U	420 U	600 U	270 U	430 U	480 U	510 U	540 U			
3-NITROANILINE	1500 U	1100 U	1500 U	680 U	1100 U	1200 U	1300 U	1400 U			
4,6-DINITRO-2-METHYLPHENOL	1500 U	1100 U	1500 U	680 U	1100 U	1200 U	1300 U	1400 U			
4-BROMOPHENYL PHENYL ETHER	600 U	420 U	600 U	270 U	430 U	480 U	510 U	540 U			
4-CHLORO-3-METHYLPHENOL	600 U	420 U	600 U	270 U	430 U	480 U	510 U	540 U			
4-CHLOROANILINE	600 U	420 U	600 U	270 U	430 U	480 U	510 U	540 U			
4-CHLOROPHENYL PHENYL ETHER	600 U	420 U	600 U	270 U	430 U	480 U	510 U	540 U			
4-METHYLPHENOL	600 U	420 U	600 U	270 U	430 U	480 U	510 U	540 U			
4-NITROANILINE	1500 U	1100 U	1500 U	680 U	1100 U	1200 U	1300 U	1400 U			
4-NITROPHENOL	1500 U	1100 U	1500 U	680 U	1100 U	1200 U	1300 U	1400 U			
ACENAPHTHENE	600 U	420 U	600 U	270 U	430 U	480 U	510 U	540 U	200 UJ	220 UJ	83 U
ACENAPHTHYLENE	600 U	420 U	290 J	270 U	430 U	480 U	510 U	540 U	200 UJ	220 UJ	83 U
ACETOPHENONE	600 U	420 U	600 U	270 U	430 U	480 U	510 U	540 U			
ANTHRACENE	600 U	420 U	420 J	270 U	430 U	480 U	510 U	540 U	200 UJ	220 UJ	83 U
ATRAZINE	600 U	420 U	600 U	270 U	430 U	480 U	510 U	540 U			
BENZALDEHYDE	110 J	420 U	320 J	270 U	430 U	480 U	73 J	73 J			
BENZO(A)ANTHRACENE	170 J	270 J	1200	89 J	430 U	480 U	510 U	540 U	200 UJ	220 UJ	360
BENZO(A)PYRENE	190 J	330 J	1000	64 J	43 J	480 U	510 U	540 U	200 UJ	220 UJ	320
BENZO(B)FLUORANTHENE	230 J	430 J	2300	98 J	44 J	480 U	510 U	540 U	200 UJ	220 UJ	370
BENZO(G,H,I)PERYLENE	130 J	130 J	490 J	39 J	430 U	480 U	510 U	540 U	200 UJ	220 UJ	83 U
BENZO(K)FLUORANTHENE	96 J	330 J	790	54 J	430 U	480 U	510 U	540 U	200 UJ	220 UJ	42 J
BIS(2-CHLOROETHOXY)METHANE	600 U	420 U	600 U	270 U	430 U	480 U	510 U	540 U			
BIS(2-CHLOROETHYL)ETHER	600 U	420 U	600 U	270 U	430 U	480 U	510 U	540 U			
BIS(2-ETHYLHEXYL)PHTHALATE	64 B	70 B	64 B	32 B	70 B	49 B	294.5 B	540 U			
BUTYL BENZYL PHTHALATE	600 U	420 U	600 U	270 U	430 U	480 U	510 U	540 U			
CAPROLACTAM	600 U	420 U	600 U	270 U	430 U	480 U	510 U	540 U			
CARBAZOLE	600 U	420 U	61 J	270 U	430 U	480 U	510 U	540 U			
CHRYSENE	140 J	280 J	1300	89 J	430 U	480 U	510 U	540 U	200 UJ	220 UJ	62 J
DI-N-BUTYL PHTHALATE	600 U	420 U	600 U	270 U	430 U	480 U	510 U	540 U			
DI-N-OCTYL PHTHALATE	600 U	420 UJ	600 U	270 U	430 U	480 U	510 U	540 U			
DIBENZO(A,H)ANTHRACENE	600 U	45 J	210 J	270 U	430 U	480 U	510 U	540 U	200 UJ	220 UJ	83 U
DIBENZOFURAN	600 U	420 U	600 U	270 U	430 U	480 U	510 U	540 U			

order	001	002	003	004	005	006	007	008	009	010	011
nsample	S36SD0010001	S36SD0020001	S36SD0030001	S36SD0040001	S36SD0050001	S36SD0060001	S36SD0060001-AVG	S36SD0060001-D	S36SD0070102	S36SD0080102	S36SD0090102
location	S36SD001	S36SD002	S36SD003	S36SD004	S36SD005	S36SD006	S36SD006	S36SD006	S36SD007	S36SD008	S36SD009
project_no	2144_20060824	2144_20060824	2144_20060824	2144_20060824	2144_20060824	2144_20060824	2144_20060824	2144_20060824	2144_20070817	2144_20070817	2144_20070817
sample_coc	S36SD0010001	S36SD0020001	S36SD0030001	S36SD0040001	S36SD0050001	S36SD0060001	S36SD0060001-AVG	S36SDDUP0101	S36SD0070102	S36SD0080102	S36SD0090102
sample_dat	20050720	20050720	20050720	20050720	20050720	20050721	20050721	20050721	20070411	20070411	20070411
top_depth	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	1	1	1
bottom_dep	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	2	2	2
sort	**c_001**	**c_002**	**c_003**	**c_004**	**c_005**	**c_006**	**c_007**	**c_008**	**c_009**	**c_010**	**c_011**
DIETHYL PHTHALATE	600 U	420 U	600 U	270 U	430 U	480 U	510 U	540 U			
DIMETHYL PHTHALATE	600 U	420 U	600 U	270 U	430 U	480 U	510 U	540 U			
FLUORANTHENE	230 J	500	1300	120 J	430 U	480 U	510 U	540 U	200 UJ	220 UJ	110
FLUORENE	600 U	420 U	600 U	270 U	430 U	480 U	510 U	540 U	200 UJ	220 UJ	83 U
HEXACHLOROBENZENE	600 U	420 U	600 U	270 U	430 U	480 U	510 U	540 U			
HEXACHLOROBUTADIENE	600 U	420 U	600 U	270 U	430 U	480 U	510 U	540 U			
HEXACHLOROCYCLOPENTADIENE	600 U	420 U	600 U	270 U	430 U	480 U	510 U	540 U			
HEXACHLOROETHANE	600 U	420 U	600 U	270 U	430 U	480 U	510 U	540 U			
INDENO(1,2,3-CD)PYRENE	120 J	140 J	480 J	34 J	430 U	480 U	510 U	540 U	200 UJ	220 UJ	83 U
ISOPHORONE	600 U	420 U	600 U	270 U	430 U	480 U	510 U	540 U			
N-NITROSO-DI-N-PROPYLAMINE	600 U	420 U	600 U	270 U	430 U	480 U	510 U	540 U			
N-NITROSODIPHENYLAMINE	600 U	420 U	600 U	270 U	430 U	480 U	510 U	540 U			
NAPHTHALENE	600 U	420 U	600 U	270 U	430 U	480 U	510 U	540 U	200 UJ	220 UJ	83 U
NITROBENZENE	600 U	420 U	600 U	270 U	430 U	480 U	510 U	540 U			
PENTACHLOROPHENOL	1500 U	1100 U	1500 U	680 U	1100 U	1200 U	1300 U	1400 U			
PHENANTHRENE	110 J	120 J	110 J	65 J	430 U	480 U	510 U	540 U	200 UJ	220 UJ	79 J
PHENOL	600 U	420 U	600 U	270 U	430 U	480 U	510 U	540 U			
PYRENE	230 J	510	1200	120 J	67 J	480 U	510 U	540 U	200 UJ	220 UJ	100
Explosives (mg/kg)											
1,3,5-TRINITROBENZENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U			
1,3-DINITROBENZENE	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ			
2,4,6-TRINITROTOLUENE	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ			
2,4-DINITROTOLUENE	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ			
2,6-DINITROTOLUENE	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ			
2-AMINO-4,6-DINITROTOLUENE	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ			
2-NITROTOLUENE	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ			
3-NITROTOLUENE	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ			
4-AMINO-2,6-DINITROTOLUENE	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ			
4-NITROTOLUENE	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ			
HMX	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U			
NITROBENZENE	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ	0.25 UJ			
NITROCELLULOSE	1.6 B	0.98 B	1.7 B	2.2 B	0.85 B	0.98 B	0.99 B	1 B			
NITROGLYCERIN	0.55	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U			
NITROGUANIDINE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U			
RDX	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U			
TETRYL	0.25 U	0.25 UJ	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U			
Inorganics (mg/kg)											
ALUMINUM	7740	4340	3950	7490	3980	4550	4300	4050	21300 J	19600 J	7530
ANTIMONY	2.4 L	0.45 L	0.74 L	4.5 L	0.47 UL	0.69 L	0.4825 L	0.55 UL	3.1 UJ	3.2 UJ	1.5 L
ARSENIC	4.9	5.5	9.7	7	3.3	3	2.75	2.5	6.8 J	5.8 J	17.7
BARIUM	50	26.8	40.7	61.4	28.5	31.1	31.7	32.3	220 J	182 J	255
BERYLLIUM	0.32	0.27	0.25	0.38	0.26	0.29	0.315	0.34	1.3 J	1.2 J	0.61
CADMIUM	3.1	0.41	0.92	2.3	0.15	0.17	0.18	0.19	1 J	0.99 J	1
CALCIUM	932	801	1210	2200	711	858	979	1100	3530 J	4540 J	1660
CHROMIUM	20.5	14	14.6	19.4	11.3	15.3	14.4	13.5	27.8 J	25.4 J	110
COBALT	4.2	2.1	3.7	5.7	3.3	4.5	4.45	4.4	18.8 J	17.9 J	20.2
COPPER	55.8	13.4	20.8	97	10.2 B	11.6 B	12.1 B	12.6 B	38.3 J	38.9 J	103
IRON	20300	9690	17100	15700	9110	9420	9585	9750	29300 J	26100 J	93500
LEAD	118	20.5	23.3	114	9.8	17.1	17.95	18.8	74 J	71.2 J	4100 J

order	001	002	003	004	005	006	007	008	009	010	011
nsample	S36SD0010001	S36SD0020001	S36SD0030001	S36SD0040001	S36SD0050001	S36SD0060001	S36SD0060001-AVG	S36SD0060001-D	S36SD0070102	S36SD0080102	S36SD0090102
location	S36SD001	S36SD002	S36SD003	S36SD004	S36SD005	S36SD006	S36SD006	S36SD006	S36SD007	S36SD008	S36SD009
project_no	2144_20060824	2144_20060824	2144_20060824	2144_20060824	2144_20060824	2144_20060824	2144_20060824	2144_20060824	2144_20070817	2144_20070817	2144_20070817
sample_coc	S36SD0010001	S36SD0020001	S36SD0030001	S36SD0040001	S36SD0050001	S36SD0060001	S36SD0060001-AVG	S36SDDUP0101	S36SD0070102	S36SD0080102	S36SD0090102
sample_dat	20050720	20050720	20050720	20050720	20050720	20050721	20050721	20050721	20070411	20070411	20070411
top_depth	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	1	1	1
bottom_dep	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	2	2	2
sort	**c_001**	**c_002**	**c_003**	**c_004**	**c_005**	**c_006**	**c_007**	**c_008**	**c_009**	**c_010**	**c_011**
MAGNESIUM	521	794	566	905	504	588	587.5	587	2910 J	2970 J	1070
MANGANESE	158 K	116 K	425 K	395 K	292 K	215 K	255.5 K	296 K	1740 J	1800 J	1100
MERCURY	0.12	0.058 U	0.079 U	0.23	0.056 U	0.069 U	0.072 U	0.075 U	0.22 J	0.27 J	0.12
NICKEL	11.9	6	10.1	10.8	7.5	7.4 B	7.5 B	7.6 B	27.6 J	27.3 J	102
POTASSIUM	307	636	374	430	331	373	365.5	358	2790 J	2560 J	734
SELENIUM	0.78 UL	0.61 UL	0.97 UL	0.76 UL	0.71 UL	0.80 UL	0.815 UL	0.83 UL	1.8 UJ	1.9 UJ	0.74 UL
SILVER	4.9	0.56	0.5	1.3	0.37	0.48	0.415	0.35	0.61 UJ	0.64 UJ	0.25 U
SODIUM	99.1	93.7	97.2	134	64.5 B	83.2	81.3	79.4	727 J	652 J	246 U
THALLIUM	0.52 U	0.41 U	0.64 U	0.50 U	0.47 U	0.53 U	0.54 U	0.55 U	1.8 UJ	1.9 UJ	0.74 U
VANADIUM	17.4	15.3	21.4	26.4	16.3	16	17.1	18.2	51.1 J	43.4 J	24.6
ZINC	315 J	29.7 J	44.8 J	191 J	16.6 J	22.3 J	25.4 J	28.5 J	186 J	178 J	840
Miscellaneous Parameters (mg/kg)											
CYANIDE	0.17 U	0.12 U	0.17 U	0.14 U	0.13	0.26	0.17	0.16 U	0.78 UJ	0.83 UJ	0.31 UL
HEXAVALENT CHROMIUM	6.89 U	4.96 U	7.07 U	6.48 U	5.13 U	5.77 U	6.025 U	6.28 U			
PERCENT CLAY (%)									20 %	18 %	5 %
PERCENT GRAVEL (%)									0 %	0 %	36 %
PERCENT SAND (%)									1 %	1 %	41 %
PERCENT SILT (%)									79 %	81 %	18 %
TOTAL ORGANIC CARBON									78800 J	91000 J	50300
AVS/SEM (umo/g)											
ACID VOLATILE SULFIDE									0.091 UJ	37.7 J	21 L
CADMIUM									0.0014 UJ	0.0077 J	0.0052 J
COPPER									0.014 J	0.36 J	0.63 J
LEAD									0.0038 J	0.27 J	0.57 J
MERCURY									0.000061 UJ	0.000065 UJ	0.000025 UL
NICKEL									0.011 J	0.19 J	0.52 J
ZINC									0.18 B	2 J	1.2 J

order	012	013	014	015	016	017	018	019
nsample	S36SD0100102	S36SD0110102	S36SD0120102	S36SD0120102-AVG	S36SD0120102-D	S36SD0130102	S36SD0140102	S36SD0150102
location	S36SD010	S36SD011	S36SD012	S36SD012	S36SD012	S36SD013	S36SD014	S36SD015
project_no	2144_20070817	2144_20070817	2144_20070817	2144_20070817	2144_20070817	2144_20070817	2144_20070817	2144_20070817
sample_coc	S36SD0100102	S36SD0110102	S36SD0120102	S36SD0120102-AVG	S36DUP010102	S36SD0130102	S36SD0140102	S36SD0150102
sample_dat	20070411	20070411	20070411	20070411	20070411	20070411	20070412	20070412
top_depth	1	1	1	1	1	1	1	1
bottom_dep	2	2	2	2	2	2	2	2
sort	**c_012**	**c_013**	**c_014**	**c_015**	**c_016**	**c_017**	**c_018**	**c_019**
Volatile Organics (ug/kg)								
1,1,1-TRICHLOROETHANE								
1,1,2,2-TETRACHLOROETHANE								
1,1,2-TRICHLOROETHANE								
1,1,2-TRICHLOROTRIFLUOROETHANE								
1,1-DICHLOROETHANE								
1,1-DICHLOROETHENE								
1,2,4-TRICHLOROBENZENE								
1,2-DIBROMO-3-CHLOROPROPANE								
1,2-DIBROMOETHANE								
1,2-DICHLOROBENZENE								
1,2-DICHLOROETHANE								
1,2-DICHLOROPROPANE								
1,3-DICHLOROBENZENE								
1,4-DICHLOROBENZENE								
2-BUTANONE								
2-HEXANONE								
4-METHYL-2-PENTANONE								
ACETONE								
BENZENE								
BROMODICHLOROMETHANE								
BROMOFORM								
BROMOMETHANE								
CARBON DISULFIDE								
CARBON TETRACHLORIDE								
CHLOROBENZENE								
CHLORODIBROMOMETHANE								
CHLOROETHANE								
CHLOROFORM								
CHLOROMETHANE								
CIS-1,2-DICHLOROETHENE								
CIS-1,3-DICHLOROPROPENE								
CYCLOHEXANE								
DICHLORODIFLUOROMETHANE								
ETHYLBENZENE								
ISOPROPYLBENZENE								
METHYL ACETATE								
METHYL CYCLOHEXANE								
METHYL TERT-BUTYL ETHER								
METHYLENE CHLORIDE								
STYRENE								
TETRACHLOROETHENE								
TOLUENE								
TOTAL XYLENES								
TRANS-1,2-DICHLOROETHENE								
TRANS-1,3-DICHLOROPROPENE								
TRICHLOROETHENE								
TRICHLOROFLUOROMETHANE								
VINYL CHLORIDE								

order	012	013	014	015	016	017	018	019
nsample	S36SD0100102	S36SD0110102	S36SD0120102	S36SD0120102-AVG	S36SD0120102-D	S36SD0130102	S36SD0140102	S36SD0150102
location	S36SD010	S36SD011	S36SD012	S36SD012	S36SD012	S36SD013	S36SD014	S36SD015
project_no	2144_20070817	2144_20070817	2144_20070817	2144_20070817	2144_20070817	2144_20070817	2144_20070817	2144_20070817
sample_coc	S36SD0100102	S36SD0110102	S36SD0120102	S36SD0120102-AVG	S36DUP010102	S36SD0130102	S36SD0140102	S36SD0150102
sample_dat	20070411	20070411	20070411	20070411	20070411	20070411	20070412	20070412
top_depth	1	1	1	1	1	1	1	1
bottom_dep	2	2	2	2	2	2	2	2
sort	**c_012**	**c_013**	**c_014**	**c_015**	**c_016**	**c_017**	**c_018**	**c_019**
Semivolatile Organics (ug/kg)								
1,1-BIPHENYL								
1-METHYLNAPHTHALENE	190 UJ	210 UJ	250 UJ	245 UJ	240 UJ	220 UJ	170 UJ	220 UJ
2,2'-OXYBIS(1-CHLOROPROPANE)								
2,4,5-TRICHLOROPHENOL								
2,4,6-TRICHLOROPHENOL								
2,4-DICHLOROPHENOL								
2,4-DIMETHYLPHENOL								
2,4-DINITROPHENOL								
2,4-DINITROTOLUENE								
2,6-DINITROTOLUENE								
2-CHLORONAPHTHALENE								
2-CHLOROPHENOL								
2-METHYLNAPHTHALENE	190 UJ	210 UJ	250 UJ	245 UJ	240 UJ	220 UJ	170 UJ	220 UJ
2-METHYLPHENOL								
2-NITROANILINE								
2-NITROPHENOL								
3,3'-DICHLOROBENZIDINE								
3-NITROANILINE								
4,6-DINITRO-2-METHYLPHENOL								
4-BROMOPHENYL PHENYL ETHER								
4-CHLORO-3-METHYLPHENOL								
4-CHLOROANILINE								
4-CHLOROPHENYL PHENYL ETHER								
4-METHYLPHENOL								
4-NITROANILINE								
4-NITROPHENOL								
ACENAPHTHENE	190 UJ	210 UJ	250 UJ	245 UJ	240 UJ	220 UJ	170 UJ	220 UJ
ACENAPHTHYLENE	190 UJ	210 UJ	250 UJ	245 UJ	240 UJ	220 UJ	170 UJ	220 UJ
ACETOPHENONE								
ANTHRACENE	190 UJ	210 UJ	250 UJ	245 UJ	240 UJ	220 UJ	170 UJ	220 UJ
ATRAZINE								
BENZALDEHYDE								
BENZO(A)ANTHRACENE	190 UJ	210 UJ	1000 J	1000 J	1000 J	220 UJ	170 UJ	220 UJ
BENZO(A)PYRENE	190 UJ	810 J	250 UJ	245 UJ	240 UJ	220 UJ	170 UJ	220 UJ
BENZO(B)FLUORANTHENE	190 UJ	930 J	250 UJ	245 UJ	240 UJ	220 UJ	170 UJ	220 UJ
BENZO(G,H,I)PERYLENE	190 UJ	210 UJ	250 UJ	245 UJ	240 UJ	220 UJ	170 UJ	220 UJ
BENZO(K)FLUORANTHENE	190 UJ	63 J	250 UJ	245 UJ	240 UJ	220 UJ	170 UJ	220 UJ
BIS(2-CHLOROETHOXY)METHANE								
BIS(2-CHLOROETHYL)ETHER								
BIS(2-ETHYLHEXYL)PHTHALATE								
BUTYL BENZYL PHTHALATE								
CAPROLACTAM								
CARBAZOLE								
CHRYSENE	190 UJ	210 UJ	82 J	74.5 J	67 J	220 UJ	170 UJ	220 UJ
DI-N-BUTYL PHTHALATE								
DI-N-OCTYL PHTHALATE								
DIBENZO(A,H)ANTHRACENE	190 UJ	210 UJ	250 UJ	245 UJ	240 UJ	220 UJ	170 UJ	220 UJ
DIBENZOFURAN								

order	012	013	014	015	016	017	018	019
nsample	S36SD0100102	S36SD0110102	S36SD0120102	S36SD0120102-AVG	S36SD0120102-D	S36SD0130102	S36SD0140102	S36SD0150102
location	S36SD010	S36SD011	S36SD012	S36SD012	S36SD012	S36SD013	S36SD014	S36SD015
project_no	2144_20070817	2144_20070817	2144_20070817	2144_20070817	2144_20070817	2144_20070817	2144_20070817	2144_20070817
sample_coc	S36SD0100102	S36SD0110102	S36SD0120102	S36SD0120102-AVG	S36DUP010102	S36SD0130102	S36SD0140102	S36SD0150102
sample_dat	20070411	20070411	20070411	20070411	20070411	20070411	20070412	20070412
top_depth	1	1	1	1	1	1	1	1
bottom_dep	2	2	2	2	2	2	2	2
sort	**c_012**	**c_013**	**c_014**	**c_015**	**c_016**	**c_017**	**c_018**	**c_019**
DIETHYL PHTHALATE								
DIMETHYL PHTHALATE								
FLUORANTHENE	190 UJ	120 J	120 J	120 J	240 UJ	86 J	170 UJ	220 UJ
FLUORENE	190 UJ	210 UJ	250 UJ	245 UJ	240 UJ	220 UJ	170 UJ	220 UJ
HEXACHLOROBENZENE								
HEXACHLOROBUTADIENE								
HEXACHLOROCYCLOPENTADIENE								
HEXACHLOROETHANE								
INDENO(1,2,3-CD)PYRENE	190 UJ	210 UJ	250 UJ	245 UJ	240 UJ	220 UJ	170 UJ	220 UJ
ISOPHORONE								
N-NITROSO-DI-N-PROPYLAMINE								
N-NITROSODIPHENYLAMINE								
NAPHTHALENE	190 UJ	210 UJ	250 UJ	245 UJ	240 UJ	220 UJ	170 UJ	220 UJ
NITROBENZENE								
PENTACHLOROPHENOL								
PHENANTHRENE	190 UJ	210 UJ	250 UJ	245 UJ	240 UJ	220 UJ	170 UJ	220 UJ
PHENOL								
PYRENE	190 UJ	110 J	96 J	88 J	80 J	93 J	170 UJ	220 UJ
Explosives (mg/kg)								
1,3,5-TRINITROBENZENE								
1,3-DINITROBENZENE								
2,4,6-TRINITROTOLUENE								
2,4-DINITROTOLUENE								
2,6-DINITROTOLUENE								
2-AMINO-4,6-DINITROTOLUENE								
2-NITROTOLUENE								
3-NITROTOLUENE								
4-AMINO-2,6-DINITROTOLUENE								
4-NITROTOLUENE								
HMX								
NITROBENZENE								
NITROCELLULOSE								
NITROGLYCERIN								
NITROGUANIDINE								
RDX								
TETRYL								
Inorganics (mg/kg)								
ALUMINUM	21500 J	30700 J	19300 J	19000 J	18700 J	23000 J	25700 J	19300 J
ANTIMONY	2.9 UJ	3.4 UJ	3.9 UJ	3.9 UJ	3.9 UJ	3.3 UJ	2.4 UJ	3.6 UJ
ARSENIC	7.1 J	10.6 J	4.2 J	4.7 J	5.2 J	8.1 J	7.1 J	7.8 J
BARIUM	189 J	251 J	120 J	130 J	140 J	172 J	190 J	149 J
BERYLLIUM	1.3 J	1.7 J	0.86 J	0.91 J	0.96 J	1.7 J	1.5 J	1.6 J
CADMIUM	3.6 J	16 J	1.8 J	1.8 J	1.8 J	1 J	0.84 J	0.77 J
CALCIUM	4580 J	4900 J	3420 J	3740 J	4060 J	5990 J	5380 J	4800 J
CHROMIUM	29.8 J	42.4 J	24.4 J	24.65 J	24.9 J	30.7 J	37 J	26.5 J
COBALT	17.6 J	20.2 J	11 J	11.15 J	11.3 J	26.8 J	17.9 J	25.4 J
COPPER	45.2 J	127 J	33.4 J	33.2 J	33 J	38 J	40.8 J	30.4 J
IRON	40800 J	52200 J	21900 J	23750 J	25600 J	26000 J	29700 J	23100 J
LEAD	61.2 J	118 J	33.1 J	35.25 J	37.4 J	42.3 J	43.6 J	39 J

order	012	013	014	015	016	017	018	019
nsample	S36SD0100102	S36SD0110102	S36SD0120102	S36SD0120102-AVG	S36SD0120102-D	S36SD0130102	S36SD0140102	S36SD0150102
location	S36SD010	S36SD011	S36SD012	S36SD012	S36SD012	S36SD013	S36SD014	S36SD015
project_no	2144_20070817	2144_20070817	2144_20070817	2144_20070817	2144_20070817	2144_20070817	2144_20070817	2144_20070817
sample_coc	S36SD0100102	S36SD0110102	S36SD0120102	S36SD0120102-AVG	S36DUP010102	S36SD0130102	S36SD0140102	S36SD0150102
sample_dat	20070411	20070411	20070411	20070411	20070411	20070411	20070412	20070412
top_depth	1	1	1	1	1	1	1	1
bottom_dep	2	2	2	2	2	2	2	2
sort	**c_012**	**c_013**	**c_014**	**c_015**	**c_016**	**c_017**	**c_018**	**c_019**
MAGNESIUM	2760 J	3870 J	2840 J	2885 J	2930 J	3130 J	3550 J	2750 J
MANGANESE	1370 J	2080 J	489 J	609 J	729 J	1180 J	1260 J	778 J
MERCURY	0.26 J	0.29 J	0.21 J	0.21 J	0.21 J	2.9 J	0.21 J	0.25 J
NICKEL	26.6 J	36.6 J	20.6 J	20.8 J	21 J	29.7 J	28.5 J	27 J
POTASSIUM	2290 J	3500 J	2240 J	2315 J	2390 J	2480 J	3180 J	2100 J
SELENIUM	1.7 UJ	2 UJ	2.3 UJ	2.3 UJ	2.3 UJ	2 UJ	1.5 UJ	2.2 UJ
SILVER	0.58 UJ	0.81 J	0.78 UJ	1.045 J	1.7 J	0.65 UJ	0.49 UJ	0.72 UJ
SODIUM	587 J	755 J	777 UJ	777 UJ	777 UJ	650 UJ	503 J	718 UJ
THALLIUM	1.7 UJ	2 UJ	2.3 UJ	2.3 UJ	2.3 UJ	2 UJ	1.5 UJ	2.2 UJ
VANADIUM	50.1 J	66.5 J	42.6 J	43.5 J	44.4 J	61.4 J	57.9 J	57.9 J
ZINC	207 J	278 J	146 J	149 J	152 J	204 J	184 J	188 J
Miscellaneous Parameters (mg/kg)								
CYANIDE	0.74 UJ	0.83 UJ	0.96 UJ	0.96 UJ	0.96 UJ	0.83 UJ	0.63 UJ	0.89 UJ
HEXAVALENT CHROMIUM								
PERCENT CLAY (%)	31 %	21 %	12 %	13.5 %	15 %	23 %	12 %	20 %
PERCENT GRAVEL (%)	1 %	0 %	14 J %	8 J %	2 J %	1 %	4 %	1 %
PERCENT SAND (%)	3 %	3 %	20 J %	12.5 J %	5 J %	4 %	8 %	14 %
PERCENT SILT (%)	64 %	75 %	54 %	66.5 %	79 %	73 %	75 %	64 %
TOTAL ORGANIC CARBON	82200 J	72300 J	57000 J	77800 J	98600 J	72400 J	108000 J	162000 J
AVS/SEM (umo/g)								
ACID VOLATILE SULFIDE	14.3 J	28.4 J	0.67 J	0.3625 J	0.11 UJ	13.9 J	6.6 J	0.11 UJ
CADMIUM	0.018 J	0.13 J	0.014 J	0.007425 J	0.0017 UJ	0.015 J	0.0072 J	0.0068 J
COPPER	0.48 J	1.3 J	0.25 J	0.12945 J	0.0089 J	0.77 J	0.34 J	0.34 J
LEAD	0.28 J	0.48 J	0.12 J	0.061 J	0.002 J	0.34 J	0.15 J	0.16 J
MERCURY	0.000058 UJ	0.000066 UJ	0.000074 UJ	0.000075 UJ	0.000075 UJ	0.000066 UJ	0.000047 UJ	0.00007 UJ
NICKEL	0.2 J	0.25 J	0.094 J	0.0486 J	0.0064 UJ	0.2 J	0.14 J	0.19 J
ZINC	2.6 J	3 J	1.6 J	0.80975 J	0.039 B	3.9 J	1.7 J	2.3 J

order	006	007	008	010	011	012	013	014	015	016
site	36	36	36	36	36	36	36	36	36	36
location	S36PW001	S36PW001	S36PW001	S36PW001	S36PW002	S36PW002	S36PW003	S36PW003	S36PW004	S36PW004
nsample	S36PW0010101	S36PW0010101-AVG	S36PW0010101-D	S36PW0010101-F	S36PW0020101	S36PW0020101-F	S36PW0030101	S36PW0030101-F	S36PW0040101	S36PW0040101-F
sample	S36PW0010101	S36PW0010101-AVG	S36PWDUP0101	S36PW0010101	S36PW0020101	S36PW0020101	S36PW0030101	S36PW0030101	S36PW0040101	S36PW0040101
matrix	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW
sacode	ORIG	AVG	DUP	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
gis_date	20050721	20050721	20050721	20050721	20050721	20050721	20050720	20050720	20050720	20050720
sample_dat	07/21/05	07/21/05	07/21/05	07/21/05	07/21/05	07/21/05	07/20/05	07/20/05	07/20/05	07/20/05
validated	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
cto_proj	2144	2144	2144	2144	2144	2144	2144	2144	2144	2144
sort	c_006	c_007	c_008	c_010	c_011	c_012	c_013	c_014	c_015	c_016
Volatile Organics (ug/L)										
1,1,1-TRICHLOROETHANE	0.50 U	0.5 U	0.50 U		0.50 U		0.50 UJ		0.50 UJ	
1,1,2,2-TETRACHLOROETHANE	0.50 U	0.5 U	0.50 U		0.50 U		0.50 U		0.50 UJ	
1,1,2-TRICHLOROETHANE	0.50 UJ	0.5 UJ	0.50 UJ		0.50 UJ		0.50 UJ		0.50 UJ	
1,1,2-TRICHLOROTRIFLUOROETHANE	0.50 UJ	0.5 UJ	0.50 UJ		0.50 UJ		0.50 UJ		0.50 UJ	
1,1-DICHLOROETHANE	0.50 U	0.5 UJ	0.50 UJ		0.50 U		0.50 UJ		0.50 UJ	
1,1-DICHLOROETHENE	0.50 U	0.5 U	0.50 U		0.50 U		0.50 UJ		0.50 UJ	
1,2,3-TRICHLOROBENZENE	0.50 U	0.5 U	0.50 U		0.50 U		0.50 U		0.50 UJ	
1,2,4-TRICHLOROBENZENE	0.50 U	0.5 U	0.50 U		0.50 U		0.50 U		0.50 UJ	
1,2-DIBROMO-3-CHLOROPROPANE	0.50 U	0.5 U	0.50 U		0.50 U		0.50 U		0.50 UJ	
1,2-DIBROMOETHANE	0.50 U	0.5 UJ	0.50 UJ		0.50 UJ		0.50 UJ		0.50 UJ	
1,2-DICHLOROBENZENE	0.50 U	0.5 U	0.50 U		0.50 U		0.50 U		0.50 UJ	
1,2-DICHLOROETHANE	0.50 U	0.5 U	0.50 U		0.50 U		0.50 UJ		0.50 UJ	
1,2-DICHLOROPROPANE	0.50 U	0.5 U	0.50 U		0.50 U		0.50 U		0.50 UJ	
1,3-DICHLOROBENZENE	0.50 U	0.5 U	0.50 U		0.50 U		0.50 U		0.50 UJ	
1,4-DICHLOROBENZENE	0.50 U	0.5 U	0.50 U		0.50 U		0.50 U		0.50 UJ	
2-BUTANONE	5 U	5 U	5 U		5 U		5 U		5 UJ	
2-HEXANONE	5 U	5 U	5 U		5 UJ		5 UJ		5 UJ	
4-METHYL-2-PENTANONE	5 U	5 U	5 U		5 UJ		5 UJ		5 UJ	
ACETONE	5 U	5 U	5 U		5 U		5 U		5 UJ	
BENZENE	0.50 U	0.5 U	0.50 U		0.50 U		0.50 U		0.50 UJ	
BROMOCHLOROMETHANE	0.50 U	0.5 UJ	0.50 UJ		0.50 U		0.50 U		0.50 UJ	
BROMODICHLOROMETHANE	0.50 U	0.5 U	0.50 U		0.50 U		0.50 U		0.50 UJ	
BROMOFORM	0.50 U	0.5 UJ	0.50 UJ		0.50 UJ		0.50 UJ		0.50 UJ	
BROMOMETHANE	0.50 U	0.5 U	0.50 U		0.50 U		0.50 U		0.50 UJ	
CARBON DISULFIDE	0.50 U	0.5 U	0.50 U		0.50 U		0.50 U		0.50 UJ	
CARBON TETRACHLORIDE	0.50 U	0.5 U	0.50 U		0.50 U		0.50 UJ		0.50 UJ	
CHLOROBENZENE	0.50 U	0.5 U	0.50 U		0.50 U		0.50 U		0.50 UJ	
CHLORODIBROMOMETHANE	0.50 U	0.5 UJ	0.50 UJ		0.50 UJ		0.50 UJ		0.50 UJ	
CHLOROETHANE	0.50 U	0.5 U	0.50 U		0.50 U		0.50 U		0.50 UJ	
CHLOROFORM	0.50 U	0.5 UJ	0.50 UJ		0.50 U		0.50 UJ		0.50 UJ	
CHLOROMETHANE	0.50 U	0.5 U	0.50 U		0.50 U		0.50 U		0.50 UJ	
CIS-1,2-DICHLOROETHENE	0.50 U	0.5 U	0.50 U		0.50 U		0.50 U		0.50 UJ	
CIS-1,3-DICHLOROPROPENE	0.50 UJ	0.5 UJ	0.50 UJ		0.50 UJ		0.50 UJ		0.50 UJ	
CYCLOHEXANE	0.50 U	0.5 U	0.50 U		0.50 U		0.50 U		0.50 UJ	
DICHLORODIFLUOROMETHANE	0.50 U	0.5 U	0.50 U		0.50 U		0.50 U		0.50 UJ	
ETHYLBENZENE	0.50 U	0.5 U	0.50 U		0.50 U		0.50 U		0.50 UJ	
ISOPROPYLBENZENE	0.50 U	0.5 U	0.50 U		0.50 U		0.50 U		0.50 UJ	
METHYL ACETATE	0.50 U	0.5 U	0.50 U		0.50 U		0.50 UJ		0.50 UJ	
METHYL CYCLOHEXANE	0.50 U	0.5 U	0.50 U		0.50 U		0.50 U		0.50 UJ	
METHYL TERT-BUTYL ETHER	0.50 U	0.5 U	0.50 U		0.50 U		0.50 UJ		0.50 UJ	
METHYLENE CHLORIDE	0.42 B	1.36 B	2.3 B		0.50 U		0.64 B		0.50 UJ	
STYRENE	0.50 U	0.5 U	0.50 U		0.50 U		0.50 U		0.50 UJ	
TETRACHLOROETHENE	0.50 U	0.5 U	0.50 U		0.50 U		0.50 U		0.50 UJ	
TOLUENE	0.56	0.83	1.1		4		1.1		1.3 J	

order	006	007	008	010	011	012	013	014	015	016
site	36	36	36	36	36	36	36	36	36	36
location	S36PW001	S36PW001	S36PW001	S36PW001	S36PW002	S36PW002	S36PW003	S36PW003	S36PW004	S36PW004
nsample	S36PW0010101	S36PW0010101-AVG	S36PW0010101-D	S36PW0010101-F	S36PW0020101	S36PW0020101-F	S36PW0030101	S36PW0030101-F	S36PW0040101	S36PW0040101-F
sample	S36PW0010101	S36PW0010101-AVG	S36PWDUP0101	S36PW0010101	S36PW0020101	S36PW0020101	S36PW0030101	S36PW0030101	S36PW0040101	S36PW0040101
matrix	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW
sacode	ORIG	AVG	DUP	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
gis_date	20050721	20050721	20050721	20050721	20050721	20050721	20050720	20050720	20050720	20050720
sample_dat	07/21/05	07/21/05	07/21/05	07/21/05	07/21/05	07/21/05	07/20/05	07/20/05	07/20/05	07/20/05
validated	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
cto_proj	2144	2144	2144	2144	2144	2144	2144	2144	2144	2144
sort	**c_006**	**c_007**	**c_008**	**c_010**	**c_011**	**c_012**	**c_013**	**c_014**	**c_015**	**c_016**
TOTAL XYLENES	0.50 U	0.5 U	0.50 U		0.50 U		0.50 U		0.50 UJ	
TRANS-1,2-DICHLOROETHENE	0.50 U	0.5 U	0.50 U		0.50 U		0.50 U		0.50 UJ	
TRANS-1,3-DICHLOROPROPENE	0.50 UJ	0.5 UJ	0.50 UJ		0.50 UJ		0.50 UJ		0.50 UJ	
TRICHLOROETHENE	0.50 U	0.5 U	0.50 U		0.50 U		0.50 U		0.50 UJ	
TRICHLOROFLUOROMETHANE	0.50 U	0.5 U	0.50 U		0.50 U		0.50 UJ		0.50 UJ	
VINYL CHLORIDE	0.50 U	0.5 U	0.50 U		0.50 U		0.50 U		0.50 UJ	
Semivolatile Organics (ug/L)										
1,1-BIPHENYL	10 U	10 U	10 U		10 U		10 U		10 U	
2,2'-OXYBIS(1-CHLOROPROPANE)	10 U	10 U	10 U		10 U		10 U		10 U	
2,4,5-TRICHLOROPHENOL	25 U	25 U	25 U		25 U		25 U		25 U	
2,4,6-TRICHLOROPHENOL	10 U	10 U	10 U		10 U		10 U		10 U	
2,4-DICHLOROPHENOL	10 U	10 U	10 U		10 U		10 U		10 U	
2,4-DIMETHYLPHENOL	10 U	10 U	10 U		10 U		10 U		10 U	
2,4-DINITROPHENOL	25 U	25 U	25 U		25 U		25 U		25 U	
2,4-DINITROTOLUENE	10 U	10 U	10 U		10 U		10 U		10 U	
2,6-DINITROTOLUENE	10 U	10 U	10 U		10 U		10 U		10 U	
2-CHLORONAPHTHALENE	10 U	10 U	10 U		10 U		10 U		10 U	
2-CHLOROPHENOL	10 U	10 U	10 U		10 U		10 U		10 U	
2-METHYLNAPHTHALENE	10 U	10 U	10 U		10 U		10 U		10 U	
2-METHYLPHENOL	10 U	10 U	10 U		10 U		10 U		10 U	
2-NITROANILINE	25 U	25 U	25 U		25 U		25 U		25 U	
2-NITROPHENOL	10 U	10 U	10 U		10 U		10 U		10 U	
3,3'-DICHLOROBENZIDINE	10 U	10 U	10 U		10 U		10 U		10 U	
3-NITROANILINE	25 U	25 U	25 U		25 U		25 U		25 U	
4,6-DINITRO-2-METHYLPHENOL	25 U	25 U	25 U		25 U		25 U		25 U	
4-BROMOPHENYL PHENYL ETHER	10 U	10 U	10 U		10 U		10 U		10 U	
4-CHLORO-3-METHYLPHENOL	10 U	10 U	10 U		10 U		10 U		10 U	
4-CHLOROANILINE	10 U	10 U	10 U		10 U		10 U		10 U	
4-CHLOROPHENYL PHENYL ETHER	10 U	10 U	10 U		10 U		10 U		10 U	
4-METHYLPHENOL	1 J	1 J	10 U		10 U		10 U		10 U	
4-NITROANILINE	25 U	25 U	25 U		25 U		25 U		25 U	
4-NITROPHENOL	25 U	25 U	25 U		25 U		25 U		25 U	
ACENAPHTHENE	10 U	10 U	10 U		10 U		10 U		10 U	
ACENAPHTHYLENE	10 U	10 U	10 U		10 U		10 U		10 U	
ACETOPHENONE	10 U	10 U	10 U		10 U		10 U		2 J	
ANTHRACENE	10 U	10 U	10 U		10 U		10 U		10 U	
ATRAZINE	10 U	10 U	10 U		10 U		10 U		10 U	
BENZALDEHYDE	10 U	10 U	10 U		10 U		10 U		10 U	
BENZO(A)ANTHRACENE	10 U	10 U	10 U		10 U		10 U		10 U	
BENZO(A)PYRENE	10 U	10 U	10 U		10 U		10 U		10 U	
BENZO(B)FLUORANTHENE	10 U	10 U	10 U		10 U		10 U		10 U	
BENZO(G,H,I)PERYLENE	10 U	10 U	10 U		10 U		10 U		10 U	
BENZO(K)FLUORANTHENE	10 U	10 U	10 U		10 U		10 U		10 U	
BIS(2-CHLOROETHOXY)METHANE	10 U	10 U	10 U		10 U		10 U		10 U	
BIS(2-CHLOROETHYL)ETHER	10 U	10 U	10 U		10 U		10 U		10 U	

order	006	007	008	010	011	012	013	014	015	016
site	36	36	36	36	36	36	36	36	36	36
location	S36PW001	S36PW001	S36PW001	S36PW001	S36PW002	S36PW002	S36PW003	S36PW003	S36PW004	S36PW004
nsample	S36PW0010101	S36PW0010101-AVG	S36PW0010101-D	S36PW0010101-F	S36PW0020101	S36PW0020101-F	S36PW0030101	S36PW0030101-F	S36PW0040101	S36PW0040101-F
sample	S36PW0010101	S36PW0010101-AVG	S36PWDUP0101	S36PW0010101	S36PW0020101	S36PW0020101	S36PW0030101	S36PW0030101	S36PW0040101	S36PW0040101
matrix	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW
sacode	ORIG	AVG	DUP	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
gis_date	20050721	20050721	20050721	20050721	20050721	20050721	20050720	20050720	20050720	20050720
sample_dat	07/21/05	07/21/05	07/21/05	07/21/05	07/21/05	07/21/05	07/20/05	07/20/05	07/20/05	07/20/05
validated	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
cto_proj	2144	2144	2144	2144	2144	2144	2144	2144	2144	2144
sort	**c_006**	**c_007**	**c_008**	**c_010**	**c_011**	**c_012**	**c_013**	**c_014**	**c_015**	**c_016**
BIS(2-ETHYLHEXYL)PHTHALATE	10 U	10 U	10 U		10 U		10 U		2 B	
BUTYL BENZYL PHTHALATE	10 U	10 U	10 U		10 U		10 U		10 U	
CAPROLACTAM	10 U	10 U	10 U		10 U		10 U		10 U	
CARBAZOLE	10 U	10 U	10 U		10 U		10 U		10 U	
CHRYSENE	10 U	10 U	10 U		10 U		10 U		10 U	
DI-N-BUTYL PHTHALATE	10 U	10 U	10 U		10 U		10 U		10 U	
DI-N-OCTYL PHTHALATE	10 U	10 U	10 U		10 U		10 U		10 U	
DIBENZO(A,H)ANTHRACENE	10 U	10 U	10 U		10 U		10 U		10 U	
DIBENZOFURAN	10 U	10 U	10 U		10 U		10 U		10 U	
DIETHYL PHTHALATE	10 U	10 U	10 U		10 U		10 U		10 U	
DIMETHYL PHTHALATE	10 U	10 U	10 U		10 U		10 U		10 U	
FLUORANTHENE	10 U	10 U	10 U		10 U		10 U		10 U	
FLUORENE	10 U	10 U	10 U		10 U		10 U		10 U	
HEXACHLOROBENZENE	10 U	10 U	10 U		10 U		10 U		10 U	
HEXACHLOROBUTADIENE	10 U	10 U	10 U		10 U		10 U		10 U	
HEXACHLOROCYCLOPENTADIENE	10 U	10 U	10 U		10 U		10 U		10 U	
HEXACHLOROETHANE	10 U	10 U	10 U		10 U		10 U		10 U	
INDENO(1,2,3-CD)PYRENE	10 U	10 U	10 U		10 U		10 U		10 U	
ISOPHORONE	10 U	10 U	10 U		10 U		10 U		10 U	
N-NITROSO-DI-N-PROPYLAMINE	10 U	10 U	10 U		10 U		10 U		10 U	
N-NITROSODIPHENYLAMINE	10 U	10 U	10 U		10 U		10 U		10 U	
NAPHTHALENE	10 U	10 U	10 U		10 U		10 U		10 U	
NITROBENZENE	10 U	10 U	10 U		10 U		10 U		10 U	
PENTACHLOROPHENOL	25 U	25 U	25 U		25 U		25 U		25 U	
PHENANTHRENE	10 U	10 U	10 U		10 U		10 U		10 U	
PHENOL	10 U	10 U	10 U		10 U		10 U		10 U	
PYRENE	10 U	10 U	10 U		10 U		10 U		10 U	
Explosives (ug/L)										
1,3,5-TRINITROBENZENE	0.10 U	0.1 U	0.10 U		0.076 J		0.10 U		0.20 U	
1,3-DINITROBENZENE	0.25 J	0.45 J	0.65 J		0.10 U		0.10 U		0.20 U	
2,4,6-TRINITROTOLUENE	0.077 J	0.077 J	0.10 U		0.10 U		0.10 U		0.20 U	
2,4-DINITROTOLUENE	0.10 U	0.1 U	0.10 U		0.10 U		0.10 U		0.20 U	
2,6-DINITROTOLUENE	0.10 U	0.1 U	0.10 U		0.10 U		0.10 U		0.20 U	
2-AMINO-4,6-DINITROTOLUENE	0.10 U	0.1 U	0.10 U		0.10 U		0.10 U		0.20 U	
2-NITROTOLUENE	0.50 U	0.5 U	0.50 U		0.50 U		0.50 U		1 U	
3-NITROTOLUENE	0.50 U	0.5 U	0.50 U		0.50 U		0.50 U		1 U	
4-AMINO-2,6-DINITROTOLUENE	0.10 U	0.1 U	0.10 U		0.10 U		0.10 U		0.20 U	
4-NITROTOLUENE	0.50 U	0.073 J	0.073 J		0.50 U		0.50 U		1 U	
HMX	0.10 U	0.1 U	0.10 U		0.10 U		0.10 U		0.20 U	
NITROBENZENE	0.10 U	0.1 U	0.10 U		0.10 U		0.10 U		0.20 U	
NITROCELLULOSE	500 U	320 U	140 B		500 U		120 B		500 U	
NITROGLYCERIN	0.65 U	0.65 U	0.65 U		0.65 U		0.65 U		1.3 U	
NITROGUANIDINE	20 U	20 U	20 U		20 U		20 U		20 U	
RDX	0.10 U	0.1 U	0.10 U		0.10 U		0.10 U		0.20 U	
TETRYL	0.10 U	0.1 U	0.10 U		0.10 U		0.10 U		0.20 U	

order	006	007	008	010	011	012	013	014	015	016
site	36	36	36	36	36	36	36	36	36	36
location	S36PW001	S36PW001	S36PW001	S36PW001	S36PW002	S36PW002	S36PW003	S36PW003	S36PW004	S36PW004
nsample	S36PW0010101	S36PW0010101-AVG	S36PW0010101-D	S36PW0010101-F	S36PW0020101	S36PW0020101-F	S36PW0030101	S36PW0030101-F	S36PW0040101	S36PW0040101-F
sample	S36PW0010101	S36PW0010101-AVG	S36PWDUP0101	S36PW0010101	S36PW0020101	S36PW0020101	S36PW0030101	S36PW0030101	S36PW0040101	S36PW0040101
matrix	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW
sacode	ORIG	AVG	DUP	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
gis_date	20050721	20050721	20050721	20050721	20050721	20050721	20050720	20050720	20050720	20050720
sample_dat	07/21/05	07/21/05	07/21/05	07/21/05	07/21/05	07/21/05	07/20/05	07/20/05	07/20/05	07/20/05
validated	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
cto_proj	2144	2144	2144	2144	2144	2144	2144	2144	2144	2144
sort	**c_006**	**c_007**	**c_008**	**c_010**	**c_011**	**c_012**	**c_013**	**c_014**	**c_015**	**c_016**
Inorganics (ug/L)										
ALUMINUM	949 J	498.3 J	47.6 J		324 J		1930 J		539 J	
ANTIMONY	3.6 B	3.1 B	2.6 B		3.1 B		2.1 B		3.1 B	
ARSENIC	3.8	3.05	2.3		4.9		2.1		3.2	
BARIUM	136	126.5	117		280		68.4		93.2	
BERYLLIUM	0.20 U	0.2 U	0.20 U		0.20 U		0.20 U		0.20 U	
CADMIUM	0.76	0.535	0.31		1.3		0.23		0.3	
CALCIUM	32100	31850	31600		34500		18700		31800	
CHROMIUM	19.7	10.65	1.6		7.1		16.7		7.6	
COBALT	8.1	4.325	0.55		3.9		7.4		4.9	
COPPER	33.1	20.35	7.6		19.1		16.3		23.2	
IRON	38400 J	32150 J	25900 J		82800 J		16600 J		24600 J	
LEAD	14 J	7.55 J	1.1 J		6.4		2.4 K		1.9 K	
MAGNESIUM	17900	18050	18200		27100		14800		22700	
MANGANESE	2690	2470	2250		1890		1440		2620	
MERCURY	0.14 UL	0.14 UL	0.14 UL		0.14 UL		0.14 UL		0.13 UL	
NICKEL	300 J	174.8 J	49.6 J		154		364		271	
POTASSIUM	1510 B	1850 B	2190 B		5100 B		1300 B		7130	
SELENIUM	3 U	3 U	3 U		3 U		3 U		3 U	
SILVER	0.70 UL	0.7 UL	0.70 UL		0.70 UL		0.70 UL		0.70 UL	
SODIUM	64300	61700	59100		166000		64100		119000	
THALLIUM	2 U	2 U	2 U		2 U		2 U		2 U	
VANADIUM	2.6	1.4	0.40 U		0.40 U		3.8		3.2	
ZINC	68.1 J	34.575 J	2.1 B		64.9		42.5		70.4	
Inorganics, Filtered (ug/L)										
ALUMINUM		67.4	67.4	171		57.8		74.4		1090
ANTIMONY		2.4 B	2.4 B	3 B		2.1 B		2.1 B		2.7 B
ARSENIC		2 U	2 U	2 U		6.7		2 U		2.8
BARIUM		110	110	112		138		46		70.7
BERYLLIUM		0.2 U	0.20 U	0.20 U		0.20 U		0.20 U		0.20 U
CADMIUM		0.24	0.24	0.29		0.61		0.20 U		0.20 U
CALCIUM		28700	28700	29300		30200		17400		26500
CHROMIUM		0.95	0.95	0.69		0.50 U		0.72		2.9
COBALT		2	2	1.3		0.61		1.9		3.7
COPPER		2 B	2 B	4.3 B		7.2		1 U		9.6
IRON		21400	21400	21800		45500		6950		10400
LEAD		1.2	1.2	0.90 U		1.8		0.90 U		1.4
MAGNESIUM		16800	16800	17200		24900		13700		19200
MANGANESE		2310	2310	2270		1300		1170		2090
MERCURY		0.32 K	0.32 K	5.8		0.33 K		0.14 U		0.14 U
NICKEL		87.6	87.6	63.1		61.4		95.5		179
POTASSIUM		1010 B	1010 B	1030 B		4490 B		923 B		6170
SELENIUM		3 U	3 U	3 U		3 U		3 U		3 U
SILVER		0.7 UL	0.70 UL	0.70 UL		0.70 UL		0.70 UL		0.70 UL
SODIUM		70700	70700	67800		150000		64200		104000

order	006	007	008	010	011	012	013	014	015	016
site	36	36	36	36	36	36	36	36	36	36
location	S36PW001	S36PW001	S36PW001	S36PW001	S36PW002	S36PW002	S36PW003	S36PW003	S36PW004	S36PW004
nsample	S36PW0010101	S36PW0010101-AVG	S36PW0010101-D	S36PW0010101-F	S36PW0020101	S36PW0020101-F	S36PW0030101	S36PW0030101-F	S36PW0040101	S36PW0040101-F
sample	S36PW0010101	S36PW0010101-AVG	S36PWDUP0101	S36PW0010101	S36PW0020101	S36PW0020101	S36PW0030101	S36PW0030101	S36PW0040101	S36PW0040101
matrix	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW
sacode	ORIG	AVG	DUP	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
gis_date	20050721	20050721	20050721	20050721	20050721	20050721	20050720	20050720	20050720	20050720
sample_dat	07/21/05	07/21/05	07/21/05	07/21/05	07/21/05	07/21/05	07/20/05	07/20/05	07/20/05	07/20/05
validated	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
cto_proj	2144	2144	2144	2144	2144	2144	2144	2144	2144	2144
sort	**c_006**	**c_007**	**c_008**	**c_010**	**c_011**	**c_012**	**c_013**	**c_014**	**c_015**	**c_016**
THALLIUM		2 U	2 U	2 U		2 U		2 U		2 U
VANADIUM		0.4 U	0.40 U	0.40 U		0.40 U		0.40 U		3
ZINC		8.7 B	8.7 B	14.6 B		21.1 B		11.4 B		43.6
Miscellaneous Parameters (ug/L)										
CYANIDE	2 U	2 U	2 U		2 U		2 U		2 U	
HEXAVALENT CHROMIU(mg/L)	0.03 U	0.03 U	0.03 U		0.03 U		0.03 U		0.03 U	

APPENDIX C

DATA VALIDATION MEMORANDA

Tetra Tech NUS

INTERNAL CORRESPONDENCE

TO:	G. LATULIPPE	**DATE:**	OCTOBER 21, 2005
FROM:	EDWARD SEDLMYER	**COPIES:**	DV FILE

SUBJECT: **ORGANIC DATA VALIDATION – VOA/SVOA/EXP**
CTO 005, NDW INDIAN HEAD
SDG D0763

SAMPLES: 7 / Soil

S36SS0010001	S36SS0020001	S36SS0030001
S36SS0040001	S36SS0050001	S36SS0060001
S36SSDUP0101		

3 / Aqueous

S36RB0010001	S36TB0010001	S36TB0020001

OVERVIEW

The sample set for CTO 005; SDG D0763, NDW Indian Head consists of one (1) rinse blank, two (2) trip blanks, and seven (7) soil environmental samples, including one duplicate. All soil samples were analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOAs), and explosives. One field duplicate pairs were included in this SDG: (S36SSDUP0101 / S36SS0020001).

The samples were collected by TetraTech NUS on June 28 and 29, 2005 and analyzed by Mitkem Corporation. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using OLC03.2 and OLM04.3, except for explosives which were analyzed by Severn Trent Laboratories Inc. by SW-846 Method 8330 and EPA Method 353.2 analytical and reporting protocols.

The findings in this report are based upon a general review of all available data including: data completeness, system performance, holding times, GC/MS tuning, initial / continuing calibrations, laboratory method blank results, surrogate spike/internal standard recoveries, blank spike results, matrix spike/matrix spike duplicate results, compound identification, compound quantitation, field duplicates, and detection limits. Areas of concern are listed below.

Major Problems

- All VOA soil initial calibration and continuing calibration relative response factors (RRFs) were less than the 0.05 quality control limit for 1,2-dibromo-3-chloropropane on instrument "V1". The non-detected results reported for 1,2-dibromo-3-chloropropane were rejected (UR), in all soil samples.

Minor Problems

- A SVOA continuing calibration verification %D exceeded the 25% (but was <50%) quality control limit for benzaldehyde on instrument "S2", on 7/19/05 @09:00. The positive benzaldehyde result has been qualified as estimated (J), in sample RB0010001.

- The following compounds were detected in the method blanks at the maximum concentrations indicated below:

Compound	Concentration	Action Level
Methylene chloride	0.88 µg/L	8.8 µg/L
Methylene chloride	3 ug/kg	30 ug/kg
Phenol	40 ug/kg	200 ug/kg
Bis(2-ethylhexyl)phthalate	37 ug/kg	370 ug/kg

Blank Actions

- Value < Reporting Limit (RL); report value followed by a B.
- Value > RL and < Action Level; report value followed by a B.
- Value > RL and > Action Level; report value unqualified.

An action level of 10X the maximum contaminant concentration was established for methylene chloride and bis(2-ethylhexyl)phthalate and 5X for phenol to evaluate laboratory contamination. Dilution factors, percent solids, and sample aliquots were taken into consideration during the application of all action levels. The affected positive results were qualified (B) as a result of blank contamination for methylene chloride and bis(2-ethylhexyl)phthalate. Field QC samples were not qualified due to method blank contamination.

- The field duplicate pair S36SS002001 and S36SSDUP0101 exceeded the RPD and/or the difference between results was >2X RL quality control criteria for acetone. The positive and non-detected results for acetone were qualified as estimated (J) and (UJ), in the field duplicate pair.

- The soil method blank for the nitrocellulose analysis had a concentration of 1.7 mg/kg. The laboratory determined that the low end of the calibration curve had a high bias requiring re-analysis. The soil samples were re-analyzed outside of the 48 hour hydrolysis hold time. The re-analyzed soil samples were used for validation because the blank was clean. All soil nitrocellulose results have been qualified as estimated (J).

- Acetone was not detected in any associated method or trip blanks. However, acetone is considered a common laboratory contaminant and positive results have been qualified as estimated (J).

Notes

The VOA surrogate bromoform-d had a recovery greater than the quality control limit. No action was taken on this basis because no compounds associated with bromoform-d were detected.

The MS/MSD performed on sample S36SS0010001 had a relative percent difference (%RPD) outside the quality control limit for pentachlorophenol. No action was taken on this basis because the MS/MSD had acceptable recoveries.

The MS/MSD performed on sample S36SS010001 had a percent recovery less than the quality control limit for tetryl. No action was taken on this basis because tetryl was not detected in any associated samples.

The laboratory control sample (LCS) associated with the soil samples had a percent recovery less than the quality control limit for tetryl. No action was taken on this basis because tetryl was not detected in any associated samples.

The MS/MSD performed on sample S36SS0020001 had a percent recovery greater than the quality control limit for nitroglycerin. No action was taken on this basis bcause nitroglycerin was not detected in any associated samples.

EXECUTIVE SUMMARY

Laboratory Performance Issues: The initial and/or continuing calibration %RSD, %D, and /or RRF for the VOA and SVOA fraction analysis failed calibration criterion resulting in qualification of the data. Qualification of the volatile and semivolatile data was made due to laboratory blank contamination. Holding time non-compliance for nitrocellulose resulted in qualification of the data.

Other Factors Affecting Data Quality: Field duplicate imprecision resulted in qualification for one compound in the VOA fraction.

The data for these analyses were reviewed with reference to the EPA Functional Guidelines for Organic Data Validation (9/94) as modified by Region III, EPA Functional Guidelines for Low Concentration Organic Data Validation (6/01), and the NFESC guidelines "Navy IRCDQM" (September, 1999). The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC guidelines and the Quality Assurance Project Plan (QAPP)."

Edward Sedlmyer
TetraTech NUS

Edward Sedlmyer
Chemist/Data Validator

TetraTech NUS

Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO: [redacted] **DATE:** **OCTOBER 4, 2005**

FROM: **ETHAN G. LEE** **COPIES:** **DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION – TAL METALS AND MISCELLANEOUS PARAMETERS**
NDW INDIAN HEAD – CTO 005
SAMPLE DELIVERY GROUP (SDG) – D0763

SAMPLES: 7/SOIL/

S36SS0010001	S36SS0020001	S36SS0030001
S36SS0040001	S36SS0050001	S36SS0060001
S36SSDUP0101		

1/AQUEOUS/

S36RB0010001

Overview

The sample set for NDW Indian Head, CTO 005, SDG D0763, consists of seven (7) soil environmental samples and one (1) aqueous rinse blank. One (1) field duplicate pair (S36SSDUP0101 / S36SS0020001) is included in this SDG.

All samples were analyzed for target analyte list (TAL) metals, cyanide, and hexavalent chromium. The samples were collected by Tetra Tech NUS on June 28-29, 2005 and analyzed by Mitkem Corporation under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. Metals and cyanide analyses were conducted using CLP method ILM04.1. Hexavalent chromium analyses were conducted using SW-846 method 3060A and method 7196A.

Summary

All analytes, with the exception of selenium in several samples, were successfully analyzed. The findings offered in this report are based upon a general review of all available data. The data review was based on data completeness, holding times, calibration data, laboratory method/preparation blanks, interference check sample (ICS) results, matrix spike results, laboratory duplicate precision, laboratory control sample (LCS) results, ICP serial dilution results, field duplicate precision, detection limits, and analyte quantitation.

All metals analyses, with the exception of mercury, were conducted using Inductively Coupled Plasma (ICP) methodologies. Mercury analyses were conducted using Cold Vapor Atomic Absorption (CVAA) methodology.

Major Problems

- The soil matrix spike (MS) had a percent recovery (%R) <30% for selenium. Nondetected results reported for selenium were rejected (UR) in soil samples only.

Minor Problems

- The contract required detection limit (CRDL) standard run on 7/21/05 at 09:53 had a %R >120% for mercury. Positive results reported for mercury <2X the CRDL were qualified as biased high (K) in all samples.

- The CRDL standard run on 7/20/05 at 16:15 had %Rs >110% for silver and zinc. Positive results reported for silver and zinc <2X the CRDL in sample S36RB0010001 were qualified as biased high (K).

- The CRDL standards run on 7/20/05 at 18:06 and 19:29 had %Rs >110% for manganese and zinc. Positive results reported for manganese and zinc <2X the CRDL in sample S36RB0010001 were qualified as biased high (K). No qualification action was required in the soil samples because all results were >2X the CRDL.

- The following contaminants were detected in the laboratory method/preparation blanks at the following maximum concentrations:

Analyte	Maximum Concentration	Action Level
Aluminum	53.4 ug/L	53.4 mg/kg
Antimony	5.6 ug/L	5.6 mg/kg
Barium	5.2 ug/L	5.2 mg/kg
Calcium[1]	21.832 mg/kg	109.16 mg/kg
Cobalt	1.6 ug/L	1.6 mg/kg
Copper	4.1 ug/L	4.1 mg/kg
Iron	43.4 ug/L	43.4 mg/kg
Magnesium	117.7 ug/L	117.7 mg/kg
Manganese	2.0 ug/L	2.0 mg/kg
Nickel	1.7 ug/L	1.7 mg/kg
Potassium[1]	17.955 mg/kg	89.775 mg/kg
Silver[1]	0.349 mg/kg	1.745 mg/kg
Sodium	54.7 ug/L	54.7 mg/kg
Vanadium	1.2 ug/L	1.2 mg/kg
Zinc	17.6 ug/L	17.6 mg/kg
Cyanide	3.2 ug/L	0.8 mg/kg

[1] Maximum concentration present in soil preparation blank.

An action level of 5X the maximum concentration was used to evaluate the sample data for blank contamination. Sample aliquot, percent solids, and dilution factors, if applicable, were taken into consideration when evaluating for blank contamination. Positive results less than the action level for antimony, silver, sodium, and cyanide were qualified (B) as a result of blank contamination. The remaining analytes were not qualified for blank contamination because the results were either greater than the action level or they were nondetects. It should be noted that the rinse blank was not qualified for laboratory blank contamination and was not considered when determining blank action levels.

- The soil MS had a %R >125% for manganese. Positive results reported for manganese were qualified as biased high (K) in the soil samples only.

Notes

The CRDL standard run on 7/21/05 at 11:43 and 12:12 had %Rs >1105 for manganese. No qualification action was required because no environmental samples were associated with these standards.

The soil MS had a %R <30% for antimony. No qualification action was required because all antimony results were previously qualified for laboratory blank contamination.

Executive Summary

Laboratory Performance: Several analytes were qualified due to calibration noncompliance. Several analytes were present in the laboratory method/preparation blanks.

Other Factors Affecting Data Quality: Manganese results were qualified and selenium results were rejected due to matrix spike noncompliance.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", April 1993 and the NFESC document entitled "Navy IRCDQM" (September 1999).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Tetra Tech NUS
Ethan G. Lee
Environmental Scientist

Tetra Tech NUS
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation

Data Qualifier Key:

U	-	Value is a nondetect as reported by the laboratory.
UR	-	Nondetect is considered rejected as a result of technical noncompliance.
B	-	Positive result is considered to be an artifact of blank contamination and should not be considered present.
K	-	Positive result is considered biased high as a result of technical noncompliance.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO: G. LATULIPPE **DATE:** OCTOBER 17, 2005

FROM: BERNARD F SPADA III **COPIES:** DV FILE

SUBJECT: ORGANIC DATA VALIDATION- VOC/SVOC/EXP
CTO 005, NDW INDIAN HEAD
SDG D0848

SAMPLES: 15/Aqueous

S36PW0010101	S36PW0020101	S36PW0030101
S36PW0040101	S36PWDUP0101	S36RB0020001
S36SW0010101	S36SW0020101	S36SW0030101
S36S40040101	S36SW0050101	S36SW0060101
S36SWDUP0101	S36TB0030001-072005*	S36TB0030001-072105*

Overview

The sample set for CTO 005, NDW INDIAN HEAD, SDG D0848 consists of ten (10) environmental aqueous samples, two (2) trip blanks, one (1) rinse blank, and two (2) field duplicates. The trip blank samples denoted with an asterisk (*) were analyzed for volatile organic compounds (VOC) only. All remaining samples were analyzed for VOC, semivolatile organic compounds (SVOC), and explosives (EXP). The field duplicate pairs included in this SDG are (S36PWDUP0101 / S36PW0010101) and (S36SWDUP0101 / S36SW0010101).

The samples were collected by Tetra Tech NUS on July 20 and 21, 2005 and analyzed by Mitkem Corporation (VOC and SVOC) and Severn Trent Laboratories (EXP). All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using OLC03.2, OLM04.3, SW-846 8330, and EPA 353.2 analytical and reporting protocols.

The data contained in this SDG were validated with regard to the following parameters: data completeness, holding times, GCMS tuning, initial/continuing calibrations, laboratory method blank results, surrogate spike recoveries, blank spike/blank spike duplicate results, internal standard recoveries, chromatographic resolution, compound identification, compound quantitation, field duplicate precision, and detection limits. Areas of concern are listed below.

Major

- None.

Minor

- Positive results below the detection limit but above the method detection limit were qualified as estimated (J) due to uncertainty near detection limit.

- The volatile continuing calibration performed on July 26 at 10:55 exceeded the 30% relative standard deviation (RSD) quality control criteria (and was >50%) for 1,1,2-trichlorotrifluoroethane. Non-detected results for 1,1,2-trichlorotrifluoroethane were qualified as estimated (UJ) in samples S36PW0010101, S36PW0020101, S36PWDUP0101, S36SW0060101, and S36RB0020001.

- The following compounds were detected in the aqueous method blank:

Compound	Maximum Concentration	Blank Action Level
Methylene chloride	0.88 ug/L	8.8 ug/L
Bis(2-ethylhexyl)phthalate	1.0 ug/L	10 ug/L
Nitrocellulose	0.20 mg/L	1.0 mg/L

  Sample aliquot and dilution factors were taken into consideration when applying the blank action levels. Positive results for the aforementioned compounds below the action level were qualified as non-detected (B) in all samples except the rinse blank and trip blanks.

- The deuterated monitoring compound (DMC) 1,1-dichloroethene-d2 was below the percent recovery quality control criterion in sample S36TB0030001-072005. Non-detected results for cis-1,2-dichloroethene and trans-1,2-dichloroethene were qualified as estimated (UJ) in sample S36TB0030001-072005.

- The DMC chloroform-d was below the percent recovery quality control criterion in samples S36TB0030001-072005, S36SW0040101, S36PWDUP0101, and the re-analysis of sample S36PW0030101. Non-detected results for 1,1-dichloroethane, chloroform, and bromochloromethane were qualified as estimated (UJ) in the aforementioned samples.

- The DMC 1,2-dchloroethane-d4 was below the percent recovery quality control criterion in the re-analysis of samples S36PW0040101 and S36PW0030101. Non-detected results for 1,1-dichloroethene, trichlorofluoromethane, 1,1,2-trichlorotrifluoroethane, methyl acetate, MTBE, 1,1,1-trichloroethane, carbon tetrachloride, and 1,2-dichloroethane were qualified as estimated (UJ) in sample S36PW0030101. No action was taken for methylene chloride in sample S36PW0030101 on this basis because the result was qualified for method blank contamination. No action was taken for sample S36PW0040101 on this basis because the initial analysis was used for validation.

- The DMC benzene-d6 was below the percent recovery quality control criterion in samples S36TB0030001-072005, S36TB0030001-072105 and S36PW0030101. Non-detected results for benzene were qualified as estimated (UJ) in samples S36TB0030001-072005 and S36TB0030001-072105. No action was taken for sample S36PW0030101 on this basis because the re-analysis was used for validation.

- The DMC trans-1,3-dichloropropene-d4 was below the percent recovery quality control criterion in all samples except S36SW0040101 and the initial analysis of S36PW0040101. Non-detected results for cis-1,3-dichloropropene, trans-1,3-dichloropropene, and 1,1,2-trichloroethane were qualified as estimated (UJ) in all samples except S36SW0040101 and S36PW0040101.

- The DMC 2-hexanone-d5 was below the percent recovery quality control criterion in samples S36PW0020101, and the re-analysis of samples S36PW0030101 and S36PW0040101. Non-detected results for 2-hexanone and 4-methyl-2-pentanone were qualified as estimated (UJ) in samples S36PW0020101 and S36PW0030101. No action was taken for sample S36PW0040101 on this basis because the initial analysis was used for validation.

- The DMC bromoform-d was below the percent recovery quality control criterion in samples S36PW0030101, S36PW0020101, S36RB0020001, S36PWDUP0101, and the re-analysis of samples S36PW0030101 and S36PW0040101. Non-detected results for bromoform, dibromochloromethane, and 1,2-dibromoethane were qualified as estimated (UJ) in samples S36PW0030101, S36PW0020101, S36RB0020001, and S36PWDUP0101. No action was taken for sample S36PW0040101 on this basis because the initial analysis was used for validation.

- The DMC 1,1,2,2-tetrachloroethane-d2 was below the percent recovery quality control criterion in sample S36TB0030001-072005. Non-detected results for 1,1,2,2-tetrachloroethane and 1,2-dibromo-3-chloropropane were qualified as estimated (UJ) in sample S36TB0030001-072005.

- All internal standards were below the percent recovery quality control criterion in the VOC fraction of sample S36PW0040101. The sample was re-analyzed with compliant internal standard recoveries, however, two deuterated monitoring compounds were recovered <20% in the re-analysis. The original analysis was used for validation. Positive and non-detected results were qualified as estimated (J and UJ) in sample S36PW0040101.

- The internal standard 1,4-dichlorobenzene-d4 was below the percent recovery quality control criterion in the VOC fraction of sample S36SW0030101. The sample was re-analyzed with similar results. The initial analysis was used for validation because fewer DMCs were non-compliant. Non-detected results for bromoform, 1,3-dichlorobenzene, 1,2-dichlorobenzene, 1,4-dichlorobenzene, 1,2-dibromo-3-chloropropane, 1,2,4-trichlorobenzene, and 1,2,3-trichlorobenzene were qualified as estimated (UJ) in sample S36SW0030101.

- The percent recoveries of 1,3,5-trinitrobenzene, 2,4,6-trinitrotoluene, 2-nitrotoluene, RDX, and tetryl were below the quality control criterion in the MS/MSD performed on the EXP fraction of sample S36SW0050101. Non-detected results for the aforementioned compounds were qualified as estimated (UJ) in sample S36SW0050101.

- The positive results for 1,3-dinitrobenzene were qualified as estimated (J) in samples S36PW0010101 and S36PWDUP0101 due to percent difference between analytical columns >25%.

Notes

The laboratory truncated sample ID names due to limitations with their software. Two samples were truncated to the same ID. The trip blank samples were both listed as TB0030001 on the laboratory Forms II and VIII. The validator contacted the laboratory to determine which data corresponded to which sample. No action was taken on this basis. This item is noted as a completeness issue.

The laboratory did not submit raw data for the explosives analyses. On August 31 the laboratory was requested to submit the raw data for all explosives analyses. The laboratory re-submitted the explosives analyses including the raw data on October 10. No action was taken on this basis.

The volatile initial calibration performed on July 19, 2005 exceeded the 30% relative standard deviation (RSD) quality control criteria (but was <50%) for methylene chloride and 1,2,3-trichlorobenzene. No action was taken on this basis because all results for the aforementioned compounds were non-detected.

The volatile continuing calibration performed on July 25 at 09:53 exceeded the 25% difference (but was <50%) for 1,1,2-trichlorotrifluoroethane. No action was taken on this basis because all results for 1,1,2-trichlorotrifluoroethane were non-detected.

The volatile continuing calibration performed on July 26 at 10:55 exceeded the 25% difference (but was <50%) for bromomethane and trichlorofluoromethane. No action was taken on this basis because all results for the aforementioned compounds were non-detected

The volatile initial calibration performed on July 28, 2005 exceeded the 30% RSD (but was <50%) for methylene chloride and methyl acetate. No action was taken on this basis because all results for the aforementioned compounds were either non-detected or qualified for method blank contamination.

The DMC chloroethane-d5 exceeded the percent recovery quality control criterion in samples S36PW0040101, S36PW0010101, S36RB0020001, and the re-analysis of sample S36SW0030101. No action was taken on this basis because all associated results were non-detected in the aforementioned samples.

The DMC 1,2-dichloropropane-d6 was below the percent recovery quality control criterion in sample S36PW0030101. No action was taken on this basis because the re-analysis was used for validation.

The internal standard 1,4-difluorobenzene was below the percent recovery quality control criterion in the VOC fraction of sample S36PW0030101. The sample was re-analyzed with acceptable internal standard recoveries. The re-analysis was used for validtaion. No action was taken on this basis.

The percent recovery of 4-nitrophenol exceeded the quality control criterion in the SVOC LCS/MS/MSD. No actions were taken on this basis because all results for 4-nitrophenol were non-detected.

The percent recovery of 2-nitrotoluene was below the quality control criterion in the blank spikes (G5G270000-491 and G5G280000-585). No action was taken on this basis because the recoveries were 1% and 2% below criteria respectively, and the blank spike duplicate (G5G280000-585) was compliant.

The laboratory sub-contracted the explosives analyses. The data provided for the explosives analyses did not have the same sample names as listed on the chains of custody. The validator changed the sample names on the Form Is to match the chains of custody.

The field duplicate pair S36PWDUP0101 and S36PW0010101 exceeded the 50% relative percent difference (RPD) quality control criteria for toluene and 1,3-dinitrobenzene. No action was taken on this basis because the results were less than 2X the reporting limit.

Executive Summary

Laboratory Performance: Qualifications were made based on calibration non-compliances, surrogate recovery non-compliances, method blank contamination, %D between analytical columns, and internal standard non-compliances.

Other Factors Affecting Data Quality: Qualifications were made based on MS/MSD non-compliances.

The data for these analyses were reviewed with reference to U.S. EPA National Functional Guidelines for Data Validation as modified by EPA Region III (9/94), National Functional Guidelines for Low Concentration Organics (June 2001), and the NFESC guidelines entitled Navy IRCDQM (Sept. 1999). The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Bernard F Spada III

Tetra Tech NUS
Bernard F Spada III
Chemist/Data Validator

Edward Bedlmayer Jr for

Tetra Tech NUS
Joseph A. Samchuck
Quality Assurance Officer

Attachments:
Appendix A – Qualified Analytical Results
Appendix B – Results as Reported by the Laboratory
Appendix C – Support Documentation

Tetra Tech NUS

INTERNAL CORRESPONDENCE

TO:	**G. LATULIPPE**	**DATE:**	**SEPTEMBER 23, 2005**
FROM:	**ERIN M. FAUST**	**COPIES:**	**DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION – TAL METALS, HEXAVALENT CHROMIUM AND CYANIDE**
CTO 005 NDW INDIAN HEAD
SAMPLE DELIVERY GROUP (SDG) – D0848

SAMPLES: 13/Aqueous/

S36PW0010101	S36PW0020101	S36PW0030101
S36PW0040101	S36PWDUP0101	S36RB0020001
S36SW0010101	S36SW0020101	S39SW0030101
S36SW0040101	S36SW0050101	S36SW0060101
S36SWDUP0101		

Overview

The sample set for NDW Indian Head, CTO 005, SDG D0848, consists of twelve (12) aqueous environmental samples and one (1) aqueous rinsate blank, S36RB0020001. Two (2) field duplicate pairs (S36PWDUP0101 / S36PW0010101 and S36SWDUP0101 / S36SW0010101) are included within this SDG.

All samples were analyzed for target analyte list (TAL) metals, cyanide and hexavalent chromium. Samples S36PW0010101, S36PW0020101, S36PWDUP0101, S36PW0040101 and S36PW0030101 were also analyzed for dissolved TAL metals and were designated "-F". The samples were collected on July 20 and 21, 2005 and analyzed by Mitkem Corporation under Naval Facilities Engineering Service Center (NFESC) Quality Assurance / Quality Control (QA/QC) criteria. Metals and cyanide analyses were conducted using Contract Laboratory Program (CLP) method ILM04.1. Hexavalent chromium analyses were conducted using Standard Methods method SM3500.

Summary

All analytes were successfully analyzed. The findings offered in this report are based upon a general review of all available data. The data review was based on data completeness, holding times, calibration data, laboratory method/preparation blanks, interference check sample (ICS) results, matrix spike results, laboratory duplicate results, laboratory control sample (LCS) results, field duplicate results, ICP serial dilution results, detection limits and analyte quantitation.

All metals analyses, with the exception of mercury, were conducted using Inductively Coupled Plasma (ICP) instrumentation. Mercury analyses were conducted using Cold Vapor Atomic Absorption (CVAA) instrumentation.

Areas of concern with respect to data quality are listed below.

Minor Problems

- The Contract Required Detection Limit (CRDL) percent recovery for mercury was > 120% quality control limit, affecting the dissolved metals matrix. The positive results, less than two times the CRDL, reported for mercury in these samples were qualified as biased high, "K".

- The CRDL percent recovery for mercury was < 80% quality control limit, affecting the total metals matrix. The nondetected results reported for mercury in these samples were qualified as biased low, "UL".

- The CRDL percent recovery for silver was < 90% quality control limit, affecting all samples. The nondetected results reported for silver were qualified as biased low, "UL".

- The CRDL percent recovery for lead was > 110% quality control limit, affecting all total metals samples except S36PWDUP0101 and S36RB0020001. The positive results, less than two times the CRDL, reported for lead in these samples were qualified as biased high, "K".

- The CRDL percent recoveries for manganese, thallium and zinc were > 110% quality control limit, affecting all samples. The positive results, less than two times the CRDL, reported for manganese and zinc in sample S36RB0020001 were qualified as biased high, "K". No validation action was necessary for thallium because all thallium results were reported by the laboratory as nondetected.

- The following contaminants were detected in the laboratory method/preparation blanks at the following maximum concentrations:

Analyte	Maximum Concentration	Action Level
Antimony	2.1 µg/L	10.5 µg/L
Barium[1]	1.646 µg/L	8.23 µg/L
Calcium[1]	93.298 µg/L	466.49 µg/L
Copper	1.1 µg/L	5.5 µg/L
Iron[1]	12.015 µg/L	60.075 µg/L
Magnesium	11.0 µg/L	55.0 µg/L
Manganese[1]	0.764 µg/L	3.82 µg/L
Potassium[1]	1030.756 µg/L	5153.78 µg/L
Sodium	694.2 µg/L	3471 µg/L
Thallium	2.3 µg/L	11.5 µg/L
Zinc[1]	7.368 µg/L	36.84 µg/L

[1] Maximum concentration present in a laboratory preparation blank.

An action level of 5X the maximum contaminant level has been used to evaluate sample data for blank contamination. Sample aliquot and dilution factors, if applicable, were taken into consideration when evaluating for blank contamination. Positive results less than the blank action level reported for antimony, copper, potassium and zinc were qualified "B" as a result of laboratory blank contamination.

- Field duplicate imprecision (RPD > 30%) was noted for iron in both the S36PWDUP0101 / S36PW0010101 and S36SWDUP0101 / S36SW0010101 sample pairs, affecting the total metals matrix. The positive results reported for iron in the total metals samples were qualified as estimated, "J". The rinsate blank sample was not qualified due to field duplicate imprecision.

- Field duplicate imprecision (difference > 2X CRDL) was noted for aluminum in both the S36PWDUP0101 / S36PW0010101 and S36SWDUP0101 / S36SW0010101 sample pairs, affecting the total metals matrix. The positive results reported for aluminum in the total metals samples qualified as estimated, "J". The rinsate blank sample was not qualified due to field duplicate imprecision.

- Field duplicate imprecision (RPD > 30%) was noted for lead, nickel and zinc in the S36SWDUP0101 / S36SW0010101 sample pair. The positive results reported for these analytes in this sample pair only were qualified as estimated, "J".

- Field duplicate imprecision (difference > 2X CRDL) was noted for manganese in the S36PWDUP0101 / S36PW0010101 sample pair, affecting the total metals matrix. The positive results reported for manganese in this sample pair only were qualified as estimated, "J".

Notes

The rinsate blank sample was not used to establish blank action levels and was not qualified due to laboratory blank contamination.

Executive Summary

Laboratory Performance: Lead, manganese, mercury, silver and zinc were qualified due to calibration noncompliance. Several analytes were present in the laboratory method/preparation blanks.

Other Factors Affecting Data Quality: Field duplicate imprecision was noted for several analytes.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Data Validation", April 1993 as amended for use within USEPA Region III, and the NFESC document entitled "Navy Installation Restoration Chemical Data Quality Manual" (September 1999).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Erin M Faust

Tetra Tech NUS
Erin M. Faust
Environmental Scientist

Edward Siedlanor /for

Tetra Tech NUS
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation

Data Qualifier Key:

B	-	Positive result is considered to be an artifact of blank contamination and should not be considered present.
J	-	Positive result is considered estimated, "J", as a result of technical noncompliances.
K	-	Positive result is considered biased high, "K", as a result of technical noncompliances.
U	-	Value is a nondetect as reported by the laboratory.
UL	-	Nondetected result is considered biased low, "UL", as a result of technical noncompliances.

Tetra Tech NUS

INTERNAL CORRESPONDENCE

TO:	**G. LATULIPPE**	**DATE:**	**OCTOBER 17, 2005**
FROM:	**BERNARD F SPADA III**	**COPIES:**	**DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION- VOC/SVOC/EXP**
CTO 005, NDW INDIAN HEAD
SDG D0849

SAMPLES: 7/Sediment

S36SD0010101	S36SD0020001	S36SD0030001
S36SD0040001	S36SD0050001	S36SD0060001
S36SDDUP0101		

Overview

The sample set for CTO 005, NDW INDIAN HEAD, SDG D0849 consists of six (6) environmental sediment samples and one (1) field duplicate. All samples were analyzed for volatile organic compounds (VOC), semivolatile organic compounds (SVOC), and explosives (EXP). The field duplicate pair included in this SDG is S36SDDUP0101 and S36SD0060001.

The samples were collected by Tetra Tech NUS on July 20 and 21, 2005 and analyzed by Mitkem Corporation (VOC and SVOC) and Severn Trent Laboratories (EXP). All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using OLM04.3, SW-846 8330, and EPA 353.2 analytical and reporting protocols.

The data contained in this SDG were validated with regard to the following parameters: data completeness, holding times, GCMS tuning, initial/continuing calibrations, laboratory method blank results, surrogate spike recoveries, blank spike/blank spike duplicate results, internal standard recoveries, chromatographic resolution, compound identification, compound quantitation, field duplicate precision, and detection limits. Areas of concern are listed below.

Major

- The VOC initial calibration performed on July 14, 2005 was below the 0.05 relative response factor (RRF) quality control criterion for 1,2-dibromo-3-chloropropane. Non-detected results for 1,2-dibromo-3-chloropropane were rejected (UR) in all samples.

Minor

- Positive results below the detection limit but above the method detection limit were qualified as estimated (J) due to uncertainty near detection limit.
- The volatile initial calibration performed on July 14, 2005 exceeded the 30% relative standard deviation (RSD) quality control criteria (but was <50%) for acetone. Positive results for acetone were qualified as estimated (J).

- The SVOC continuing calibration performed on August 1 at 13:59 exceeded the 25% difference quality control criterion (but was <50%) for benzaldehyde, pentachlorophenol, butylbenzlyphthalate, and di-n-octylphthalate. Positive results for benzaldehyde were qualified as estimated (UJ) in samples S36SD0010001, S36SD0030001, and S36SDDUP0101. No action was taken for non-detected results for the aforementioned compounds.

- The SVOC continuing calibration performed on August 15 at 12:20 exceeded the 25% difference quality control criterion (but was <50%) for benzaldehyde, hexachlorobenzene, pentachlorophenol, carbazole, pyrene, butylbenzlyphthalate, bis(2-ethylhexyl)phthalate, and di-n-octylphthalate. The positive result for pyrene was qualified as estimated (J) in sample S36SD0040001. No further action was taken on this basis because all associated results for the aforementioned compounds were either non-detected or qualified for method blank contamination.

- The following compounds were detected in the method blanks:

Compound	Maximum Concentration	Blank Action Level
Methylene chloride	5.0 ug/kg	50 ug/kg
Bis(2-ethylhexyl)phthalate	41 ug/kg	410 ug/kg
Nitrocellulose	0.12 mg/kg	6.0 mg/kg

  Sample aliquot, percent solids, and dilution factors were taken into consideration when applying the blank action levels. Positive results for the aforementioned compounds below the action level were qualified as non-detected (B) due to method blank contamination.

- Although acetone was not detected in the method blanks, it is considered a common laboratory contaminant. Positive acetone results were qualified as estimated (J).

- The SVOC internal standard perylene-d12 was below the percent recovery quality control criterion in sample S36SD0020001. The sample was not re-extracted and re-analyzed because the surrogate also was below criterion in the MS/MSD performed on the sample. Positive and non-detected results for di-n-octylphthalate, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, dibenzo(a,h)anthracene, and benzo(g,h,i)perylene were qualified as estimated (J and UJ) in sample S36SD0020001.

- The field duplicate pair S43SDDUP0101 and S43SD0060001 exceeded the 50% relative percent difference (RPD) quality control criteria for acetone. The positive results for acetone were qualified as estimated (J) in samples S43SDDUP0101 and S43SD0060001.

- The percent recoveries of 1,3-dinitrobenzene, 2,4,6-trinitrotoluene, 2,4-dinitrotoluene, 2,6-dinitrotoluene, 2-amino-4,6-dinitrotoluene, 2-nitrotoluene, 3-nitrotoluene, 4-amino-2,6-dinitrotoluene, 4-nitrotoluene, and nitrobenzene were below the quality control criterion in the EXP blank spike. Non-detected results for the aforementioned compounds were qualified as estimated (UJ) in all samples.

- The percent recoveries of 1,3-dinitrobenzene, 2-nitrotoluene, 3-nitrotoluene, 4-amino-2,6-dinitrotoluene, 4-nitrotoluene, and tetryl were below the quality control criterion in the MS/MSD performed on sample S36SD0020001. Non-detected results for the aforementioned compounds were qualified as estimated (UJ) in sample S36SD0020001.

Notes

The laboratory did not submit raw data for the explosives analyses. On August 31 the laboratory was requested to submit the raw data for all explosives analyses. The laboratory re-submitted the explosives analyses including the raw data on October 10. No action was taken on this basis.

The VOC continuing calibration performed on July 27 at 10:52 was below the 0.05 RRF quality control criterion for 1,2-dibromo-3-chloropropane. No action was taken on this basis because only QC samples were associated with this calibration.

The VOC continuing calibration performed on July 25 at 10:31 exceeded the 25% difference (but was <50%) for 4-methyl-2-pentanone. No action was taken on this basis because all results for 4-methyl-2-pentanone were non-detected.

The VOC continuing calibration performed on July 27 at 10:52 exceeded the 25% difference (but was <50%) for acetone and 2-butanone. No action was taken on this basis because only QC samples were associated with this calibration.

The SVOC surrogate terphenyl-d14 exceeded the percent recovery quality control criterion in sample S36SD0060001. No action was taken on this basis because only one surrogate was non-compliant.

The percent recoveries of 4-nitrophenol and 2,4-dinitrotoluene exceeded the quality control criterion in the SVOC MS/MSD performed on sample S36SD0020001. No actions were taken on this basis because all results for the aforementioned compounds were non-detected.

The percent recovery of pyrene exceeded the quality control criterion in the MSD performed on sample S36SD0020001. No action was taken on this basis because the MS was compliant.

The percent recoveries of 2,4-dinitrotoluene, 2,6-dinitrotoluene, and 2-amino-4,6-dinitrotoluene were below the quality control criterion in the MS performed on sample S36SD0020001. No action was taken on this basis because the recoveries were compliant in the MSD.

The laboratory sub-contracted the explosives analyses. The data provided for the explosives analyses did not have the same sample names as listed on the chains of custody. The validator changed the sample names on the Form Is to match the chains of custody.

Executive Summary

Laboratory Performance: Qualifications were made based on calibrations, blank spike non-compliances, method blank contamination, and internal standard non-compliances.

Other Factors Affecting Data Quality: Qualifications were made based on MS/MSD non-compliances and field duplicate imprecision.

The data for these analyses were reviewed with reference to U.S. EPA National Functional Guidelines for Data Validation as modified by EPA Region III (9/94) and the NFESC guidelines entitled Navy IRCDQM (Sept. 1999). The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Bernard F Spada III

Tetra Tech NUS
Bernard F Spada III
Chemist/Data Validator

Edward Sedlmayer /for

Tetra Tech NUS
Joseph A. Samchuck
Quality Assurance Officer

Attachments:
Appendix A – Qualified Analytical Results
Appendix B – Results as Reported by the Laboratory
Appendix C – Support Documentation

Tetra Tech NUS

INTERNAL CORRESPONDENCE

TO:	**G. LATULIPPE**	**DATE:**	**OCTOBER 4, 2005**
FROM:	**ETHAN G. LEE**	**COPIES:**	**DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION – TAL METALS AND MISCELLANEOUS PARAMETERS**
NDW INDIAN HEAD – CTO 005
SAMPLE DELIVERY GROUP (SDG) – D0849

SAMPLES: 7/SEDIMENT/

S36SD0010001	S36SD0020001	S36SD0030001
S36SD0040001	S36SD0050001	S36SD0060001
S36SDDUP0101		

Overview

The sample set for NDW Indian Head, CTO 005, SDG D0849, consists of seven (7) sediment environmental samples. One (1) field duplicate pair (S36SDDUP0101 / S36SD0060001) is included in this SDG.

All samples were analyzed for target analyte list (TAL) metals, cyanide, and hexavalent chromium. The samples were collected by Tetra Tech NUS on July 20-21, 2005 and analyzed by Mitkem Corporation under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. Metals and cyanide analyses were conducted using CLP method ILM04.1. Hexavalent chromium analyses were conducted using SW-846 method 7196A.

Summary

All analytes were successfully analyzed. The findings offered in this report are based upon a general review of all available data. The data review was based on data completeness, holding times, calibration data, laboratory method/preparation blanks, interference check sample (ICS) results, matrix spike results, laboratory duplicate precision, laboratory control sample (LCS) results, ICP serial dilution results, field duplicate precision, detection limits, and analyte quantitation.

All metals analyses, with the exception of mercury, were conducted using Inductively Coupled Plasma (ICP) methodologies. Mercury analyses were conducted using Cold Vapor Atomic Absorption (CVAA) methodology.

Minor Problems

- The following contaminants were detected in the laboratory method/preparation blanks at the following maximum concentrations:

Analyte	Maximum Concentration	Action Level
Aluminum	24.2 ug/L	24.2 mg/kg
Barium[1]	0.264 mg/kg	1.32 mg/kg
Calcium[1]	30.87 mg/kg	154.4 mg/kg
Chromium[1]	1.329 mg/kg	6.645 mg/kg
Copper[1]	1.94 mg/kg	9.7 mg/kg
Iron[1]	24.856 mg/kg	124.28 mg/kg
Magnesium	18.7 ug/L	18.7 mg/kg
Manganese[1]	0.338 mg/kg	1.69 mg/kg
Nickel[1]	1.174 mg/kg	5.87 mg/kg
Sodium[1]	11.542 mg/kg	57.71 mg/kg
Thallium	3.8 ug/L	3.8 mg/kg
Vanadium	0.4 ug/L	0.4 mg/kg
Zinc[1]	1.842 mg/kg	9.21 mg/kg

[1] Maximum concentration present in sediment preparation blank.

An action level of 5X the maximum concentration was used to evaluate the sample data for blank contamination. Sample aliquot, percent solids, and dilution factors, if applicable, were taken into consideration when evaluating for blank contamination. Positive results less than the action level for copper, nickel, and sodium were qualified (B) as a result of blank contamination. The remaining analytes were not qualified for blank contamination because the results were either greater than the action level or they were nondetects.

- The matrix spike (MS) had percent recoveries (%Rs) <75% for antimony and selenium and >125% for manganese. Positive results reported for antimony were qualified as biased low (L). Positive results reported for manganese were qualified as biased high (K). Nondetected results reported for antimony and selenium were qualified as biased low (UL).

- The ICP serial dilution had a percent difference (%D) >10% and an initial sample concentration >50X the instrument detection limit (IDL) for zinc. Positive results reported for zinc were qualified as estimated (J).

Notes

The contract required detection limit (CRDL) standard run on 8/15/05 at 19:41 had a %R <90% for lead. No qualification action was required because no samples that were associated with this standard were analyzed for lead.

The CRDL standards run on 8/15/05 at 19:41 and 20:55 had %Rs >110% for selenium. No qualification action was required because all selenium results were nondetects.

The CRDL standard run on 8/16/05 at 10:04 had a %R <90% for lead. No qualification action was required because all lead results were >2X the CRDL.

The MS had a %R >125% for lead. No qualification action was required because the initial sample concentration was >4X the spike added.

The post digest spike had %Rs <30% for antimony and selenium and <75% for manganese. No qualification action was required on this basis.

The Form 1 for hexavalent chromium in sample S36SD0040001 was missing from the original data package submittal. The laboratory was contacted and B. Dodge submitted the missing form.

Executive Summary

Laboratory Performance: Several analytes were present in the laboratory method/preparation blanks.

Other Factors Affecting Data Quality: Several analytes were qualified due to matrix spike noncompliance. Zinc was qualified due to ICP serial dilution noncompliance.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", April 1993 and the NFESC document entitled "Navy IRCDQM" (September 1999).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Tetra Tech NUS
Ethan G. Lee
Environmental Scientist

Tetra Tech NUS
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation

Data Qualifier Key:

U	-	Value is a nondetect as reported by the laboratory.
UL	-	Nondetect is considered biased low as a result of technical noncompliance.
B	-	Positive result is considered to be an artifact of blank contamination and should not be considered present.
J	-	Positive result is considered estimated as a result of technical noncompliance.
K	-	Positive result is considered biased high as a result of technical noncompliance.
L	-	Positive result is considered biased low as a result of technical noncompliance.

Tetra Tech NUS

INTERNAL CORRESPONDENCE

TO:	**G. LATULIPPE**	**DATE:**	**OCTOBER 17, 2005**
FROM:	**BERNARD F SPADA III**	**COPIES:**	**DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION- VOC/SVOC/EXP**
CTO 005, NDW INDIAN HEAD
SDG D0874

SAMPLES: 14/Aqueous

S36MW0010101	S36MW0020101	S36MW0030101
S36MWDUP0101	S36TB0040001	S38MW0010102
S38MW0010102D*	S38MW0020102	S38MW0030102*
S38MW0040102D	S38MW0040102S*	S38MWDUP0102*
S38TB0020002	S38TB0030002	

Overview

The sample set for CTO 005, NDW INDIAN HEAD, SDG D0874 consists of nine (9) environmental aqueous samples, three (3) trip blanks, and two (2) field duplicates. All samples were analyzed for volatile organic compounds (VOC). All samples except the trip blanks were also analyzed for semivolatile organic compounds (SVOC). The samples denoted with an asterisk (*) were also analyzed for explosives (EXP). The field duplicate pairs included in this SDG are (S36MWDUP0101 / S36MW0010101) and (S38MWDUP0102 / S38MW0010102D).

The samples were collected by Tetra Tech NUS on July 26-28, 2005 and analyzed by Mitkem Corporation (VOC and SVOC) and Severn Trent Laboratories (EXP). All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using OLC03.2, OLM04.3, SW-846 8330, and EPA 353.2 analytical and reporting protocols.

The data contained in this SDG were validated with regard to the following parameters: data completeness, holding times, GCMS tuning, initial/continuing calibrations, laboratory method blank results, surrogate spike recoveries, blank spike/blank spike duplicate results, internal standard recoveries, chromatographic resolution, compound identification, compound quantitation, field duplicate precision, and detection limits. Areas of concern are listed below.

Major

- The VOC continuing calibration performed on August 2 at 10:18 was below the 0.05 relative response factor (RRF) quality control criterion for methyl acetate. The non-detected result for methyl acetate were rejected (UR) in sample S36MWDUP0101.

Minor

- Positive results below the detection limit but above the method detection limit were qualified as estimated (J) due to uncertainty near detection limit.

- The VOC initial calibration performed on July 28, 2005 exceeded the 50% relative standard deviation (RSD) quality control criterion for acetone. Non-detected results for acetone were qualified as estimated (UJ) in all samples.

- The SVOC continuing calibration performed on August 17 at 10:51 exceeded the 25% (but was <50%) difference quality control criterion for benzaldehyde. Positive results for benzaldehyde were qualified as estimated (J) in samples S36MW0010101, S36MW0020101, and S36MWDUP0101.

- The following compounds were detected in the aqueous method blank:

Compound	Maximum Concentration	Blank Action Level
Methylene chloride	0.84 ug/L	8.4 ug/L
Nitrocellulose	0.2 mg/L	1.0 mg/L

  Sample aliquot and dilution factors were taken into consideration when applying the blank action levels. No action was taken on this basis because field blanks were not qualified for method blank contamination.

- The VOC deuterated monitoring compounds 1,2-dichloropropane-d6 and trans-1,3-dichloropropene-d4 were below the percent recovery quality control criteria in sample S36MWDUP0101. Non-detected results for 1,1,2-trichloroethane, 1,2-dichloropropane, bromodichloromethane, cis-1,3-dichloropropene, cyclohexane, methyl cyclohexane, and trans-1,3-dichloropropene were qualified as estimated (UJ) in sample S36MWDUP0101.

- The SVOC continuing calibration performed on August 23 at 10:47 exceeded the 25% (and was >50%) difference quality control criterion for benzaldehyde. The non-detected result for benzaldehyde was qualified as estimated (UJ) in sample S38MW0030102.

Notes

The volatile initial calibration performed on July 28, 2005 exceeded the 30% relative standard deviation (RSD) quality control criteria (but was <50%) for methylene chloride and methyl acetate. No action was taken on this basis because all results for the aforementioned compounds were either non-detected or qualified for method blank contamination.

The volatile continuing calibration performed on August 1 at 10:36 exceeded the 25% difference (but was <50%) for methylene chloride. No action was taken on this basis because all results for methylene chloride were either non-detected or qualified for method blank contamination.

The volatile continuing calibration performed on August 2 at 10:18 exceeded the 25% difference (but was <50%) for trichlorofluoromethane and carbon disulfide. No action was taken on this basis because the associated results for the aforementioned compounds were non-detected.

The volatile continuing calibration performed on August 2 at 10:18 exceeded the 25% difference (and was >50%) for methyl acetate. No action was taken on this basis because the associated result for methyl acetate was rejected for RRF non-compliance.

The VOC deuterated monitoring compound 1,1,2,2-tetrachloroethane-d2 exceeded the percent recovery quality control criterion in sample S36MW0010101. No action was taken on this basis because all associated results were non-detected in sample S36MW001001.

Sample S36MW0020101 was re-analyzed at a 4X dilution because the concentration of toluene exceeded the linear calibration range of the instrument. The result for toluene from the 4X dilution was used for validation.

The SVOC initial calibration performed on August 19, 2005 exceeded the 30% RSD (but was <50%) quality control criterion for benzaldehyde and 4-chloroaniline. No action was taken on this basis because all associated results for the aforementioned compounds were non-detected.

The SVOC continuing calibration performed on August 17 at 10:51 exceeded the 25% (but was <50%) difference quality control criterion for 2,2'-oxybis(1-chloropropane), hexachlorocyclopentadiene, 2,4,6-trichlorophenol, 4-nitroaniline, indeno(1,2,3-cd)pyrene, and benzo(g,h,i)perylene. No action was taken on this basis because all associated results for the aforementioned compounds were non-detected.

The SVOC continuing calibration performed on August 23 at 10:47 exceeded the 25% (but was <50%) difference quality control criterion for 2,4-dimethylphenol and atrazine. No action was taken on this basis because all associated results for the aforementioned compounds were non-detected.

The percent recoveries of 4-nitrophenol and pentachlorophenol exceeded the quality control criterion in the SVOC MS/MSD. The percent recovery of 4-chloro-3-methylphenol also exceeded the criteria in the MSD. No actions were taken on this basis because all results for the aforementioned compounds were non-detected.

Sample S36MW0020101 was re-analyzed at a 2X dilution because the concentration of 4-methylphenol exceeded the linear calibration range of the instrument. The result for 4-methylphenol from the 2X dilution was used for validation.

Sample S38MW0030102 was analyzed at a 10X dilution. The sample was not analyzed un-diluted. This accounts for the elevated reporting limits for all non-detected compounds in the SVOC fraction of sample S38MW0030102.

The results for benzaldehyde and phenol exceeded the relative percent difference (RPD) quality control criterion in the field duplicate pair S36MWDUP0101 and S36MW0010101. No action was taken on this basis because the difference between results were >2X the RL.

Executive Summary

Laboratory Performance: Qualifications were made based on calibrations, surrogate recovery non-compliances, and method blank contamination.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to U.S. EPA National Functional Guidelines for Data Validation as modified by EPA Region III (9/94) and the NFESC guidelines entitled Navy IRCDQM (Sept. 1999). The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Bernard F Spada

Tetra Tech NUS
Bernard F Spada III
Chemist/Data Validator

Edward W. Hollyn / for

Tetra Tech NUS
Joseph A. Samchuck
Quality Assurance Officer

Attachments:
Appendix A – Qualified Analytical Results
Appendix B – Results as Reported by the Laboratory
Appendix C – Support Documentation

Tetra Tech NUS

INTERNAL CORRESPONDENCE

TO:	**G. LATULIPPE**	**DATE:**	**SEPTEMBER 27, 2005**
FROM:	**ERIN M. FAUST**	**COPIES:**	**DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION – TAL METALS, CYANIDE AND HEXAVALENT CHROMIUM**
CTO 005 NDW INDIAN HEAD
SAMPLE DELIVERY GROUP (SDG) – D0874

SAMPLES: 11/Aqueous/

S36MW0010101	S36MW0020101	S36MW0030101
S36MWDUP0101	S38MW0010102	S38MW0010102D
S38MW0020102	S38MW0030102	S38MW0040102D
S38MW0040102S	S38MWDUP0102	

Overview

The sample set for NDW Indian Head, CTO 005, SDG D0874, consists of eleven (11) aqueous environmental samples. Two (2) field duplicate pairs (S36MWDUP0101 / S36MW0010101 and S38MWDUP0102 / S38MW0010102D) are included within this SDG.

All samples were analyzed for target analyte list (TAL) metals, cyanide and hexavalent chromium. Samples S38MW0040102D and S38MW0010102 were also analyzed for dissolved TAL metals and were designated "-F". The samples were collected on July 26, 27 and 28, 2005 and analyzed by Mitkem Corporation under Naval Facilities Engineering Service Center (NFESC) Quality Assurance / Quality Control (QA/QC) criteria. Metals and cyanide analyses were conducted using Contract Laboratory Program (CLP) method ILM04.1. Hexavalent chromium analyses were conducted using Standard Methods method SM3500.

Summary

All analytes were successfully analyzed. The findings offered in this report are based upon a general review of all available data. The data review was based on data completeness, holding times, calibration data, laboratory method/preparation blanks, interference check sample (ICS) results, matrix spike results, post digestion spike results, laboratory duplicate results, laboratory control sample (LCS) results, field duplicate results, ICP serial dilution results, detection limits and analyte quantitation.

All metals analyses, with the exception of mercury, were conducted using Inductively Coupled Plasma (ICP) instrumentation. Mercury analyses were conducted using Cold Vapor Atomic Absorption (CVAA) instrumentation.

Areas of concern with respect to data quality are listed below.

Minor Problems

- The 24-hour holding time for hexavalent chromium was exceeded in samples S36MWDUP0101, S38MW0010102 and S38MW0010102D. The nondetected results reported for hexavalent chromium in these samples were qualified as estimated, "UJ".

- The Contract Required Detection Limit (CRDL) percent recovery for selenium was > 110% quality control limit, affecting all samples. The positive results, less than two times the CRDL, reported for selenium were qualified as estimated, "J", due to conflicting noncompliances.

- The CRDL percent recovery for lead was < 90% quality control limit, affecting all samples. The nondetected results reported for lead were qualified as biased low, "UL". The positive results, less than two times the CRDL, reported for lead were qualified as biased low, "L", or estimated, "J", due to conflicting noncompliances.

- The following contaminants were detected in the laboratory method/preparation blanks at the following maximum concentrations:

Analyte	Maximum Concentration	Action Level
Aluminum	24.2 µg/L	121 µg/L
Barium[1]	2.814 µg/L	14.07 µg/L
Calcium	81.5 µg/L	407.5 µg/L
Chromium	0.50 µg/L	2.5 µg/L
Copper[1]	3.117 µg/L	15.585 µg/L
Iron[1]	14.776 µg/L	73.88 µg/L
Magnesium	18.7 µg/L	93.5 µg/L
Manganese[1]	1.22 µg/L	6.1 µg/L
Nickel	1.0 µg/L	5.0 µg/L
Potassium	83.0 µg/L	415 µg/L
Sodium	174.9 µg/L	874.5 µg/L
Thallium	3.8 µg/L	19.0 µg/L
Vanadium	0.40 µg/L	2.0 µg/L
Zinc[1]	7.649 µg/L	36.245 µg/L

[1] Maximum concentration present in a laboratory preparation blank.

An action level of 5X the maximum contaminant level has been used to evaluate sample data for blank contamination. Sample aliquot and dilution factors, if applicable, were taken into consideration when evaluating for blank contamination. Positive results less than the blank action level reported for aluminum, chromium, copper, iron, nickel, vanadium and zinc were qualified "B" as a result of laboratory blank contamination.

- The interfering analyte calcium was present in sample S36MW0010101 at a concentration that was comparable to the level of calcium in the Interference Check Sample (ICS) solution. Several analytes, namely, antimony, barium, cadmium, chromium, cobalt, copper, lead, manganese, potassium, silver, sodium, vanadium and zinc were present in the ICS solution at a concentration that exceeded the absolute value of the Instrument Detection Limit (IDL). Interference effects exist for antimony, cadmium, cobalt, lead and vanadium in the affected sample. The positive results reported for cadmium and lead were qualified as biased high, "K". The positive result reported for antimony was qualified as biased low, "L". The nondetected results reported for cobalt and vanadium were qualified as biased low, "UL".

- The interfering analyte calcium was present in sample S36MWDUP0101 at a concentration that was comparable to the level of calcium in the Interference Check Sample (ICS) solution.

Several analytes, namely, antimony, barium, cadmium, chromium, cobalt, copper, lead, manganese, potassium, silver, sodium, vanadium and zinc were present in the ICS solution at a concentration that exceeded the absolute value of the Instrument Detection Limit (IDL). Interference effects exist for antimony, cadmium, cobalt, lead and vanadium in the affected sample. The positive results reported for cadmium and lead were qualified as biased high, "K". The nondetected results reported for antimony, cobalt and vanadium were qualified as biased low, "UL".

- The interfering analyte calcium was present in sample S38MW0010102 at a concentration that was comparable to the level of calcium in the Interference Check Sample (ICS) solution. Several analytes, namely, antimony, barium, cadmium, chromium, cobalt, copper, lead, manganese, potassium, silver, sodium, vanadium and zinc were present in the ICS solution at a concentration that exceeded the absolute value of the Instrument Detection Limit (IDL). Interference effects exist for antimony, barium, cadmium, chromium, cobalt, lead and vanadium in the affected sample. The positive results reported for cadmium and chromium were qualified as biased high, "K". The positive results reported for barium, cobalt and vanadium were qualified as biased low, "L". The nondetected result reported for antimony was qualified as biased low, "UL". The positive result reported for lead was qualified as estimated, "J", due to conflicting noncompliances.

- The interfering analyte calcium was present in sample S38MW0040102S at a concentration that was comparable to the level of calcium in the Interference Check Sample (ICS) solution. Several analytes, namely, antimony, barium, cadmium, chromium, cobalt, copper, lead, manganese, potassium, silver, sodium, vanadium and zinc were present in the ICS solution at a concentration that exceeded the absolute value of the Instrument Detection Limit (IDL). Interference effects exist for antimony, cobalt and vanadium in the affected sample. The nondetected results reported for antimony, cobalt and vanadium were qualified as biased low, "UL".

- The interfering analyte calcium was present in sample S38MW0010102-F at a concentration that was comparable to the level of calcium in the Interference Check Sample (ICS) solution. Several analytes, namely, antimony, barium, cadmium, chromium, cobalt, copper, lead, manganese, potassium, silver, sodium, vanadium and zinc were present in the ICS solution at a concentration that exceeded the absolute value of the Instrument Detection Limit (IDL). Interference effects exist for antimony, barium, cobalt, lead and vanadium in the affected sample. The positive results reported for barium and cobalt were qualified as biased low, "L". The nondetected results reported for antimony and vanadium were qualified as biased low, "UL". The positive result reported for lead was qualified as estimated, "J", due to conflicting noncompliances.

- The matrix spike (MS) percent recovery for selenium was < 75% quality control limit. The nondetected results reported for selenium were qualified as biased low, "UL". The positive results reported for selenium were qualified as estimated, "J", due to conflicting noncompliances.

Notes

The post digestion spike (PDS) percent recovery for selenium was < 75% quality control limit. No validation action was taken based on the PDS percent recovery.

Executive Summary

Laboratory Performance: The holding time was exceeded for hexavalent chromium in three samples. Lead and selenium were qualified due to calibration noncompliance. Several analytes were present in the laboratory method/preparation blanks.

Other Factors Affecting Data Quality: The interfering analyte calcium was present in several samples. Selenium was qualified due to MS noncompliance.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Data Validation", April 1993 as amended for use within USEPA Region III, and the NFESC document entitled "Navy Installation Restoration Chemical Data Quality Manual" (September 1999).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Tetra Tech NUS
Erin M. Faust
Environmental Scientist

Tetra Tech NUS
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation

Data Qualifier Key:

B	-	Positive result is considered to be an artifact of blank contamination and should not be considered present.
J	-	Positive result is considered estimated, "J", as a result of technical noncompliances.
K	-	Positive result is considered biased high, "K", as a result of technical noncompliances.
L	-	Positive result is considered biased low, "L", as a result of technical noncompliances.
U	-	Value is a nondetect as reported by the laboratory.
UJ	-	Nondetected result is considered estimated, "UJ", as a result of technical noncompliances.
UL	-	Nondetected result is considered biased low, "UL", as a result of technical noncompliances.

Tetra Tech NUS

INTERNAL CORRESPONDENCE

TO:	**G. LATULIPPE**	**DATE:**	**AUGUST 8, 2007**
FROM:	**TERRI L. SOLOMON**	**COPIES:**	**DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – PAHs**
NDW INDIAN HEAD
SAMPLE DELIVERY GROUP (SDG) – INDIANHEADS001

SAMPLES: 10/Sediment

S36DUP010102	S36SD0070102	S36SD0080102
S36SD0090102	S36SD0100102	S36SD0110102
S36SD0120102	S36SD0130102	S36SD0140102
S36SD0150102		

2/Aqueous

S36RB0010102	S36RB0020102

Overview

The sample set for NDW Indian Head, SDG INDIANHEADS001, consists of ten (10) environmental sediment samples and two (2) rinsate blanks (S36RB0010102 and S36RB0020102). One (1) field duplicate pair (S36SD0120102 / S36DUP010102) was included within this SDG.

The samples were analyzed for Polycyclic Aromatic Hydrocarbons (PAHs). The samples were collected by Tetra Tech NUS on April 11 and 12, 2007 and analyzed by Empirical Laboratories under Naval Facilities Engineering Service Center (NFESC) Quality Assurance / Quality Control (QA/QC) criteria. PAH analyses were conducted using SW846 method 8270C.

Summary

All compounds were successfully analyzed. The findings offered in this report are based upon a general review of all available data. The data review was based on data completeness, holding times, GC/MS tuning, initial / continuing calibration data, laboratory method/preparation blanks, surrogate spike recoveries, laboratory control sample / laboratory control sample duplicate (LCS / LCSD) results, matrix spike / matrix spike duplicate recoveries, field duplicate precision, detection limits and analyte quantitation.

Areas of concern with respect to data quality are listed below.

Major Problems – None.

Minor Problems

- Positive results reported below the reporting limit (RL) but above the method detection limit (MDL) for the organic analyses were qualified as estimated, "J".

- The percent solids for samples S36DUP010102, S36SD0070102, S36SD0080102, S36SD0100102, S36SD0110102, S36SD0120102, S36SD0130102, S36SD0140102 and S36SD0150102 were < 30%. The positive and nondetected results reported for the aforementioned samples were qualified as estimated, "J" and "UJ", respectively.

Notes

The matrix spike and/or matrix spike duplicate percent recoveries for acenaphthene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(g,h,i)perylene, benzo(a)pyrene, chrysene, dibenz(a,h)anthracene, fluoranthene, fluorine, indeno(1,2,3-cd)pyrene, 2-methylnaphthalene, 1-methylnaphthalene, naphthalene, phenanthrene and pyrene were outside the laboratory control limits for sample S36SD0120102. No validation actions were warranted based on matrix spike / matrix spike duplicate percent recoveries alone.

The surrogate recoveries for samples S36DUP010102, S36SD0070102, S36SD0080102, S36SD0090102, S36SD0100102, S36SD0110102, S36SD0120102, S36SD0130102, S36SD0140102 and S36SD0150102 were below the laboratory control limits for nitrobenzene-d5, 2-fluorobiphenyl and terphenyl-d14. No validation actions were warranted as all surrogates were diluted out of the affected samples.

All samples with the exception of S36RB0010102 and S36RB0020102 were analyzed at a 10X dilution due to sample matrix interferences and this resulted in increased detection limits.

Executive Summary

Laboratory Performance: None.

Other Factors Affecting Data Quality: The percent solids for several samples were < 30%.

The data for these analyses were reviewed with reference to Region III modifications to the "National Functional guidelines for Organic Data Review", September 1994, and the Department of Defense (DoD) document entitled "Quality Systems Manual (QSM) for Environmental Laboratories " (January 2006).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the DoD QSM."

Tetra Tech NUS
For Terri L. Solomon
Environmental Scientist

Tetra Tech NUS
Joseph A. Samchuck
Quality Assurance Officer

Attachments:
1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation

Data Qualifier Key:

J - Positive result is considered to be estimated "J" as a result of technical noncompliances.

UJ - Nondetected result is considered to be estimated, "UJ", as a result of technical noncompliances.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO: G. LATULIPPE **DATE:** AUGUST 20, 2007

FROM: Matthew D. Kraus **COPIES:** DV FILE

SUBJECT: INORGANIC DATA VALIDATION – TAL METALS, MISC, AVS/SEM
NDW INDIAN HEAD – CTO 005
SDG – INDIANHEADS001

SAMPLES: 2/Aqueous/

S36RB0010102 S36RB0020102

10/Sediment/

S36DUP010102 S36SD0070102 S36SD0080102
S36SD0090102 S36SD0100102 S36SD0110102
S36SD0120102 S36SD0130102 S36SD0140102
S36SD0150102

Overview

The data package for NDW INDIAN HEAD, CTO 005, SDG INDIANHEADS001 contained two aqueous field blanks and ten sediment environmental samples including one field duplicate pair (S36DUP010102 / S36SD0120102).

Samples were collected on April 11-12, 2007 by Tetra Tech NUS and were analyzed for target analyte list (TAL) metals, cyanide, Simultaneous Extracted Metals (SEM)/Acid Volatile Sulfide (AVS), and total organic carbon (TOC) by Empirical Laboratories, LLC under Naval Facilities Engineering Service Center (NFESC) Quality Assurance / Quality Control (QA/QC) criteria. All sediment samples were analyzed for grain size by Beaver Engineering.

The following table exhibits the analytical method and instrumentation used for analysis.

Target Analyte	Analytical Method	Instrumentation
TAL Metals	CLP SOW 4.1	Inductively Coupled Plasma (ICP) – Atomic Emission Spectrometer (AES)
Mercury	CLP SOW 4.1	Cold Vapor Atomic Absorption Spectrometer (CVAA)
Cyanide	CLP SOW 4.1	Automated Analyzer
SEM/AVS	USEPA 821/R91-100	Spectrometric / ICP-AES
TOC	Lloyd Kahn Method (USEPA 9060)	TOC Analyzer
Grain Size	ASTM D422	Sieves & Hydrometers

Summary

All analytes were successfully analyzed. The findings in this report are based upon a general review of all available data.

The data review was based on results pertaining to data completeness, holding times, calibration data, laboratory method/preparation blanks, interference check samples, matrix spikes, laboratory duplicates, laboratory control samples, ICP serial dilutions, field duplicate precision, detection limits and analyte quantization.

Minor Problems

- The contract required detection limit (CRDL) standard percent recoveries (%Rs) were < 90% for selenium affecting all sediment samples. The non-detected selenium result reported for sample S36SD0090102 was qualified as biased low, "UL". The remaining non-detected selenium results were qualified as estimated, "UJ", due to conflicting bias.

- The CRDL standard run on 04/26/07 yielded %Rs for selenium and thallium > 110% affecting the rinsate blanks. No validation action was required for selenium results in the rinsate blanks or the thallium result in S36RB0010102 because those results were reported as non-detected. The positive result reported for thallium in S36RB0020102 was qualified as biased high, "K".

- The SEM CRDL %R for lead was > 110% affecting all samples except S36SD0090102. The positive lead results affected were qualified as estimated, "J", due to conflicting bias.

- The following contaminants were detected in the laboratory method/preparation blanks at the following maximum concentrations.

Analyte	Maximum Concentration	Action Level
Lead	2.30 µg/L	1.15 mg/kg
Thallium	5.00 µg/L	2.50 mg/kg
Zinc [1]	0.0075 µmol/g	0.038 µmol/g

[1] Maximum concentration affects SEM samples only.

An action level of 5X the maximum contaminate concentration was used to evaluate sample data for blank contamination. Sample aliquot and dilution, if applicable, were taken into consideration when evaluating for blank contamination. Zinc (SEM) was qualified "B" due to laboratory blank contamination.

- The initial interference check sample (ICS) percent recovery (%R) for lead was greater than the upper quality control (120%) affecting all sediment samples. All of the positive results reported for lead in sediment samples were qualified as estimated, "J", due to conflicting directional bias.

- The final ICS %R for selenium was less than the lower qualify control limit (80%) at 78.0% affecting all sediment samples. The non-detected selenium results reported for sample S36SD0090102 was qualified as biased low, "UL". All of the other non-detected results reported for selenium in sediment samples were qualified as estimated, "UJ", due to conflicting directional bias.

- The matrix spike (MS) and matrix spike duplicates (MSD) %Rs for antimony and cyanide were both less than the lower quality control limit (75%) but greater than 30%R affecting all sediment results. Positive and non-detected results reported for antimony and cyanide in sediment sample S36SD0090102 were qualified as biased low, "L", or "UL", respectively. All of the other non-

detected results reported for antimony and cyanide in the sediment matrix were qualified as estimated, "UJ", due to conflicting directional bias.

- The MS and MSD %Rs for mercury were less than the lower quality control limit (75%) but greater than 30%R affecting all SEM results. The non-detected result reported for SEM mercury in sample S36SD0090102 was qualified as biased low "UL". All of the other non-detected results reported for SEM mercury were qualified as estimated, "UJ", due to conflicting directional bias.

- The MS and MSD %Rs for AVS were less than the lower quality control limit (75%) but greater than 30%R affecting all results. The positive result reported for AVS in sample S36SD0090102 was qualified as biased low, "L". All of the other non-detected and positive results reported for AVS were qualified as estimated, "UJ" or "J", respectively due to conflicting directional bias.

- For the serial dilution analysis of sample S36SD0140102 the original sample yielded a lead concentration which was greater than 50X the instrument detection limit (IDL) and the percent difference between the original and serial dilution results was greater than 10%. All of the positive results reported for lead in the sediment matrix were qualified as estimated, "J", due to conflicting directional bias.

- Field duplicate imprecision (>50% RPD when sample result > 5X RL) was noted for TOC. The positive results reported for TOC in the field duplicate pair (S36DUP010102 / S36SD0120102) were qualified as estimated, "J".

- Field duplicate imprecision (>50% RPD when sample result > 5X CRDL or difference between samples > 4X CRDL when one or both sample results are < 5X CRDL) was noted for all SEM metals except for mercury. The positive and non-detected SEM results (except mercury) not previously qualified due to laboratory blank contamination were qualified as estimated, "J" or "UJ", respectively.

- Field duplicate imprecision (>50% RPD) was noted for percent gravel and percent sand. The positive results reported for percent gravel and percent sand in the field duplicate pair (S36DUP010102 / S36SD0120102) were qualified as estimated, "J".

- Positive and non-detected analyte results for all fractions in all sediment samples except S36SD0090102 were qualified as estimated, "J" or "UJ", respectively due to percent solid recoveries less than 30%. Sample results qualified due to laboratory blank contamination were not affected by this qualification.

Notes

The CRDL %Rs for lead and thallium were >110% affecting sediment samples. No validation action was required because all of the affected results were either non-detected or greater than 2X the respective CRDL.

The MS %R for calcium was less than the lower quality control limit; however, the MSD and post-digestion matrix spikes were within quality control limits therefore no validation action was taken.

The MSD %R for mercury was > 125% however the MS %R for mercury was within QC limits therefore, no validation action was taken.
The MS and MSD %Rs for iron were negative and outside of quality control limits. No validation action was necessary because the iron sample concentrations were > 4X the amount of spike added.

Percent solid parameters initially were not visible in DvForm3. Amy Thompson corrected this problem by uploading the laboratory sample IDs and sampling dates which were not included in the electronic data deliverable (EDD) received from Beaver Engineering.

The MS and MSD %Rs for iron were negative and outside of quality control limits. No validation action was necessary because the iron sample concentrations were > 4X the amount of spike added.

Percent solid parameters initially were not visible in DvForm3. Amy Thompson corrected this problem by uploading the laboratory sample IDs and sampling dates which were not included in the electronic data deliverable (EDD) received from Beaver Engineering.

Executive Summary

Laboratory Performance: Zinc (SEM) was qualified due to laboratory blank contamination. Lead selenium and thallium were qualified due to CRDL noncompliance.

Other Factors Affecting Data Quality: Lead and selenium were qualified due to ICS %R noncompliance. Antimony, cyanide, mercury (SEM), and AVS were qualified due to MS/MSD noncompliance. Lead was qualified due to serial dilution noncompliance. TOC, SEM metals (except mercury), percent gravel, and percent sand were qualified due to field duplicate imprecision. Many analyte results were qualified due to low percent solids.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Data Validation", April 1993 as amended for use within USEPA Region III, and the Department of Defense (DoD) document entitled "Quality Systems Manual (QSM) for Environmental Laboratories" (January 2006).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the DoD QSM Guidelines and the Quality Assurance Project Plan (QAPP)."

Tetra Tech NUS
Matthew D. Kraus
Environmental Scientist

Tetra Tech NUS
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the laboratory
3. Appendix C - Support Documentation

Data Qualifier Key:

U	-	Value is a nondetect as reported by the laboratory.
B	-	Positive result is considered to be an artifact of blank contamination and should not be considered present.
J	-	Positive result is considered estimated, "J", as a result of a technical noncompliance.
K	-	Positive result is considered biased high, "K", as a result of a technical noncompliance.
L	-	Positive result is considered biased low, "L", as a result of a technical noncompliance.
UJ	-	Non-detected result is considered estimated, "UJ", as a result of a technical noncompliance.
UL	-	Non-detected result is considered biased low, "UL", as a result of a technical noncompliance.

APPENDIX D

FOOD-CHAIN MODELING

APPENDIX D – FOOD-CHAIN MODELING

D.1 FOOD-CHAIN MODELING EQUATIONS AND METHODOLOGY

Chemical intake for wildlife exposed to the contaminants of potential concern (COPCs) in surface soil and sediment was estimated as daily dose (mg/kg-day) using exposure equations. The contaminant concentrations in surface soil (Table D-1) and sediment (Table D-2) were used to calculate chronic daily intake (CDI) doses. The following equations present the CDI equations that were used in calculating a total daily dose for the surrogate species selected for modeling:

The following equation was used to calculate the CDI for wildlife receptors:

$$CDI = \frac{[(Cf * If) + (Cs * Is) + (Cw * Iw)] * H}{BW}$$

Where:

CDI	=	Chronic daily intake (mg/kg-day)
Cf	=	Chemical concentration in food – (see discussion below)
Cs	=	Chemical concentration in surface soil (mg/kg) or sediment (mg/kg)
Cw	=	Chemical concentration in surface water (mg/L)
If	=	Food ingestion rate (kg/day)
Is	=	Incidental surface soil or sediment ingestion rate (kg/day)
Iw	=	Water ingestion rate (L/day)
H	=	Portion of food intake from the contaminated area (unitless)
BW	=	Body weight (kg)

Chemical concentrations in food items for soil invertivorous and herbivorous receptors were calculated using soil-to-invertebrate or soil-to-plant bioaccumulation factors (BAFs) and regression equations from the United States Environmental Protection Agency (EPA) Ecological Soil Screening Level (SSL) Guidance Document (EPA, 2007) or other published sources. The sources of the BAFs are documented in Table D-3. The following equation was used to calculate the chemical concentration in plants or invertebrates (see Table D-1) when BAFs are used:

$$Cf = Cs * BAF$$

Where:

Cf	=	Contaminant concentration in food (mg/kg)

Cs	=	Contaminant concentration in surface soil (mg/kg)
BAF	=	Biota-soil bioaccumulation factor (unitless)

Chemical concentrations in food items for piscivorous receptors will be calculated using sediment-to-fish biota-sediment bioaccumulation factors (BSAFs). The sources of the BSAFs are documented in Table D-3. Contaminant concentrations in food items for piscivorous mammals and birds (see Table D-2) were calculated as follows:

$$\text{Cf (for metals)} = \text{Csd} * \text{BSAF}$$

Where:

Cf	=	Contaminant concentration in food (mg/kg)
Csd	=	Contaminant concentration in sediment (mg/kg)
BSAF	=	Biota-sediment bioaccumulation factor (unitless)

$$\text{Cf (for organics)} = \text{Csd} * \left(\text{BSAF} * \frac{\%\text{L}}{\%\text{TOC}} \right)$$

Where:

Cf	=	Contaminant concentration in food (mg/kg)
Csd	=	Contaminant concentration in sediment (mg/kg)
BSAF	=	Biota-sediment bioaccumulation factor (for organics) (unitless)
%L	=	Percent lipids [14.4 percent (dry weight) for invertebrates]
%TOC	=	Percent total organic carbon (TOC) (average TOC for the site)

The exposure assumptions (e.g., ingestion rates and body weight) were obtained from the Wildlife Exposure Factors Handbook (EPA, 1993) or other literature sources, as necessary. The exposure parameters from EPA (1993) are wet weight values; however, the BAFs estimate the tissue concentrations in dry weight. Therefore, the exposure parameters from EPA (1993) were converted to dry weight values for the food chain model calculations.

An ecological effects quotient (EEQ) approach was used to characterize the risk to terrestrial receptors. This approach characterizes the potential effects by comparing the exposure concentration with the effects data. An EEQ of greater than 1.0 is considered indicative of a potential risk. The EEQ is not an expression of probability, and the meaning of values greater than 1.0 must be interpreted in light of uncertainties in risk management.

The EEQ for the terrestrial wildlife model was calculated as follows:

$$EEQ = \frac{\text{Total CDI}}{\text{TRV}}$$

Where:	EEQ	= Ecological effects quotient (unitless)
	Total CDI	= Total daily intake dose (mg/kg-day)
	TRV	= Toxicity reference value (mg/kg-day)

The TRVs were developed from no observed adverse effect levels (NOAELs) and lowest observed adverse effects levels (LOAELs) and are provided in Table D-4. The sources and endpoints for NOAELs and LOAELS are provided in Table D-5.

D.2 RECEPTOR PROFILES

The following sections present the receptor profiles for the short-tailed shrew, meadow vole, northern bobwhite quail, American woodcock, great blue heron, and raccoon. The majority of the information for the profiles was obtained from the Wildlife Exposure Factors Handbook (EPA, 1993). The data for the incidental soil ingestion rates were obtained from the Estimates of Soil Ingestion by Wildlife (Beyer, 1994) or the EPA Ecological Soil Screening Guidance (2007).

The food and water ingestion rates are listed in g/g (of body weight)-day on a wet weight basis but were converted to dry weight for the food-chain model. The home ranges are presented in hectares in EPA (1993) but were converted to acres by multiplying the number of hectares by 2.471. Also note that the estimated percent of soil in the diets is listed in dry weight. Table D-6 presents the exposure parameters, and Table D-7 presents the calculation of the exposure parameters and how the calculations were done.

Short-Tailed Shrew (*Blarina brevicauda*)

Shrews inhabit a wide variety of habitats and are common in areas with abundant vegetative cover. They need cool, moist habitats because of their high metabolic and water-loss rates. The short-tailed shrew is primarily carnivorous, eating insects such as earthworms, slugs, and snails.

The adult body weight for the short-tailed shrew in various habitats ranged from 0.015 to 0.01921 kg with an average of 0.0161 kg. The listed food ingestion rates for shrews are 0.49 and 0.62 g/g-day (wet-weight). The water ingestion rate was listed as 0.223 g/g-day. The food and water ingestion rates in kg/day and L/day, respectively, were calculated as shown in Table D-7. The food ingestion rates were then multiplied by 0.16, which is the solids content of worms (Sample et al., 1997), to convert the

ingestion rate from a wet-weight value to a dry-weight value. The incidental soil ingestion rate was calculated by multiplying the ingestion rate by the percentage of soil that is incidentally ingested (assumed 3 percent for conservative food chain model and 0.9 percent for the average food chain model) from EPA (2007). Three percent is the 90th percentile value, and 0.9 percent is the 50th percentile value from EPA (2007). The home range for the shrew (0. 9699 acres) was calculated using data from a tamarek bog in Manitoba (only value available).

American Woodcock (*Scolopax minor*)

Woodcocks inhabit both woodlands and abandoned fields, particularly those with rich and moderately to poorly drained loamy soils, which tend to support abundant earthworm populations. They feed primarily on invertebrates found in moist upland soils by probing the soil with their long prehensile-tipped bill. Earthworms are their preferred diet, but seeds and other plant matter may also be consumed.

The adult body weight for the woodcock ranges from 0.134 to 0.218 kg with an average of 0.173 kg. The listed food ingestion rate for the woodcock is 0.77 g/g-day (wet-weight). The water ingestion rate is listed as 0.1 g/g-day. The food ingestion rates were then multiplied by 0.16, which is the solids content of worms (Sample et al., 1997), to convert the ingestion rate from a wet-weight value to a dry-weight value. The incidental soil ingestion rate was calculated by multiplying the ingestion rate by the percentage of soil that is incidentally ingested (assumed 16.4 percent for conservative food chain model and 6.4 percent for the average food chain model) from EPA (2007). The 90th percentile value is 16.4 percent, and 6.4 percent is the 50th percentile value from EPA (2007).

The range of home range sizes for the woodcock is 7.66 to 182 acres with an average of 61 acres.

Meadow Vole (Microtus pennsylvanicus)

Meadow voles inhabit grassy fields, marshes, and bogs; however, they prefer fields with more grass, more cover, and fewer woody plants. They typically consume green succulent vegetation, sedges, seeds, roots, bark, fungi, insects, and animal matter. However, green succulent vegetation makes up the majority of their diet.

The adult body weight for the vole ranges from 0.017 to 0.0524 kg with an average of 0.0358 kg. The only listed food ingestion rates for voles range from 0.30 to 0.35 g/g-day (wet-weight), with an average of 0.325 g/g-day. The water ingestion rates are 0.14 (estimated) and 0.21 g/g-day, with an average of 0.175 g/g-day. The food and water ingestion rates in kg/day and L/day, respectively, were calculated as shown in Table D-7. The food ingestion rates were then multiplied by 0.30, which is the solids content of young grass (Sample et al., 1997), to convert the ingestion rate from a wet-weight value to a dry-weight value.

The incidental soil ingestion rate was calculated by multiplying the ingestion rate by the percentage of soil that is incidentally ingested (assumed 3.2 percent for conservative food chain model and 1.2 percent for the average food chain model) from EPA (2007). The 90th percentile value is 3.2 percent, and 1.2 percent is the 50th percentile value from EPA (2007). The home range for the meadow vole ranges from 0.000494 to 0.2051 acre with an average of 0.0659 acre.

Northern Bobwhite Quail (*Colinus virginianus*)

Quails inhabit grasslands, idle fields, pastures, and large clumps of grasses. Bobwhite quails forage in areas with open vegetation, some bare ground, and light litter. Seeds from weeds, woody plants, and grasses comprise the majority of an adult's diet, although green vegetation has been found to dominate the diet of this species in winter in the southern areas of the United States.

The adult body weight for the bobwhite quail ranges from 0.154 to 0.1939 kg with an average of 0.1751 kg. The listed food ingestion rates for quails range from 0.067 to 0.093 g/g-day (wet-weight), with an average of 0.078 g/g-day. The water ingestion rate is estimated as 0.10 and 0.11 g/g-day, and measured as 0.10 to 0.13 g/g-day, for an average water ingestion rate of 0.11 g/g-day. The food and water ingestion rates in kg/day and L/day, respectively, were calculated as shown in Table D-7. The food ingestion rates were then multiplied by 0.30, which is the solids content of young grass (Sample et al., 1997), to convert the ingestion rate from a wet-weight value to a dry-weight value. The incidental soil ingestion rate was calculated by multiplying the ingestion rate by the percentage of soil that is incidentally ingested (assumed 13.9 percent for the conservative food chain model and 6.10 percent for the average food chain model based on a mourning dove because values for the bobwhite quail were not available) from EPA (2007). The 90th percentile value is 13.0 percent, and 6.10 percent is the 50th percentile value from EPA (2007).

The home range for the quail ranges from 8.9 to 41.3 acres with an average of 18.8 acres.

Great Blue Heron (*Ardea herodias*)

Great blue herons inhabit a variety of freshwater and marine areas, including lakes, rivers, marshes, and coastal wetlands, particularly where small fish are plentiful in shallow waters. Fish are the preferred prey, but they also eat amphibians, reptiles, crustaceans, insects, birds, and mammals. The majority of the fish they consume are less than 25 cm (10 inches) in length.

The adult body weights range from 2.204 to 2.576 kg with an average of 2.310 kg. The food ingestion rate is listed as 0.18 g/g-day (wet-weight), while the water ingestion rate is listed as 0.045 g/g-day. The incidental soil ingestion rate is calculated by multiplying the ingestion rate by the percentage of sediment

that is incidentally ingested (3.3 percent) based on the mallard (Beyer, 1994). The 3.3 percent value is based on the incidental sediment ingestion rate of a mallard (Beyer, 1994), which also consumes aquatic organisms, because an incidental sediment ingestion rate was not available for the heron.

The range of feeding range sizes for the heron is 1.5 to 21 acres for an average of 11 acres.

Raccoon (Procyon lotor)

Raccoons are found near virtually every aquatic habitat, particularly in hardwood swamps, mangroves, floodplain forests, and freshwater and saltwater marshes. They are also common in suburban residential areas. They use surface waters for both drinking and foraging. They feed primarily on fleshy fruits, nuts, acorns, and corn, but also eat grains, insects, frogs, crayfish, eggs, and virtually any animal and vegetable matter.

The adult body weights range from 3.67 to 7.6 kg, with an average of 5.636 kg. The average food ingestion rate of 0.184 kg/day was calculated using the average body weight and the following equation for carnivores from Nagy et al. (1999):

$$FI = ((2.23)*BW(g)^{0.85})/1000$$

Where:	FI	=	Food ingestion rate (kg/day)
	BW	=	Body weight in kg
	g	=	grams

The water ingestion rate ranges from 0.082 to 0.083 g/g, which is converted to the ingestion rate in L/day by multiplying the value by the body weight of the raccoon. The incidental soil ingestion rate is calculated by multiplying the ingestion rate by the percentage of soil that is incidentally ingestion (9.4 percent), as presented in Beyer (1994).

The home range for the conservative model is assumed to be equal to the size of the site indicating that the raccoon will spend all of its time at the site. The typical home range sizes for the raccoon are 96 to 6,325 acres for an average of 1,558 acres.

D.3 SOIL TO EARTHWORM BIOACCUMULATION FACTORS FOR PAHs

This section presents the literature-derived soil to earthworm BAFs that were incorporated into the food-chain models for PAHs because values were not available in other sources.

Table D-8 presents the soil to earthworm BAFs for PAHs. Two sets of BAF studies were found for PAHs. One study by Ma et al., (1998) calculated BAFs for PAHs in different soil types. The BAFs were presented as values for total PAHs. The second study, reported in Beyer (1990), presented average soil and earthworm concentrations for individual PAHs. That data were used to calculate the BAFs by dividing the PAH concentrations in the earthworm samples by the PAH concentrations in the soil samples. For the conservative food chain model, 1.606 [the maximum BAF from Ma et al. (1998)] was used while the average BAF of 0.609 was used for the average food chain model. The values from Ma et al., (1998) were used for the food-chain model because they are based on more data and are slightly greater than the values reported from Beyer (1990), so they are more conservative (see Table D-8). These values are similar to the maximum and average BAFs reported from the Beyer (1990) study of 0.669 and 0.256, respectively.

D.4 FOOD-CHAIN MODELING RESULTS

Tables D-9 and D-10 present the results of the food-chain model for the meadow vole based on conservative and average inputs, respectively. Tables D-11 and D-12 present the results of the food-chain model for the bobwhite quail based on conservative and average inputs, respectively. Tables D-13 and D-14 present the results of the food-chain model for the short-tailed shrew based on conservative and average inputs, respectively. Tables D-15 and D-16 present the results of the food-chain model for the American woodcock based on conservative and average inputs, respectively. Tables D-17 and D-18 present the results of the food-chain model for the great blue heron based on conservative and average inputs, respectively. Tables D-19 and D-20 present the results of the food-chain model for the raccoon based on conservative and average inputs, respectively.

D.5 REFERENCES

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TABLE D-1

CHEMICAL CONCENTRATIONS IN SURFACE SOIL AND TISSUE
SITE 36 - CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	Maximum Surface Soil Concentration (mg/kg)	Average Surface Soil Concentration (mg/kg)	Conservative Earthworm BAF	Average Earthworm BAF	Earthworm Concentrations				Plant Concentrations	
					Maximum (mg/kg)	Average (mg/kg)	Conservative Plant BAF	Average Plant BAF	Maximum (mg/kg)	Average (mg/kg)
Semivolatile Organic Compounds										
ACENAPHTHYLENE	5.60E-02	5.60E-02	1.606	0.609	0.089936	0.034104	Eco SSL	Eco SSL	0.033	0.033
ANTHRACENE	8.90E-02	8.90E-02	1.606	0.609	0.142934	0.054201	Eco SSL	Eco SSL	0.057	0.057
BENZO(A)ANTHRACENE	2.50E-01	1.78E-01	1.606	0.609	0.4015	0.108402	Eco SSL	Eco SSL	0.029	0.024
BENZO(A)PYRENE	2.40E-01	1.34E-01	1.606	0.609	0.38544	0.081606	Eco SSL	Eco SSL	0.032	0.018
BENZO(B)FLUORANTHENE	4.70E-01	1.61E-01	1.606	0.609	0.75482	0.098049	Eco SSL	Eco SSL	0.146	0.050
BENZO(G,H,I)PERYLENE	1.10E-01	1.02E-01	1.606	0.609	0.17666	0.062118	Eco SSL	Eco SSL	0.029	0.026
BENZO(K)FLUORANTHENE	1.90E-01	1.67E-01	1.606	0.609	0.30514	0.101703	Eco SSL	Eco SSL	0.028	0.025
CHRYSENE	3.30E-01	1.52E-01	1.606	0.609	0.52998	0.092568	Eco SSL	Eco SSL	0.035	0.022
DIBENZO(A,H)ANTHRACENE	4.20E-02	4.20E-02	1.606	0.609	0.067452	0.025578	Eco SSL	Eco SSL	0.005	0.005
FLUORANTHENE	3.70E-01	1.43E-01	1.606	0.609	0.59422	0.087087	Eco SSL	Eco SSL	0.185	0.07
INDENO(1,2,3-CD)PYRENE	1.20E-01	8.55E-02	1.606	0.609	0.19272	0.0520695	Eco SSL	Eco SSL	0.013	0.01
PHENANTHRENE	1.10E-01	8.10E-02	1.606	0.609	0.17666	0.049329	Eco SSL	Eco SSL	0.215	0.18
PYRENE	3.70E-01	1.40E-01	1.606	0.609	0.59422	0.08526	Eco SSL	Eco SSL	0.266	0.1
Metals										
ARSENIC	6.20E+00	4.10E+00	Eco SSL	Eco SSL	0.9	0.7	Eco SSL	Eco SSL	0.233	0.154
CADMIUM	3.10E+00	6.10E-01	Eco SSL	Eco SSL	20.4	5.6	Eco SSL	Eco SSL	1.15	0.47
CHROMIUM	1.22E+01	1.02E+01	Eco SSL	Eco SSL	3.7	3.1	Eco SSL	Eco SSL	0.500	0.418
COPPER	4.66E+01	2.11E+01	Eco SSL	Eco SSL	24.0	10.9	Eco SSL	Eco SSL	8.9	6.5
LEAD	1.78E+02	5.37E+01	Eco SSL	Eco SSL	52.7	20.0	Eco SSL	Eco SSL	4.85	2.48
MERCURY	9.70E-02	8.00E-02	Regression - Sample et al., (1998)		4.93E-01	4.62E-01	5	0.652	0.485	0.05216
NICKEL	1.04E+01	6.70E+00	Eco SSL	Eco SSL	11.0	7.1	Eco SSL	Eco SSL	0.62	0.45
ZINC	8.10E+01	4.45E+01	Eco SSL	Eco SSL	361.5	297.1	Eco SSL	Eco SSL	55.1	39.6

BAF - Bioaccumulation factor
Sources for the BAFs are provided in Table D-3.
Eco-SSL - USEPA Ecological Soil Screening Level

TABLE D-2

CHEMICAL CONCENTRATIONS IN SEDIMENT AND TISSUE
SITE 36 - CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	Maximum Sediment Concentration (mg/kg)	Average Sediment Concentration (mg/kg)	Maximum Surface Water Concentration (mg/L)	Average Surface Water Concentration (mg/L)	Conservative Fish BSAF	Average Fish BSAF	Maximum Tissue Concentration (mg/kg)	Average Tissue Concentration (mg/kg)
Semivolatile Organics								
ACENAPHTHYLENE	2.90E-01	1.52E-01	0.00E+00	0.00E+00	2.90E-01	2.90E-01	1.50E-01	7.85E-02
ANTHRACENE	4.20E-01	1.61E-01	0.00E+00	0.00E+00	2.90E-01	2.90E-01	2.17E-01	8.31E-02
BENZO(A)ANTHRACENE	1.20E+00	2.85E-01	0.00E+00	0.00E+00	2.90E-01	2.90E-01	6.19E-01	1.47E-01
BENZO(A)PYRENE	1.00E+00	2.50E-01	0.00E+00	0.00E+00	2.90E-01	2.90E-01	5.16E-01	1.29E-01
BENZO(B)FLUORANTHENE	2.30E+00	3.59E-01	0.00E+00	0.00E+00	2.90E-01	2.90E-01	1.19E+00	1.85E-01
BENZO(G,H,I)PERYLENE	4.90E-01	1.43E-01	0.00E+00	0.00E+00	2.90E-01	2.90E-01	2.53E-01	7.38E-02
BENZO(K)FLUORANTHENE	7.90E-01	1.72E-01	0.00E+00	0.00E+00	2.90E-01	2.90E-01	4.08E-01	8.88E-02
CHRYSENE	1.30E+00	2.09E-01	0.00E+00	0.00E+00	2.90E-01	2.90E-01	6.71E-01	1.08E-01
DIBENZO(A,H)ANTHRACENE	2.10E-01	1.36E-01	0.00E+00	0.00E+00	2.90E-01	2.90E-01	1.08E-01	7.02E-02
FLUORANTHENE	1.30E+00	2.37E-01	0.00E+00	0.00E+00	2.90E-01	2.90E-01	6.71E-01	1.22E-01
INDENO(1,2,3-CD)PYRENE	4.80E-01	1.42E-01	0.00E+00	0.00E+00	2.90E-01	2.90E-01	2.48E-01	7.33E-02
PHENANTHRENE	1.20E-01	1.19E-01	0.00E+00	0.00E+00	2.90E-01	2.90E-01	6.19E-02	6.14E-02
PYRENE	1.20E+00	2.18E-01	0.00E+00	0.00E+00	2.90E-01	2.90E-01	6.19E-01	1.13E-01
Inorganics								
ARSENIC	1.77E+01	7.26E+00	0.00E+00	0.00E+00	6.90E-01	1.43E-01	1.22E+01	1.04E+00
CADMIUM	1.60E+01	2.27E+00	7.10E-04	2.00E-04	7.99E+00	6.00E-01	1.28E+02	1.36E+00
CHROMIUM	1.10E+02	2.99E+01	1.50E-03	6.40E-04	4.68E-01	1.00E-01	5.15E+01	2.99E+00
COPPER	1.27E+02	4.62E+01	7.50E-03	1.95E-03	5.25E+00	1.56E+00	6.67E+02	7.19E+01
LEAD	4.10E+03	3.26E+02	1.36E-02	3.40E-03	6.07E-01	7.10E-02	2.49E+03	2.31E+01
MERCURY	2.90E+00	3.50E-01	0.00E+00	0.00E+00	2.87E+00	1.14E+00	8.32E+00	3.98E-01
NICKEL	1.02E+02	2.51E+01	2.00E-03	1.47E-03	2.32E+00	4.86E-01	2.37E+02	1.22E+01
SILVER	4.90E+00	7.90E-01	0.00E+00	0.00E+00	1.00E+00	1.00E+00	4.90E+00	7.90E-01
ZINC	8.40E+02	2.02E+02	0.00E+00	0.00E+00	7.53E+00	1.94E+00	6.32E+03	3.91E+02

BSAF - Biota sediment accumulation factor
Sources for the BSAFs are provided in Table D-3.

TABLE D-3

DRY WEIGHT BAFs AND/OR BSAFs FOR PLANTS, EARTHWORMS, SEDIMENT INVERTEBRATES AND FISH
SITE 36 - CLOSED LANDFILL
NSF IH, INDIAN HEAD, MARYLAND

	Plant BAFs[1,2]		Earthworm BAFs[1,3]		Fish BSAFs[4]		Sediment Invertebrate BSAFs[5]	
Chemicals	**Conservative[6]**	**Average[6]**	**Conservative[6]**	**Average[6]**	**Conservative[6]**	**Average[6]**	**Conservative[6]**	**Average[6]**
Semivolatile Organics								
Acenaphthene	Eco-SSL	Eco-SSL	1.61E+00	6.09E-01	2.90E-01	2.90E-01	1.00E+00	1.00E+00
Acenaphthylene	Eco-SSL	Eco-SSL	1.61E+00	6.09E-01	2.90E-01	2.90E-01	1.00E+00	1.00E+00
Anthracene	Eco-SSL	Eco-SSL	1.61E+00	6.09E-01	2.90E-01	2.90E-01	1.00E+00	1.00E+00
Benzo(a)anthracene	Eco-SSL	Eco-SSL	1.61E+00	6.09E-01	2.90E-01	2.90E-01	1.00E+00	1.00E+00
Benzo(a)pyrene	Eco-SSL	Eco-SSL	1.61E+00	6.09E-01	2.90E-01	2.90E-01	1.00E+00	1.00E+00
Benzo(b)fluoranthene	Eco-SSL	Eco-SSL	1.61E+00	6.09E-01	2.90E-01	2.90E-01	1.00E+00	1.00E+00
Benzo(g,h,i)perylene	Eco-SSL	Eco-SSL	1.61E+00	6.09E-01	2.90E-01	2.90E-01	1.00E+00	1.00E+00
Benzo(k)fluoranthene	Eco-SSL	Eco-SSL	1.61E+00	6.09E-01	2.90E-01	2.90E-01	1.00E+00	1.00E+00
Chrysene	Eco-SSL	Eco-SSL	1.61E+00	6.09E-01	2.90E-01	2.90E-01	1.00E+00	1.00E+00
Dibenzo(a,h)anthracene	Eco-SSL	Eco-SSL	1.61E+00	6.09E-01	2.90E-01	2.90E-01	1.00E+00	1.00E+00
Fluoranthene	Eco-SSL	Eco-SSL	1.61E+00	6.09E-01	2.90E-01	2.90E-01	1.00E+00	1.00E+00
Indeno(1,2,3-cd)pyrene	Eco-SSL	Eco-SSL	1.61E+00	6.09E-01	2.90E-01	2.90E-01	1.00E+00	1.00E+00
Phenanthrene	Eco-SSL	Eco-SSL	1.61E+00	6.09E-01	2.90E-01	2.90E-01	1.00E+00	1.00E+00
Pyrene	Eco-SSL	Eco-SSL	1.61E+00	6.09E-01	2.90E-01	2.90E-01	1.00E+00	1.00E+00
Inorganics								
Arsenic	Eco-SSL	Eco-SSL	Eco-SSL	Eco-SSL	1.00E+00	1.00E+00	6.90E-01	1.43E-01
Cadmium	Eco-SSL	Eco-SSL	Eco-SSL	Eco-SSL	1.00E+00	1.00E+00	7.99E+00	6.00E-01
Chromium	Eco-SSL	Eco-SSL	Eco-SSL	Eco-SSL	1.00E+00	1.00E+00	4.68E-01	1.00E-01
Copper	Eco-SSL	Eco-SSL	Eco-SSL	Eco-SSL	1.00E+00	1.00E+00	5.25E+00	1.56E+00
Lead	Eco-SSL	Eco-SSL	Eco-SSL	Eco-SSL	1.00E+00	1.00E+00	6.07E-01	7.10E-02
Mercury	5.00E+00	6.52E-01	Regression - Sample et al., (1998)		1.00E+00	1.00E+00	2.87E+00	1.14E+00
Nickel	Eco-SSL	Eco-SSL	Eco-SSL	Eco-SSL	1.00E+00	1.00E+00	2.32E+00	4.86E-01
Silver	Eco-SSL	Eco-SSL	Eco-SSL	Eco-SSL	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Zinc	Eco-SSL	Eco-SSL	Eco-SSL	Eco-SSL	1.00E+00	1.00E+00	7.53E+00	1.94E+00

Default value of 1 is assigned to parameters without uptake factors

Notes:

BAF - Bioaccumulation Factor

BSAF - Biota Sediment Accumulation Factor

1 - Where "Eco-SSL" is given, values were calculated using equations from USEPA (2007), Attachment 4-1, Tables 4a (for inorganics) and 4b (for organics).

2 - ORNL (September, 1998) for mercury; conservative value is 90th percentile; average value is median value.

3 - Sources for the PAH BAFs are provided in Section D.3 of Appendix D; Sample, et al. (1998) for mercury.

4 - U.S. EPA, November 2004; only one value is available for conservative and average exposures.

5 - ORNL (August, 1998) for all chemicals; conservative value is 90th percentile; average value is median value

6 - Conservative and average refers to the exposure scenarios for which the uptake factors are used

USEPA (U.S. Environmental Protection Agency), 2007. Guidance for Developing Ecological Soil Screening Level. Office of Solid Waste and Emergency and Response. OSWER Directive 92857-55. August.

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ORNL (Oak Ridge National Laboratory). 1998. Empirical Model for the Uptake of Inorganic Chemicals from Soil by Plants. BJC/OR-133. September.

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TABLE D-4

TOXICITY REFERENCE VALUES FOR TERRESTRIAL FOOD CHAIN MODEL
SITE 36 - CLOSED LANDFILL
NSF IH, INDIAN HEAD, MARYLAND

PARAMETER	Mammal		Bird	
	NOAEL	LOAEL	NOAEL	LOAEL
SEMIVOLATILES (mg/kg)				
Acenaphthene	65.6[1]	356[1]	2	20
Acenaphthylene	65.6[1]	356[1]	2	20
Anthracene	65.6[1]	356[1]	2	20
Benzo(a)anthracene	0.615[2]	38.4[2]	2	20
Benzo(a)pyrene	0.615[2]	38.4[2]	2	20
Benzo(b)fluoranthene	0.615[2]	38.4[2]	2	20
Benzo(g,h,i)perylene	0.615[2]	38.4[2]	2	20
Benzo(k)fluoranthene	0.615[2]	38.4[2]	2	20
Chrysene	0.615[2]	38.4[2]	2	20
Dibenzo(a,h)anthracene	0.615[2]	38.4[2]	2	20
Fluoranthene	65.6[1]	356[1]	2	20
Fluorene	65.6[1]	356[1]	2	20
Indeno(1,2,3-cd)pyrene	0.615[2]	38.4[2]	2	20
Phenanthrene	65.6[1]	356[1]	2	20
Pyrene	0.615[2]	38.4[2]	2	20
INORGANICS (mg/kg)				
Arsenic	1.04	4.55	2.24	4.51
Cadmium	0.77	6.9	1.47	6.35
Chromium	2.4	58.17	2.66	15.63
Copper	5.6	82.7	4.05	34.87
Lead	4.7	186.4	1.63	44.6
Mercury	0.032	0.16	0.0064	0.064
Nickel	1.7	14.77	6.71	18.57
Silver	6.02	118.62	2.02	60.47
Zinc	75.4	297.58	66.1	171.44

Notes:
1 - Low Molecular Weight PAH
2 - High Molecular Weight PAH

The sources of these NOAELS and LOAELS are presented in Table D-5.

The NOAELS and LOAELS in the source table were divided by 10 if a subchronic study was the basis for the value. Also, if only a NOAEL was available, the value was multiplied by 10 to estimate the LOAEL. If only a LOAEL was available, the value was divided by 10 to estimate the NOAEL.

TABLE D-5

SOURCES AND ENDPOINTS FOR NOAELs AND LOAELs FOR TERRESTRIAL WILDLIFE
SITE 36 - CLOSED LANDFILL
NSF IH, INDIAN HEAD, MARYLAND

Parameters	Concentration (mg/kg-day)	Endpoint	Effect	Chronic/ Subchronic	Species	Primary Reference	Source of Reference
Semivolatiles Organics							
7,12-Dimethylbenz(a)anthracene	2	NOAEL	systemic	chronic	nestling/starlings	Trust et al., 1994	
7,12-Dimethylbenz(a)anthracene	20	LOAEL	systemic	chronic	nestling/starlings	Trust et al., 1994	
Low Molecular Weight PAHs*	65.6	NOAEL	reproduction & growth	chronic	mammals	EPA, 2007a	
Low Molecular Weight PAHs*	356	LOAEL	reproduction & growth	chronic	mammals	EPA, 2007a	
High Molecular Weight PAHs**	0.615	NOAEL	reproduction & growth	chronic	mammals	EPA, 2007a	
High Molecular Weight PAHs**	38.4	LOAEL	reproduction & growth	chronic	mammals	EPA, 2007a	
Inorganics							
Arsenic	2.24	NOAEL	reproduction & growth	chronic	birds	EPA, 2005a	
Arsenic	4.51	LOAEL	reproduction & growth	chronic	birds	EPA, 2005a	
Arsenic	1.04	NOAEL	reproduction & growth	chronic	mammals	EPA, 2005a	
Arsenic	4.55	LOAEL	reproduction & growth	chronic	mammals	EPA, 2005a	
Cadmium	1.47	NOAEL	reproduction & growth	chronic	birds	EPA, 2005b	
Cadmium	6.35	LOAEL	reproduction & growth	chronic	birds	EPA, 2005b	
Cadmium	0.77	NOAEL	reproduction & growth	chronic	mammals	EPA, 2005b	
Cadmium	6.9	LOAEL	reproduction & growth	chronic	mammals	EPA, 2005b	
Chromium(III)	2.66	NOAEL	reproduction & growth	chronic	birds	EPA, 2005c	
Chromium(III)	15.63	LOAEL	reproduction & growth	chronic	birds	EPA, 2005c	
Chromium(III)	2.4	NOAEL	reproduction & growth	chronic	mammals	EPA, 2005c	
Chromium(III)	58.17	LOAEL	reproduction & growth	chronic	mammals	EPA, 2005c	
Chromium(VI)	5.66	NOAEL	reproduction & growth	chronic	mammals	EPA, 2005c	
Chromium(VI)	38.37	LOAEL	reproduction & growth	chronic	mammals	EPA, 2005c	
Copper	4.05	NOAEL	reproduction & growth	chronic	birds	EPA, 2007b	
Copper	34.87	LOAEL	reproduction & growth	chronic	birds	EPA, 2007b	
Copper	5.6	NOAEL	reproduction & growth	chronic	mammals	EPA, 2007b	
Copper	82.7	LOAEL	reproduction & growth	chronic	mammals	EPA, 2007b	

TABLE D-5

SOURCES AND ENDPOINTS FOR NOAELs AND LOAELs FOR TERRESTRIAL WILDLIFE
SITE 36 - CLOSED LANDFILL
NSF IH, INDIAN HEAD, MARYLAND

Parameters	Concentration (mg/kg-day)	Endpoint	Effect	Chronic/ Subchronic	Species	Primary Reference	Source of Reference
Lead	1.63	NOAEL	reproduction & growth	chronic	birds	EPA, 2005d	
Lead	44.6	LOAEL	reproduction & growth	chronic	birds	EPA, 2005d	
Lead	4.7	NOAEL	reproduction & growth	chronic	mammals	EPA, 2005d	
Lead	186.4	LOAEL	reproduction & growth	chronic	mammals	EPA, 2005d	
Mercury	0.064	LOAEL	reproductive	chronic	mallard duck	Heinz, 1979	Sample et.al., 1996
Mercury	0.032	NOAEL	reproductive	chronic	rat	Verschuuren et al., 1976	Sample et.al., 1996
Mercury	0.16	LOAEL	reproductive	chronic	rat	Verschuuren et al., 1976	Sample et.al., 1996
Nickel	6.71	NOAEL	reproduction & growth	chronic	birds	EPA, 2007c	
Nickel	18.57	LOAEL	reproduction & growth	chronic	birds	EPA, 2007c	
Nickel	1.7	NOAEL	reproduction & growth	chronic	mammals	EPA, 2007c	
Nickel	14.77	LOAEL	reproduction & growth	chronic	mammals	EPA, 2007c	
Silver	2.02	NOAEL	reproduction & growth	chronic	birds	EPA, 2006	
Silver	60.47	LOAEL	reproduction & growth	chronic	birds	EPA, 2006	
Silver	6.02	NOAEL	reproduction & growth	chronic	mammals	EPA, 2006	
Silver	118.62	LOAEL	reproduction & growth	chronic	mammals	EPA, 2006	
Zinc	75.4	NOAEL	reproduction & growth	chronic	mammals	EPA, 2007d	
Zinc	297.58	LOAEL	reproduction & growth	chronic	mammals	EPA, 2007d	
Zinc	66.1	NOAEL	reproduction & growth	chronic	birds	EPA, 2007d	
Zinc	171.44	LOAEL	reproduction & growth	chronic	birds	EPA, 2007d	

Notes:

* Low molecular weight PAHs are acenaphthene, acenaphthylene, anthracene, fluoranthene, fluorene, and phenanthrene

** High molecular weight PAHs are benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene,indeno(1,2,3-cd)pyrene, and pyrene.

The NOAELS and LOAELS for the PAHs for birds were based on 7,12-dimethylbenz(a)anthracene.

The LOAELs used for PAHs and several metals were calculated as the geometric mean of growth and reproduction data from the Eco Soil Screening Levels (EPA, 2005,2006, 2007).

TABLE D-5 REFERENCES

SOURCES AND ENPOINTS FOR NOAELS AND LOAELS FOR TERRESTRIAL WILDLIFE SITE 36, NSF IH, INDIAN HEAD, MD

EPA (U.S. Environmental Protection Agency), 2005a. Ecological Soil Screening Levels for Arsenic, Interim Final. Office of Emergency and Remedial Response. OSWER Directive 9285.7-62. March.

EPA, 2005b. Ecological Soil Screening Levels for Cadmium, Interim Final. Office of Emergency and Remedial Response. OSWER Directive 9285.7-65. March.

EPA, 2005c. Ecological Soil Screening Levels for Chromium, Interim Final. Office of Emergency and Remedial Response. OSWER Directive 9285.7-66. March.

EPA, 2005d. Ecological Soil Screening Levels for Lead, Interim Final. Office of Emergency and Remedial Response. OSWER Directive 9285.7-70. March.

EPA, 2006. Ecological Soil Screening Levels for Silver, Interim Final. Office of Emergency and Remedial Response. OSWER Directive 9285.7-77. October

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EPA, 2007b. Ecological Soil Screening Levels for Copper, Interim Final. Office of Emergency and Remedial Response. OSWER Directive 9285.7-68. February.

EPA, 2007c. Ecological Soil Screening Levels for Nickel, Interim Final. Office of Emergency and Remedial Response. OSWER Directive 9285.7-76. March.

EPA, 2007d. Ecological Soil Screening Levels for Zinc, Interim Final. Office of Emergency and Remedial Response. OSWER Directive 9285.7-73. June.

Trust, K.A., A. Fairbrother, and M.J. Hooper, 1994. Effects of 7,12-Dimethylbenz(a)anthracene on Immune Function and Mixed-Function Oxygenase Activity in the European Starling. Environ. Tox. And Chem., Vol. 13, No. 5, pp. 821-830.

Verschuuren, H. G., R. Kroes, E. M. Den Tonkelaar, J. M. Berkvens, P. W. Helleman, A. G. Rauws, P. L. Schuller, and G. J. Van Esch, 1976. "Toxicity of Methyl Mercury Chloride in Rats. II. Reproduction Study." *Toxicol.* 6: 97-106.

TABLE D-6

EXPOSURE PARAMETERS FOR THE TERRESTRIAL WILDLIFE MODEL
SITE 36 - CLOSED LANDFILL
NSF IH, INDIAN HEAD, MARYLAND

Species/Exposure Inputs	Conservative Inputs		Average Inputs	
	Values	Units	Values	Units
Bobwhite Quail				
Body Weight = BW	1.540E-01	kg	1.751E-01	kg
Food Ingestion Rate = If	4.880E-03	kg/day	4.080E-03	kg/day
Water Ingestion Rate = Iw	2.276E-02	L/day	1.926E-02	L/day
Soil Ingestion Rate = Is	6.783E-04	kg/day	2.489E-04	kg/day
Home Range = HR	Assume 100% on site		1.880E+01	acres
Meadow Vole				
Body Weight = BW	1.700E-02	kg	3.580E-02	kg
Food Ingestion Rate = If	3.756E-03	kg/day	3.488E-03	kg/day
Water Ingestion Rate = Iw	7.513E-03	L/day	6.261E-03	L/day
Soil Ingestion Rate = Is	1.202E-04	kg/day	4.186E-05	kg/day
Home Range = HR	Assume 100% on site		6.590E-02	acres
American Woodcock				
Body Weight = BW	1.340E-01	kg	1.731E-01	kg
Food Ingestion Rate = If	2.686E-02	kg/day	2.132E-02	kg/day
Water Ingestion Rate = Iw	2.180E-02	L/day	1.731E-02	L/day
Soil Ingestion Rate - Is	4.405E-03	kg/day	1.364E-03	kg/day
Home Range = HR	Assume 100% on site		6.100E+01	acres
Short-Tailed Shrew				
Body Weight = BW	1.500E-02	kg	1.610E-02	kg
Food Ingestion Rate = If	1.600E-03	kg/day	1.433E-03	kg/day
Water Ingestion Rate = Iw	4.280E-03	L/day	3.600E-03	L/day
Soil Ingestion Rate - Is	4.801E-05	kg/day	1.289E-05	kg/day
Home Range = HR	Assume 100% on site		9.699E-01	acres
Raccoon				
Body Weight = BW	3.670E+00	kg	5.636E+00	kg
Food Ingestion Rate = If	2.370E-01	kg/day	1.840E-01	kg/day
Water Ingestion Rate = Iw	4.680E-01	L/day	4.650E-01	L/day
Sediment Ingestion Rate = Is	2.228E-02	kg/day	1.730E-02	kg/day
Home Range = HR	Assume 100% on site		1.558E+03	acres
Great Blue Heron				
Body Weight = BW	2.20E+00	kg	2.31E+00	kg
Food Ingestion Rate = If	1.16E-01	kg/day	1.04E-01	kg/day
Water Ingestion Rate = Iw	1.16E-01	L/day	1.04E-01	L/day
Sediment Ingestion Rate - Is	3.83E-03	kg/day	3.43E-03	kg/day
Home Range = HR	Assume 100% on site		1.10E+01	acres

TABLE D-6

EXPOSURE PARAMETERS FOR THE TERRESTRIAL WILDLIFE MODEL
SITE 36 - CLOSED LANDFILL
NSF IH, INDIAN HEAD, MARYLAND

Notes:
The exposure factors were derived as presented Table D-7.

The soil/sediment ingestion rates were calculated by multiplying the food ingestion rates by the following incidental soil/sediment ingestion rates:

	Conservative	Average	Source
Bobwhite quail	13.90%	6.10%	1, 2
Meadow Vole	3.20%	1.20%	1
American Woodcock	16.40%	6.40%	1
Short-tailed Shrew	3%	0.90%	1
Raccoon	9.4%	9.4%	3
Great Blue Heron	3.3%	3.3%	3, 4

1 - EPA (United States Environmental Protection Agency), 2007. Ecological Soil Screening Level Guidance, Office of Emergency and Remedial Response. August.

2 - Based on the mourning dove.

3 - Beyer, N., E. Connor, and S. Gerould. 1994. Estimates of Soil Ingestion by Wildlife. Journal of Wildlife Management 58(2) pp. 375-382.

4 - Based on a mallard duck

TABLE D-7

DRY WEIGHT DERIVATION OF BODY WEIGHT, FOOD INTAKE, AND WATER INTAKE FACTORS FOR TERRESTRIAL FOOD CHAIN MODELS
SITE 36 - CLOSED LANDFILL
NSF IH, INDIAN HEAD, MARYLAND

	Data from EPA (1993)			Derivation of Factors for Modeling		
Species/Factor	Age/Sex/ Cond./Seas.	Value	Study Average	Calculation of Values		Notes
Short-Tailed Shrew						
Body Weight (g)	A B	15	15	Minimum Value	0.0150 kg	
				Maximum Value	0.01921 kg	
	M summer	19.21	17.27	Overall Study Average	0.01613 kg	
	F summer	17.4				
	M fall	16.87				
	M fall	15.58				
Food Ingestion Rate (g/g-day)	A B	0.49		Conservative value:	0.0016 kg/day	Maximum ingestion rate * Average Body weight * 0.16[1]
	A B	0.62		Average value	0.00143 kg/day	Average ingestion rate * Average Body weight * 0.16[1]
	Overall Study Average		0.555			[1] - 0.16 = percent solids in earthworms to convert to a dry weight ingestion rate
Water Ingestion Rate (g/g-day)	A B	0.223		Conservative value:	0.00428 L/day	Ingestion rate * Maximum Body weight
				Average value	0.00360 L/day	Ingestion rate * Average Body weight
Meadow Vole						
Body Weight (g)	A M summer	40	36.7	Minimum Value	0.017 kg	
	A F summer	33.4		Maximum Value	0.052 kg	
				Overall Study Average	0.0358 kg	
	A M spring	52.4	48.0			
	A F spring	43.5				
	A B spring	26	21.2			
	A B summer	24.3				
	A B fall	17				
	A B winter	17.5				
	A M	35.5	37.3			
	A F	39				
Food Ingestion Rate (g/g-day)		0.3	0.33	Conservative value:	0.003756 kg/day	Maximum ingestion rate * Average Body weight * 0.3 [1]
		0.35				
				Average value	0.003488 kg/day	Average ingestion rate * Average Body weight * 0.3[1]
						[1] - 0.30 = percent solids in grass to convert to a dry weight ingestion rate
Water Ingestion Rate	A B	0.21	0.18	Conservative value:	0.007513 L/day	Maximum ingestion rate * Average Body weight
	A B	0.14		Average value	0.006261 L/day	Average ingestion rate * Average Body weight

TABLE D-7

DRY WEIGHT DERIVATION OF BODY WEIGHT, FOOD INTAKE, AND WATER INTAKE FACTORS FOR TERRESTRIAL FOOD CHAIN MODELS
SITE 36 - CLOSED LANDFILL
NSF IH, INDIAN HEAD, MARYLAND

	Data from EPA (1993)			Derivation of Factors for Modeling		
Species/Factor	Age/Sex/ Cond./Seas.	Value	Study Average	Calculation of Values		Notes
Northern Bobwhite Quail						
Body Weight (g)	A B fall	189.9	191	Minimum Value	0.154 kg	
	A B winter	193.9		Maximum Value	0.194 kg	
	A B spring	190		Overall Study Average	0.1751 kg	
	A M winter	181	177			
	A M summer	163				
	A F winter	183				
	A F summer	180				
	A M winter	161	157			
	A M summer	154				
	A F winter	157				
	A F summer	157				
Food Ingestion Rate (g/g-day)	A B winter	0.093	0.078	Conservative value:	0.00488 kg/day	Maximum ingestion rate * Average Body weight * 0.3[1]
	A B spring	0.067				
	A B summer	0.079		Average value	0.00408 kg/day	Average ingestion rate * Average Body weight * 0.3[1]
	A B fall	0.072				
						[1] - 0.30 = percent solids in grass to convert to a dry weight ingestion rate
Water Ingestion Rate (g/g-day)	A M summer	0.1	0.11	Conservative value:	0.0227616 L/day	Maximum ingestion rate * Average Body weight
	A F summer	0.13				
	A M summer	0.11		Average value	0.0192598 L/day	Average ingestion rate * Average Body weight
	A F summer	0.1				
Raccoon						
Body Weight (kg)	A M	7.6	6.7	Minimum Value	3.67 kg	
	A F parous	6.4		Maximum Value	7.6 kg	
	A F nulliparous	6		Overall Study Average	5.636 kg	
	A M	6.76	6.25			
	A F	5.74				
	A M	4.31	3.99			
	A F	3.67				
Food Ingestion Rate (g/g-day)			No Value	Conservative value:	0.237 kg/day	Used maximum body weight in below equation
				Average value	0.184 kg/day	Used average body weight in below equation
						Food ingestion rates were calculated from Nagy et al., (1999) for carnivores as follows: $FI = ((2.23)*BW(g)^{0.85})/1000$
Water Ingestion Rate (g/g-day)	A M	0.082	0.083	Conservative value:	0.468 L/day	Maximum ingestion rate * Average Body weight
	A F	0.083		Average value	0.465 L/day	Average ingestion rate * Average Body weight

TABLE D-7

DRY WEIGHT DERIVATION OF BODY WEIGHT, FOOD INTAKE, AND WATER INTAKE FACTORS FOR TERRESTRIAL FOOD CHAIN MODELS
SITE 36 - CLOSED LANDFILL
NSF IH, INDIAN HEAD, MARYLAND

	Data from EPA (1993)			Derivation of Factors for Modeling		
Species/Factor	Age/Sex/ Cond./Seas.	Value	Study Average	Calculation of Values		Notes
Great Blue Heron						
Body Weight (g)	A B	2229	2229	Minimum Value	2.204 kg	
				Maximum Value	2.576 kg	
	A F	2204	2390	Overall Study Average	2.310 kg	
	A M	2576				
Food Ingestion Rate (g/g-day)	A B	0.18		Conservative value:	0.116 kg/day	Ingestion rate * Maximum Body weight * 0.25[1]
				Average value	0.104 kg/day	Ingestion rate * Average Body weight * 0.25[1]
						[1] - 0.25 = percent solids in fish to convert to a dry weight ingestion rate
Water Ingestion Rate (g/g-day)	A B	0.045		Conservative value:	0.116 L/day	Ingestion rate * Maximum Body weight
				Average value	0.104 kg/day	Ingestion rate * Average Body weight
American Woodcock						
Body Weight (g)	A M	176	197	Minimum Value	0.134 kg	
	A F	218		Maximum Value	0.218 kg	
				Overall Study Average	0.1731 kg	
	A M April	134.6	139.9			
	A M May	133.8				
	A M June	151.2				
	A M summer	145.9	164.4			
	A F summer	182.9				
	A M fall	169	191			
	A F fall	213				
Food Ingestion Rate (g/g-day)	A B winter	0.77		Conservative value:	0.02686 kg/day	Ingestion rate * Maximum Body weight * 0.16[1]
				Average value	0.02132 kg/day	Ingestion rate * Average Body weight * 0.16[1]
						[1] - 0.16 = percent solids in earthworms to convert to a dry weight ingestion rate
Water Ingestion Rate (g/g-day)	A M	0.1	0.1	Conservative value:	0.02180 L/day	Ingestion rate * Maximum Body weight
	A F	0.1				
				Average value	0.01731 L/day	Ingestion rate * Average Body weight

Notes:
A = Adult
F = Female, M = Male, B = Both
BW = Body Weight

TABLE D-8

SOIL TO EARTHWORM BIOACCUMULATION FACTORS FOR PAHS
SITE 36 – CLOSED LANDFILL
NSF-IH INDIAN HEAD, MARYLAND

Soil	Wet-Weight BAFs[1]	Dry-Weight BAFs[2]	Soil Type
OT1	0.081	0.506	Silty clay loam
OT2	0.026	0.163	Light sandy loam
OT3	0.105	0.656	Silty clay loam
OT4	0.257	1.606	Silty clay loam
OT5	0.192	1.200	Silty clay loam
OT6	0.091	0.569	Silty clay loam
GP1	0.069	0.431	Silty clay loam
GP2	0.072	0.450	Silty clay loam
GP3	0.062	0.388	Silty clay loam
GP4	0.11	0.688	Silty clay
GP5	0.042	0.263	Silty clay
GP6	0.062	0.388	Silty clay
Minimum BAF	**0.026**	**0.163**	
Maximum BAF	**0.257**	**1.606**	
Average BAF	**0.097**	**0.609**	

Notes:
Source of data is Ma et al., (1998)
1 - BAFs from the study are based on wet weight and normalized to the percent of organic carbon and percent lipids.
2 - These BAFs were calculated by dividing the wet weight BAF by 0.16 (percent solids of an earthworm)

Chemical	Earthworm Bioaccumulation Factors[1]			
	Soil Concentration (mg/kg)	Earthworm Concentration (mg/kg)	BAF (dry weight)	BAF (wet weight)[2]
Acenaphthylene	ND	ND	ND	ND
Anthanthrene	1.2	0.11	0.092	0.015
Anthracene	0.92	0.047	0.051	0.008
Benzo(a)anthracene	2	0.25	0.13	0.020
Benzo(a)pyrene	3.8	1.3	0.34	0.055
Benzo(b)fluoranthene	2.6	0.83	0.32	0.051
Benzo(e)pryene	2.1	0.91	0.43	0.069
Benzo(g,h,i)perylene	4.5	1.1	0.24	0.039
Benzo(k)fluoranthene	1.5	0.38	0.25	0.041
Chrysene	2	0.35	0.18	0.028
Dibenzo(a,i)pyrene	1.4	0.44	0.31	0.050
Dibenzo(a,j)anthracene	0.87	0.32	0.37	0.059
Fluoranthene	2.4	0.19	0.079	0.013
Fluorene	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	3.1	1.3	0.42	0.067
Naphthalene	ND	ND	ND	ND
Perylene	1.2	0.3	0.25	0.040
Phenanthrene	2.3	0.28	0.12	0.019
Pyrene	2.5	0.23	0.092	0.015
Triphenylene	1.3	0.87	0.67	0.107
		Minimum BAF	**0.051**	**0.0082**
		Maximum BAF	**0.669**	**0.107**
		Average BAF	**0.256**	**0.041**

Notes:
ND - No data available
1 - Source of data is Table 25 in Beyer (1990)
2 - Wet weight BAF was calculated by multiplying the dry weight BAF by 0.16 (percent solids of an earthworm)

TABLE D-9

MEADOW VOLE - CONSERVATIVE INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION
SITE 36-CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	Max Soil Conc. (mg/kg)	Max SW Conc. (mg/L)	Vegetation Conc. (mg/kg)	Dose (mg/kg/d) from: Soil	Surface Water	Veget.	Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients NOAEL	LOAEL
Semivolatile Organic Compounds											
ACENAPHTHYLENE	5.60E-02	0.00E+00	3.26E-02	3.96E-04	0.00E+00	7.20E-03	7.60E-03	6.56E+01	3.56E+02	1.2E-04	2.1E-05
ANTHRACENE	8.90E-02	0.00E+00	5.66E-02	6.29E-04	0.00E+00	1.25E-02	1.31E-02	6.56E+01	3.56E+02	2.0E-04	3.7E-05
BENZO(A)ANTHRACENE	2.50E-01	0.00E+00	2.93E-02	1.77E-03	0.00E+00	6.46E-03	8.23E-03	6.15E-01	3.84E+01	1.3E-02	2.1E-04
BENZO(A)PYRENE	2.40E-01	0.00E+00	3.17E-02	1.70E-03	0.00E+00	6.99E-03	8.69E-03	6.15E-01	3.84E+01	1.4E-02	2.3E-04
BENZO(B)FLUORANTHENE	4.70E-01	0.00E+00	1.46E-01	3.32E-03	0.00E+00	3.22E-02	3.55E-02	6.15E-01	3.84E+01	5.8E-02	9.2E-04
BENZO(G,H,I)PERYLENE	1.10E-01	0.00E+00	2.89E-02	7.78E-04	0.00E+00	6.40E-03	7.17E-03	6.15E-01	3.84E+01	1.2E-02	1.9E-04
BENZO(K)FLUORANTHENE	1.90E-01	0.00E+00	2.77E-02	1.34E-03	0.00E+00	6.13E-03	7.47E-03	6.15E-01	3.84E+01	1.2E-02	1.9E-04
CHRYSENE	3.30E-01	0.00E+00	3.45E-02	2.33E-03	0.00E+00	7.62E-03	9.96E-03	6.15E-01	3.84E+01	1.6E-02	2.6E-04
DIBENZO(A,H)ANTHRACENE	4.20E-02	0.00E+00	5.46E-03	2.97E-04	0.00E+00	1.21E-03	1.50E-03	6.15E-01	3.84E+01	2.4E-03	3.9E-05
FLUORANTHENE	3.70E-01	0.00E+00	1.85E-01	2.62E-03	0.00E+00	4.09E-02	4.35E-02	6.56E+01	3.56E+02	6.6E-04	1.2E-04
INDENO(1,2,3-CD)PYRENE	1.20E-01	0.00E+00	1.32E-02	8.48E-04	0.00E+00	2.92E-03	3.77E-03	6.15E-01	3.84E+01	6.1E-03	9.8E-05
PHENANTHRENE	1.10E-01	0.00E+00	2.15E-01	7.78E-04	0.00E+00	4.76E-02	4.84E-02	6.56E+01	3.56E+02	7.4E-04	1.4E-04
PYRENE	3.70E-01	0.00E+00	2.66E-01	2.62E-03	0.00E+00	5.89E-02	6.15E-02	6.15E-01	3.84E+01	1.0E-01	1.6E-03
Metals											
ARSENIC	6.20E+00	0.00E+00	2.33E-01	4.38E-02	0.00E+00	5.14E-02	9.52E-02	1.04E+00	4.55E+00	9.2E-02	2.1E-02
CADMIUM	3.10E+00	7.10E-04	1.15E+00	2.19E-02	3.14E-04	2.55E-01	2.77E-01	7.70E-01	6.90E+00	3.6E-01	4.0E-02
CHROMIUM	1.22E+01	1.50E-03	5.00E-01	8.63E-02	6.63E-04	1.11E-01	1.97E-01	2.40E+00	5.82E+01	8.2E-02	3.4E-03
COPPER	4.66E+01	7.50E-03	8.86E+00	3.30E-01	3.31E-03	1.96E+00	2.29E+00	5.82E+00	8.14E+01	3.9E-01	2.8E-02
LEAD	1.78E+02	1.36E-02	4.85E+00	1.26E+00	6.01E-03	1.07E+00	2.34E+00	4.70E+00	1.86E+02	5.0E-01	1.3E-02
MERCURY	9.70E-02	0.00E+00	4.85E-01	6.86E-04	0.00E+00	1.07E-01	1.08E-01	3.20E-02	1.60E-01	3.4E+00	6.7E-01
NICKEL	1.04E+01	2.00E-03	6.24E-01	7.35E-02	8.84E-04	1.38E-01	2.12E-01	1.70E+00	1.48E+01	1.2E-01	1.4E-02
ZINC	8.10E+01	0.00E+00	5.51E+01	5.73E-01	0.00E+00	1.22E+01	1.28E+01	7.54E+01	2.98E+02	1.7E-01	4.3E-02

Cells are shaded if the value is greater than 1.0

Body Weight = (BW)	1.70E-02	kg
Food Ingestion Rate = (If)	3.76E-03	kg/day
Water Ingestion Rate = (Iw)	7.51E-03	L/day
Soil Ingestion Rate = (Is)	1.20E-04	kg/day
Home Range = (HR)	Assume 100% on site	
Contaminated Area = (CA)	Assume equal to home range	

Dose (soil) = (Cs * Is)(H)/BW
Dose (vegetation) = (Cv * If)(H)/BW
Dose (water) = (Cw * Iw)(H)/BW
Cv = Contaminant concentration in vegetation
Cs = Contaminant concentration in soil
Cw = Contaminant concentration in water
Total Dose = Dose (soil) + Dose (vegetation) + Dose (water)
H=HR/CA (Assume = to 1)

Conc = Concentration
LOAEL = Lowest Observed Adverse Effects Concentration
NOAEL = No Observed Adverse Effects Concentration
SW = Surface Water

The calculation of the contaminant concentration in vegetation (Cv) is provided in Table D-1.

TABLE D-10

MEADOW VOLE - AVERAGE INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION
SITE 36-CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	Avg Soil Conc. (mg/kg)	Avg SW Conc. (mg/L)	Vegetation Conc. (mg/kg)	Dose (mg/kg/d) from: Soil	Surface Water	Veget.	Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients NOAEL	LOAEL
Metals											
MERCURY	8.00E-02	0.00E+00	5.22E-02	9.35E-05	0.00E+00	5.08E-03	5.18E-03	3.20E-02	1.60E-01	1.6E-01	3.2E-02

Body Weight = (BW)	3.58E-02	kg
Food Ingestion Rate = (If)	3.49E-03	kg/day
Water Ingestion Rate = (Iw)	6.26E-03	L/day
Soil Ingestion Rate = (Is)	4.19E-05	kg/day
Home Range = (HR)	6.59E-02	acres
Contaminated Area = (CA)	Assume equal to home range	

Dose (soil) = (Cs * Is)(H)/BW
Dose (vegetation) = (Cv * If)(H)/BW
Dose (water) = (Cw * Iw)(H)/BW
Cv = Contaminant concentration in vegetation
Cs = Contaminant concentration in soil
Cw = Contaminant concentration in water
Total Dose = Dose (soil) + Dose (vegetation) + Dose (water)
H=HR/CA (Assume = to 1)

Conc = Concentration
LOAEL = Lowest Observed Adverse Effects Concentration
NOAEL = No Observed Adverse Effects Concentration
SW = Surface Water

The calculation of the contaminant concentration in vegetation (Cv) is provided in Table D-1.

TABLE D-11

BOBWHITE QUAIL - CONSERVATIVE INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION
SITE 36-CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	Max Soil Conc. (mg/kg)	Max SW Conc. (mg/L)	Vegetation Conc. (mg/kg)	Dose (mg/kg/d) from: Soil	Surface Water	Veget.	Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients NOAEL	LOAEL
Semivolatile Organic Compounds											
ACENAPHTHYLENE	5.60E-02	0.00E+00	3.26E-02	2.47E-04	0.00E+00	1.03E-03	1.28E-03	2.00E+00	2.00E+01	6.4E-04	6.4E-05
ANTHRACENE	8.90E-02	0.00E+00	5.66E-02	3.92E-04	0.00E+00	1.79E-03	2.19E-03	2.00E+00	2.00E+01	1.1E-03	1.1E-04
BENZO(A)ANTHRACENE	2.50E-01	0.00E+00	2.93E-02	1.10E-03	0.00E+00	9.27E-04	2.03E-03	2.00E+00	2.00E+01	1.0E-03	1.0E-04
BENZO(A)PYRENE	2.40E-01	0.00E+00	3.17E-02	1.06E-03	0.00E+00	1.00E-03	2.06E-03	2.00E+00	2.00E+01	1.0E-03	1.0E-04
BENZO(B)FLUORANTHENE	4.70E-01	0.00E+00	1.46E-01	2.07E-03	0.00E+00	4.62E-03	6.69E-03	2.00E+00	2.00E+01	3.3E-03	3.3E-04
BENZO(G,H,I)PERYLENE	1.10E-01	0.00E+00	2.89E-02	4.85E-04	0.00E+00	9.17E-04	1.40E-03	2.00E+00	2.00E+01	7.0E-04	7.0E-05
BENZO(K)FLUORANTHENE	1.90E-01	0.00E+00	2.77E-02	8.37E-04	0.00E+00	8.79E-04	1.72E-03	2.00E+00	2.00E+01	8.6E-04	8.6E-05
CHRYSENE	3.30E-01	0.00E+00	3.45E-02	1.45E-03	0.00E+00	1.09E-03	2.55E-03	2.00E+00	2.00E+01	1.3E-03	1.3E-04
DIBENZO(A,H)ANTHRACENE	4.20E-02	0.00E+00	5.46E-03	1.85E-04	0.00E+00	1.73E-04	3.58E-04	2.00E+00	2.00E+01	1.8E-04	1.8E-05
FLUORANTHENE	3.70E-01	0.00E+00	1.85E-01	1.63E-03	0.00E+00	5.86E-03	7.49E-03	2.00E+00	2.00E+01	3.7E-03	3.7E-04
INDENO(1,2,3-CD)PYRENE	1.20E-01	0.00E+00	1.32E-02	5.29E-04	0.00E+00	4.18E-04	9.47E-04	2.00E+00	2.00E+01	4.7E-04	4.7E-05
PHENANTHRENE	1.10E-01	0.00E+00	2.15E-01	4.85E-04	0.00E+00	6.82E-03	7.31E-03	2.00E+00	2.00E+01	3.7E-03	3.7E-04
PYRENE	3.70E-01	0.00E+00	2.66E-01	1.63E-03	0.00E+00	8.44E-03	1.01E-02	2.00E+00	2.00E+01	5.0E-03	5.0E-04
Metals											
ARSENIC	6.20E+00	0.00E+00	2.33E-01	2.73E-02	0.00E+00	7.37E-03	3.47E-02	2.24E+00	4.51E+00	1.5E-02	7.7E-03
CADMIUM	3.10E+00	7.10E-04	1.15E+00	1.37E-02	1.05E-04	3.66E-02	5.03E-02	1.47E+00	6.35E+00	3.4E-02	7.9E-03
CHROMIUM	1.22E+01	1.50E-03	5.00E-01	5.37E-02	2.22E-04	1.59E-02	6.98E-02	2.66E+00	1.56E+01	2.6E-02	4.5E-03
COPPER	4.66E+01	7.50E-03	8.86E+00	2.05E-01	1.11E-03	2.81E-01	4.87E-01	4.05E+00	3.48E+01	1.2E-01	1.4E-02
LEAD	1.78E+02	1.36E-02	4.85E+00	7.84E-01	2.01E-03	1.54E-01	9.40E-01	1.63E+00	4.46E+01	5.8E-01	2.1E-02
MERCURY	9.70E-02	0.00E+00	4.85E-01	4.27E-04	0.00E+00	1.54E-02	1.58E-02	6.40E-03	6.40E-02	2.5E+00	2.5E-01
NICKEL	1.04E+01	2.00E-03	6.24E-01	4.58E-02	2.96E-04	1.98E-02	6.59E-02	6.71E+00	1.86E+01	9.8E-03	3.5E-03
ZINC	8.10E+01	0.00E+00	5.51E+01	3.57E-01	0.00E+00	1.75E+00	2.10E+00	6.61E+01	1.71E+02	3.2E-02	1.2E-02

Cells are shaded if the value is greater than 1.0

Body Weight = (BW)	1.54E-01	kg
Food Ingestion Rate = (If)	4.88E-03	kg/day
Water Ingestion Rate = (Iw)	2.28E-02	L/day
Soil Ingestion Rate = (Is)	6.78E-04	kg/day
Home Range = (HR)	Assume 100% on site	
Contaminated Area = (CA)	Assume equal to home range	

Dose (soil) = (Cs * Is)(H)/BW
Dose (vegetation) = (Cv * If)(H)/BW
Dose (water) = (Cw * Iw)(H)/BW
Cv = Contaminant concentration in vegetation
Cs = Contaminant concentration in soil
Cw = Contaminant concentration in water
Total Dose = Dose (soil) + Dose (vegetation) + Dose (water)
H=HR/CA (Assume = to 1)

Conc = Concentration
LOAEL = Lowest Observed Adverse Effects Concentration
NOAEL = No Observed Adverse Effects Concentration
SW = Surface Water

The calculation of the contaminant concentration in vegetation (Cv) is provided in Table D-1.

TABLE D-12

BOBWHITE QUAIL - AVERAGE INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION
SITE 36-CLOSED LANDFILL, NSF-IH, INDIAN HEAD, MARYLAND

Chemical	Avg Soil Conc. (mg/kg)	Avg SW Conc. (mg/L)	Vegetation Conc. (mg/kg)	Dose (mg/kg/d) from: Soil	Surface Water	Veget.	Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients NOAEL	LOAEL
Metals											
MERCURY	8.00E-02	0.00E+00	5.22E-02	1.14E-04	0.00E+00	1.22E-03	1.33E-03	6.40E-03	6.40E-02	2.1E-01	2.1E-02

Body Weight = (BW)	1.75E-01	kg
Food Ingestion Rate = (If)	4.08E-03	kg/day
Water Ingestion Rate = (Iw)	1.93E-02	L/day
Soil Ingestion Rate = (Is)	2.49E-04	kg/day
Home Range = (HR)	1.88E+01	acres
Contaminated Area = (CA)	Assume equal to home range	

Dose (soil) = (Cs * Is)(H)/BW
Dose (vegetation) = (Cv * If)(H)/BW
Dose (water) = (Cw * Iw)(H)/BW
Cv = Contaminant concentration in vegetation
Cs = Contaminant concentration in soil
Cw = Contaminant concentration in water
Total Dose = Dose (soil) + Dose (vegetation) + Dose (water)
H=HR/CA (Assume = to 1)

Conc = Concentration
LOAEL = Lowest Observed Adverse Effects Concentration
NOAEL = No Observed Adverse Effects Concentration
SW = Surface Water

The calculation of the contaminant concentration in vegetation (Cv) is provided iin Table D-1.

TABLE D-13

SHORT-TAILED SHREW - CONSERVATIVE INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION
SITE 36-CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	Max Soil Conc. (mg/kg)	Max SW Conc. (mg/L)	Invertebrate Conc. (mg/kg)	Dose (mg/kg/d) from: Soil	Surface Water	Invert.	Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients NOAEL	LOAEL
Semivolatile Organic Compounds											
ACENAPHTHYLENE	5.60E-02	0.00E+00	8.99E-02	1.79E-04	0.00E+00	9.60E-03	9.77E-03	6.56E+01	3.56E+02	1.5E-04	2.7E-05
ANTHRACENE	8.90E-02	0.00E+00	1.43E-01	2.85E-04	0.00E+00	1.52E-02	1.55E-02	6.56E+01	3.56E+02	2.4E-04	4.4E-05
BENZO(A)ANTHRACENE	2.50E-01	0.00E+00	4.02E-01	8.00E-04	0.00E+00	4.28E-02	4.36E-02	6.15E-01	3.84E+01	7.1E-02	1.1E-03
BENZO(A)PYRENE	2.40E-01	0.00E+00	3.85E-01	7.68E-04	0.00E+00	4.11E-02	4.19E-02	6.15E-01	3.84E+01	6.8E-02	1.1E-03
BENZO(B)FLUORANTHENE	4.70E-01	0.00E+00	7.55E-01	1.50E-03	0.00E+00	8.05E-02	8.20E-02	6.15E-01	3.84E+01	1.3E-01	2.1E-03
BENZO(G,H,I)PERYLENE	1.10E-01	0.00E+00	1.77E-01	3.52E-04	0.00E+00	1.88E-02	1.92E-02	6.15E-01	3.84E+01	3.1E-02	5.0E-04
BENZO(K)FLUORANTHENE	1.90E-01	0.00E+00	3.05E-01	6.08E-04	0.00E+00	3.26E-02	3.32E-02	6.15E-01	3.84E+01	5.4E-02	8.6E-04
CHRYSENE	3.30E-01	0.00E+00	5.30E-01	1.06E-03	0.00E+00	5.65E-02	5.76E-02	6.15E-01	3.84E+01	9.4E-02	1.5E-03
DIBENZO(A,H)ANTHRACENE	4.20E-02	0.00E+00	6.75E-02	1.34E-04	0.00E+00	7.20E-03	7.33E-03	6.15E-01	3.84E+01	1.2E-02	1.9E-04
FLUORANTHENE	3.70E-01	0.00E+00	5.94E-01	1.18E-03	0.00E+00	6.34E-02	6.46E-02	6.56E+01	3.56E+02	9.8E-04	1.8E-04
INDENO(1,2,3-CD)PYRENE	1.20E-01	0.00E+00	1.93E-01	3.84E-04	0.00E+00	2.06E-02	2.09E-02	6.15E-01	3.84E+01	3.4E-02	5.5E-04
PHENANTHRENE	1.10E-01	0.00E+00	1.77E-01	3.52E-04	0.00E+00	1.88E-02	1.92E-02	6.56E+01	3.56E+02	2.9E-04	5.4E-05
PYRENE	3.70E-01	0.00E+00	5.94E-01	1.18E-03	0.00E+00	6.34E-02	6.46E-02	6.15E-01	3.84E+01	1.1E-01	1.7E-03
Metals											
ARSENIC	6.20E+00	0.00E+00	8.76E-01	1.98E-02	0.00E+00	9.34E-02	1.13E-01	1.04E+00	4.55E+00	1.1E-01	2.5E-02
CADMIUM	3.10E+00	7.10E-04	2.04E+01	9.92E-03	2.03E-04	2.17E+00	2.18E+00	7.70E-01	6.90E+00	2.8E+00	3.2E-01
CHROMIUM	1.22E+01	1.50E-03	3.73E+00	3.90E-02	4.28E-04	3.98E-01	4.38E-01	2.40E+00	5.82E+01	1.8E-01	7.5E-03
COPPER	4.66E+01	7.50E-03	2.40E+01	1.49E-01	2.14E-03	2.56E+00	2.71E+00	5.82E+00	8.14E+01	4.7E-01	3.3E-02
LEAD	1.78E+02	1.36E-02	5.27E+01	5.70E-01	3.88E-03	5.62E+00	6.19E+00	4.70E+00	1.86E+02	1.3E+00	3.3E-02
MERCURY	9.70E-02	0.00E+00	4.93E-01	3.10E-04	0.00E+00	5.26E-02	5.29E-02	3.20E-02	1.60E-01	1.7E+00	3.3E-01
NICKEL	1.04E+01	2.00E-03	1.10E+01	3.33E-02	5.71E-04	1.18E+00	1.21E+00	1.70E+00	1.48E+01	7.1E-01	8.2E-02
ZINC	8.10E+01	0.00E+00	3.62E+02	2.59E-01	0.00E+00	3.86E+01	3.88E+01	7.54E+01	2.98E+02	5.2E-01	1.3E-01

Cells are shaded if the value is greater than 1.0

Body Weight = (BW)	1.50E-02	kg
Food Ingestion Rate = (If)	1.60E-03	kg/day
Water Ingestion Rate = (Iw)	4.28E-03	L/day
Soil Ingestion Rate = (Is)	4.80E-05	kg/day
Home Range = (HR)	Assume 100% on site	
Contaminated Area = (CA)	Assume equal to home range	

Dose (soil) = (Cs * Is)(H)/BW
Dose (invertebrate) = (Ci * If)(H)/BW
Dose (water) = (Cw * Iw)(H)/BW
Ci = Contaminant concentration in invertebrate
Cs = Contaminant concentration in soil
Cw = Contaminant concentration in water
Total Dose = Dose (soil) + Dose (invertebrate) + Dose (water)
H=HR/CA (Assume = to 1)

Conc = Concentration
LOAEL = Lowest Observed Adverse Effects Concentration
NOAEL = No Observed Adverse Effects Concentration
SW = Surface Water

The calculation of the contaminant concentration in invertebrates (Ci) is provided in Table D-1.

TABLE D-14

SHORT-TAILED SHREW - AVERAGE INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION
SITE 36-CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	Avg Soil Conc. (mg/kg)	Avg SW Conc. (mg/L)	Invertebrate Conc. (mg/kg)	Dose (mg/kg/d) from:			Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients	
				Soil	Surface Water	Invert.				NOAEL	LOAEL
Metals											
CADMIUM	6.10E-01	2.00E-04	5.59E+00	4.88E-04	4.47E-05	4.97E-01	4.98E-01	7.70E-01	6.90E+00	6.5E-01	7.2E-02
LEAD	5.37E+01	3.40E-03	2.00E+01	4.30E-02	7.60E-04	1.78E+00	1.82E+00	4.70E+00	1.86E+02	3.9E-01	9.8E-03
MERCURY	8.00E-02	0.00E+00	4.62E-01	6.41E-05	0.00E+00	4.11E-02	4.11E-02	3.20E-02	1.60E-01	1.3E+00	2.6E-01

Cells are shaded if the value is greater than 1.0

Body Weight = (BW)	1.61E-02	kg
Food Ingestion Rate = (If)	1.43E-03	kg/day
Water Ingestion Rate = (Iw)	3.60E-03	L/day
Soil Ingestion Rate = (Is)	1.29E-05	kg/day
Home Range = (HR)	9.70E-01	acres
Contaminated Area = (CA)	Assume equal to home range	

Dose (soil) = (Cs * Is)(H)/BW
Dose (invertebrate) = (Ci * If)(H)/BW
Dose (water) = (Cw * Iw)(H)/BW
Ci = Contaminant concentration in invertebrate
Cs = Contaminant concentration in soil
Cw = Contaminant concentration in water
Total Dose = Dose (soil) + Dose (invertebrate) + Dose (water)
H=HR/CA (Assume = to 1)

Conc = Concentration
LOAEL = Lowest Observed Adverse Effects Concentration
NOAEL = No Observed Adverse Effects Concentration
SW = Surface Water

The calculation of the contaminant concentration in invertebrates (Ci) is provided in Table D-1.

TABLE D-15

AMERICAN WOODCOCK - CONSERVATIVE INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION
SITE 36-CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	Max Soil Conc. (mg/kg)	Max SW Conc. (mg/L)	Invertebrate Conc. (mg/kg)	Dose (mg/kg/d) from: Soil	Surface Water	Invert.	Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients NOAEL	LOAEL
Semivolatile Organic Compounds											
ACENAPHTHYLENE	5.60E-02	0.00E+00	8.99E-02	1.84E-03	0.00E+00	1.80E-02	1.99E-02	2.00E+00	2.00E+01	9.9E-03	9.9E-04
ANTHRACENE	8.90E-02	0.00E+00	1.43E-01	2.93E-03	0.00E+00	2.87E-02	3.16E-02	2.00E+00	2.00E+01	1.6E-02	1.6E-03
BENZO(A)ANTHRACENE	2.50E-01	0.00E+00	4.02E-01	8.22E-03	0.00E+00	8.05E-02	8.87E-02	2.00E+00	2.00E+01	4.4E-02	4.4E-03
BENZO(A)PYRENE	2.40E-01	0.00E+00	3.85E-01	7.89E-03	0.00E+00	7.73E-02	8.52E-02	2.00E+00	2.00E+01	4.3E-02	4.3E-03
BENZO(B)FLUORANTHENE	4.70E-01	0.00E+00	7.55E-01	1.55E-02	0.00E+00	1.51E-01	1.67E-01	2.00E+00	2.00E+01	8.3E-02	8.3E-03
BENZO(G,H,I)PERYLENE	1.10E-01	0.00E+00	1.77E-01	3.62E-03	0.00E+00	3.54E-02	3.90E-02	2.00E+00	2.00E+01	2.0E-02	2.0E-03
BENZO(K)FLUORANTHENE	1.90E-01	0.00E+00	3.05E-01	6.25E-03	0.00E+00	6.12E-02	6.74E-02	2.00E+00	2.00E+01	3.4E-02	3.4E-03
CHRYSENE	3.30E-01	0.00E+00	5.30E-01	1.08E-02	0.00E+00	1.06E-01	1.17E-01	2.00E+00	2.00E+01	5.9E-02	5.9E-03
DIBENZO(A,H)ANTHRACENE	4.20E-02	0.00E+00	6.75E-02	1.38E-03	0.00E+00	1.35E-02	1.49E-02	2.00E+00	2.00E+01	7.5E-03	7.5E-04
FLUORANTHENE	3.70E-01	0.00E+00	5.94E-01	1.22E-02	0.00E+00	1.19E-01	1.31E-01	2.00E+00	2.00E+01	6.6E-02	6.6E-03
INDENO(1,2,3-CD)PYRENE	1.20E-01	0.00E+00	1.93E-01	3.94E-03	0.00E+00	3.86E-02	4.26E-02	2.00E+00	2.00E+01	2.1E-02	2.1E-03
PHENANTHRENE	1.10E-01	0.00E+00	1.77E-01	3.62E-03	0.00E+00	3.54E-02	3.90E-02	2.00E+00	2.00E+01	2.0E-02	2.0E-03
PYRENE	3.70E-01	0.00E+00	5.94E-01	1.22E-02	0.00E+00	1.19E-01	1.31E-01	2.00E+00	2.00E+01	6.6E-02	6.6E-03
Metals											
ARSENIC	6.20E+00	0.00E+00	8.76E-01	2.04E-01	0.00E+00	1.76E-01	3.79E-01	2.24E+00	4.51E+00	1.7E-01	8.4E-02
CADMIUM	3.10E+00	7.10E-04	2.04E+01	1.02E-01	1.16E-04	4.08E+00	4.18E+00	1.47E+00	6.35E+00	2.8E+00	6.6E-01
CHROMIUM	1.22E+01	1.50E-03	3.73E+00	4.01E-01	2.44E-04	7.48E-01	1.15E+00	2.66E+00	1.56E+01	4.3E-01	7.4E-02
COPPER	4.66E+01	7.50E-03	2.40E+01	1.53E+00	1.22E-03	4.81E+00	6.34E+00	4.05E+00	3.48E+01	1.6E+00	1.8E-01
LEAD	1.78E+02	1.36E-02	5.27E+01	5.85E+00	2.21E-03	1.06E+01	1.64E+01	1.63E+00	4.46E+01	1.0E+01	3.7E-01
MERCURY	9.70E-02	0.00E+00	4.93E-01	3.19E-03	0.00E+00	9.88E-02	1.02E-01	6.40E-03	6.40E-02	1.6E+01	1.6E+00
NICKEL	1.04E+01	2.00E-03	1.10E+01	3.42E-01	3.25E-04	2.21E+00	2.55E+00	6.71E+00	1.86E+01	3.8E-01	1.4E-01
ZINC	8.10E+01	0.00E+00	3.62E+02	2.66E+00	0.00E+00	7.25E+01	7.51E+01	6.61E+01	1.71E+02	1.1E+00	4.4E-01

Cells are shaded if the value is greater than 1.0

Body Weight = (BW)	1.34E-01	kg
Food Ingestion Rate = (If)	2.69E-02	kg/day
Water Ingestion Rate = (Iw)	2.18E-02	L/day
Soil Ingestion Rate = (Is)	4.41E-03	kg/day
Home Range = (HR)	Assume 100% on site	
Contaminated Area = (CA)	Assume equal to home range	

Dose (soil) = (Cs * Is)(H)/BW
Dose (invertebrate) = (Ci * If)(H)/BW
Dose (water) = (Cw * Iw)(H)/BW
Ci = Contaminant concentration in invertebrate
Cs = Contaminant concentration in soil
Cw = Contaminant concentration in water
Total Dose = Dose (soil) + Dose (invertebrate) + Dose (water)
H=HR/CA (Assume = to 1)

Conc = Concentration
LOAEL = Lowest Observed Adverse Effects Concentration
NOAEL = No Observed Adverse Effects Concentration
SW = Surface Water

The calculation of the contaminant concentration in invertebrates (Ci) is provided in Table D-1.

TABLE D-16

AMERICAN WOODCOCK - AVERAGE INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION
SITE 36-CLOSED LANDFILL, NSF-IH, INDIAN HEAD, MARYLAND
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	Avg Soil Conc. (mg/kg)	Avg SW Conc. (mg/L)	Invertebrate Conc. (mg/kg)	Dose (mg/kg/d) from: Soil	Surface Water	Invert.	Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients NOAEL	LOAEL
Metals											
CADMIUM	6.10E-01	2.00E-04	5.59E+00	4.81E-03	2.00E-05	6.89E-01	6.93E-01	1.47E+00	6.35E+00	4.7E-01	1.1E-01
COPPER	2.11E+01	1.95E-03	1.09E+01	1.66E-01	1.95E-04	1.34E+00	1.50E+00	4.05E+00	3.48E+01	3.7E-01	4.3E-02
LEAD	5.37E+01	3.40E-03	2.00E+01	4.23E-01	3.40E-04	2.47E+00	2.89E+00	1.63E+00	4.46E+01	1.8E+00	6.5E-02
MERCURY	8.00E-02	0.00E+00	4.62E-01	6.31E-04	0.00E+00	5.69E-02	5.75E-02	6.40E-03	6.40E-02	9.0E+00	9.0E-01
ZINC	4.45E+01	0.00E+00	2.97E+02	3.51E-01	0.00E+00	3.66E+01	3.69E+01	6.61E+01	1.71E+02	5.6E-01	2.2E-01

Cells are shaded if the value is greater than 1.0

Body Weight = (BW)	1.73E-01	kg
Food Ingestion Rate = (If)	2.13E-02	kg/day
Water Ingestion Rate = (Iw)	1.73E-02	L/day
Soil Ingestion Rate = (Is)	1.36E-03	kg/day
Home Range = (HR)	0.00E+00	acres
Contaminated Area = (CA)	Assume equal to home range	

Dose (soil) = (Cs * Is)(H)/BW
Dose (invertebrate) = (Ci * If)(H)/BW
Dose (water) = (Cw * Iw)(H)/BW
Ci = Contaminant concentration in invertebrate
Cs = Contaminant concentration in soil
Cw = Contaminant concentration in water
Total Dose = Dose (soil) + Dose (invertebrate) + Dose (water)
H=HR/CA (Assume = to 1)

Conc = Concentration
LOAEL = Lowest Observed Adverse Effects Concentration
NOAEL = No Observed Adverse Effects Concentration
SW = Surface Water

The calculation of the contaminant concentration in invertebrates (Ci) is provided in Table D-1.

TABLE D-17

GREAT BLUE HERON - CONSERVATIVE INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION
SITE 36 - CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	Max Sed. Conc. (mg/kg)	Max SW Conc. (mg/L)	Max Tissue Conc. (mg/kg)	Dose (mg/kg/d) from: Sediment	Surface Water	Tissue	Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients NOAEL	LOAEL
Semivolatile Organics											
ACENAPHTHYLENE	2.90E-01	0.00E+00	1.50E-01	5.03E-04	0.00E+00	7.87E-03	8.38E-03	2.00E+00	2.00E+01	4.2E-03	4.2E-04
ANTHRACENE	4.20E-01	0.00E+00	2.17E-01	7.29E-04	0.00E+00	1.14E-02	1.21E-02	2.00E+00	2.00E+01	6.1E-03	6.1E-04
BENZO(A)ANTHRACENE	1.20E+00	0.00E+00	6.19E-01	2.08E-03	0.00E+00	3.26E-02	3.47E-02	2.00E+00	2.00E+01	1.7E-02	1.7E-03
BENZO(A)PYRENE	1.00E+00	0.00E+00	5.16E-01	1.74E-03	0.00E+00	2.71E-02	2.89E-02	2.00E+00	2.00E+01	1.4E-02	1.4E-03
BENZO(B)FLUORANTHENE	2.30E+00	0.00E+00	1.19E+00	3.99E-03	0.00E+00	6.24E-02	6.64E-02	2.00E+00	2.00E+01	3.3E-02	3.3E-03
BENZO(G,H,I)PERYLENE	4.90E-01	0.00E+00	2.53E-01	8.50E-04	0.00E+00	1.33E-02	1.42E-02	2.00E+00	2.00E+01	7.1E-03	7.1E-04
BENZO(K)FLUORANTHENE	7.90E-01	0.00E+00	4.08E-01	1.37E-03	0.00E+00	2.14E-02	2.28E-02	2.00E+00	2.00E+01	1.1E-02	1.1E-03
CHRYSENE	1.30E+00	0.00E+00	6.71E-01	2.26E-03	0.00E+00	3.53E-02	3.76E-02	2.00E+00	2.00E+01	1.9E-02	1.9E-03
DIBENZO(A,H)ANTHRACENE	2.10E-01	0.00E+00	1.08E-01	3.64E-04	0.00E+00	5.70E-03	6.07E-03	2.00E+00	2.00E+01	3.0E-03	3.0E-04
FLUORANTHENE	1.30E+00	0.00E+00	6.71E-01	2.26E-03	0.00E+00	3.53E-02	3.76E-02	2.00E+00	2.00E+01	1.9E-02	1.9E-03
INDENO(1,2,3-CD)PYRENE	4.80E-01	0.00E+00	2.48E-01	8.33E-04	0.00E+00	1.30E-02	1.39E-02	2.00E+00	2.00E+01	6.9E-03	6.9E-04
PHENANTHRENE	1.20E-01	0.00E+00	6.19E-02	2.08E-04	0.00E+00	3.26E-03	3.47E-03	2.00E+00	2.00E+01	1.7E-03	1.7E-04
PYRENE	1.20E+00	0.00E+00	6.19E-01	2.08E-03	0.00E+00	3.26E-02	3.47E-02	2.00E+00	2.00E+01	1.7E-02	1.7E-03
Inorganics											
ARSENIC	1.77E+01	0.00E+00	1.22E+01	3.07E-02	0.00E+00	6.42E-01	6.73E-01	2.24E+00	4.51E+00	3.0E-01	1.5E-01
CADMIUM	1.60E+01	7.10E-04	1.28E+02	2.78E-02	3.73E-05	6.72E+00	6.75E+00	1.47E+00	6.35E+00	4.6E+00	1.1E+00
CHROMIUM	1.10E+02	1.50E-03	5.15E+01	1.91E-01	7.89E-05	2.71E+00	2.90E+00	2.66E+00	1.56E+01	1.1E+00	1.9E-01
COPPER	1.27E+02	7.50E-03	6.67E+02	2.20E-01	3.94E-04	3.51E+01	3.53E+01	4.05E+00	3.48E+01	8.7E+00	1.0E+00
LEAD	4.10E+03	1.36E-02	2.49E+03	7.12E+00	7.15E-04	1.31E+02	1.38E+02	1.63E+00	4.46E+01	8.5E+01	3.1E+00
MERCURY	2.90E+00	0.00E+00	8.32E+00	5.03E-03	0.00E+00	4.37E-01	4.42E-01	6.40E-03	6.40E-02	6.9E+01	6.9E+00
NICKEL	1.02E+02	2.00E-03	2.37E+02	1.77E-01	1.05E-04	1.24E+01	1.26E+01	6.71E+00	1.86E+01	1.9E+00	6.8E-01
SILVER	4.90E+00	0.00E+00	4.90E+00	8.50E-03	0.00E+00	2.58E-01	2.66E-01	5.44E+00	5.44E+01	4.9E-02	4.9E-03
ZINC	8.40E+02	0.00E+00	6.32E+03	1.46E+00	0.00E+00	3.33E+02	3.34E+02	6.61E+01	1.71E+02	5.1E+00	1.9E+00

Cells are shaded if the value is greater than 1.0

Body Weight = (BW)	2.20E+00	kg
Food Ingestion Rate = (If)	1.16E-01	kg/day
Water Ingestion Rate = (Iw)	1.16E-01	L/day
Sediment Ingestion Rate = (Is)	3.83E-03	kg/day
Home Range = (HR)	Assume 100% on site	
Contaminated Area = (CA)	Assume equal to home range	

Dose (sediment) = (Cs * Is)(H)/BW
Dose (tissue) = (Ct * If)(H)/BW
Dose (water) = (Cw * Iw)(H)/BW
Ct = Contaminant concentration in tissue
Cs = Contaminant concentration in sediment
Cw = Contaminant concentration in water
Total Dose = Dose (sediment) + Dose (tissue) + Dose (water)
H=HR/CA (Assume = to 1)

Conc = Concentration
LOAEL = Lowest Observed Adverse Effects Concentration
NOAEL = No Observed Adverse Effects Concentration
Sed = Sediment
SW = Surface Water

The calculation of the contaminant concentration in tissue (Ct) is provided in Table D-2.

TABLE D-18

GREAT BLUE HERON - AVERAGE INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION
SITE 36 - CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	Avg Sed. Conc. (mg/kg)	Avg SW Conc. (mg/L)	Avg Tissue Conc. (mg/kg)	Dose (mg/kg/d) from: Sediment	Surface Water	Tissue	Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients NOAEL	LOAEL
Inorganics											
CADMIUM	2.27E+00	2.00E-04	1.36E+00	3.37E-03	9.00E-06	6.13E-02	6.47E-02	1.47E+00	6.35E+00	4.4E-02	1.0E-02
CHROMIUM	2.99E+01	6.40E-04	2.99E+00	4.44E-02	2.88E-05	1.35E-01	1.79E-01	2.66E+00	1.56E+01	6.7E-02	1.1E-02
COPPER	4.62E+01	1.95E-03	7.19E+01	6.86E-02	8.78E-05	3.23E+00	3.30E+00	4.05E+00	3.48E+01	8.2E-01	9.5E-02
LEAD	3.26E+02	3.40E-03	2.31E+01	4.84E-01	1.53E-04	1.04E+00	1.53E+00	1.63E+00	4.46E+01	9.4E-01	3.4E-02
MERCURY	3.50E-01	0.00E+00	3.98E-01	5.20E-04	0.00E+00	1.79E-02	1.84E-02	6.40E-03	6.40E-02	2.9E+00	2.9E-01
NICKEL	2.51E+01	1.47E-03	1.22E+01	3.73E-02	6.62E-05	5.49E-01	5.86E-01	6.71E+00	1.86E+01	8.7E-02	3.2E-02
ZINC	2.02E+02	0.00E+00	3.91E+02	3.00E-01	0.00E+00	1.76E+01	1.79E+01	6.61E+01	1.71E+02	2.7E-01	1.0E-01

Cells are shaded if the value is greater than 1.0

Body Weight = (BW)	2.31E+00	kg
Food Ingestion Rate = (If)	1.04E-01	kg/day
Water Ingestion Rate = (Iw)	1.04E-01	L/day
Sediment Ingestion Rate = (Is)	3.43E-03	kg/day
Home Range = (HR)	1.10E+01	acres
Contaminated Area = (CA)	Assume equal to home range	

Dose (sediment) = (Cs * Is)(H)/BW
Dose (tissue) = (Ct * If)(H)/BW
Dose (water) = (Cw * Iw)(H)/BW
Ct = Contaminant concentration in tissue
Cs = Contaminant concentration in sediment
Cw = Contaminant concentration in water
Total Dose = Dose (sediment) + Dose (tissue) + Dose (water)
H=HR/CA (Assume = to 1)

Conc = Concentration
LOAEL = Lowest Observed Adverse Effects Concentration
NOAEL = No Observed Adverse Effects Concentration
Sed = Sediment
SW = Surface Water

The calculation of the contaminant concentration in tissue (Ct) is provided in Table D-2.

TABLE D-19

RACCOON - CONSERVATIVE INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION
SITE 36 - CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	Max Sed Conc. (mg/kg)	Max SW Conc. (mg/L)	Max Tissue Conc. (mg/kg)	Dose (mg/kg/d) from: Sediment	Surface Water	Tissue	Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients NOAEL	LOAEL
Semivolatile Organics											
ACENAPHTHYLENE	2.90E-01	0.00E+00	1.50E-01	1.76E-03	0.00E+00	9.67E-03	1.14E-02	6.56E+01	3.56E+02	1.7E-04	3.2E-05
ANTHRACENE	4.20E-01	0.00E+00	2.17E-01	2.55E-03	0.00E+00	1.40E-02	1.66E-02	6.56E+01	3.56E+02	2.5E-04	4.6E-05
BENZO(A)ANTHRACENE	1.20E+00	0.00E+00	6.19E-01	7.28E-03	0.00E+00	4.00E-02	4.73E-02	6.15E-01	3.84E+01	7.7E-02	1.2E-03
BENZO(A)PYRENE	1.00E+00	0.00E+00	5.16E-01	6.07E-03	0.00E+00	3.33E-02	3.94E-02	6.15E-01	3.84E+01	6.4E-02	1.0E-03
BENZO(B)FLUORANTHENE	2.30E+00	0.00E+00	1.19E+00	1.40E-02	0.00E+00	7.67E-02	9.06E-02	6.15E-01	3.84E+01	1.5E-01	2.4E-03
BENZO(G,H,I)PERYLENE	4.90E-01	0.00E+00	2.53E-01	2.97E-03	0.00E+00	1.63E-02	1.93E-02	6.15E-01	3.84E+01	3.1E-02	5.0E-04
BENZO(K)FLUORANTHENE	7.90E-01	0.00E+00	4.08E-01	4.80E-03	0.00E+00	2.63E-02	3.11E-02	6.15E-01	3.84E+01	5.1E-02	8.1E-04
CHRYSENE	1.30E+00	0.00E+00	6.71E-01	7.89E-03	0.00E+00	4.33E-02	5.12E-02	6.15E-01	3.84E+01	8.3E-02	1.3E-03
DIBENZO(A,H)ANTHRACENE	2.10E-01	0.00E+00	1.08E-01	1.27E-03	0.00E+00	7.00E-03	8.28E-03	6.15E-01	3.84E+01	1.3E-02	2.2E-04
FLUORANTHENE	1.30E+00	0.00E+00	6.71E-01	7.89E-03	0.00E+00	4.33E-02	5.12E-02	6.56E+01	3.56E+02	7.8E-04	1.4E-04
INDENO(1,2,3-CD)PYRENE	4.80E-01	0.00E+00	2.48E-01	2.91E-03	0.00E+00	1.60E-02	1.89E-02	6.15E-01	3.84E+01	3.1E-02	4.9E-04
PHENANTHRENE	1.20E-01	0.00E+00	6.19E-02	7.28E-04	0.00E+00	4.00E-03	4.73E-03	6.56E+01	3.56E+02	7.2E-05	1.3E-05
PYRENE	1.20E+00	0.00E+00	6.19E-01	7.28E-03	0.00E+00	4.00E-02	4.73E-02	6.15E-01	3.84E+01	7.7E-02	1.2E-03
Inorganics											
ARSENIC	1.77E+01	0.00E+00	1.22E+01	1.07E-01	0.00E+00	7.89E-01	8.96E-01	1.04E+00	4.55E+00	8.6E-01	2.0E-01
CADMIUM	1.60E+01	7.10E-04	1.28E+02	9.71E-02	9.05E-05	8.26E+00	8.35E+00	7.70E-01	6.90E+00	1.1E+01	1.2E+00
CHROMIUM	1.10E+02	1.50E-03	5.15E+01	6.68E-01	1.91E-04	3.32E+00	3.99E+00	2.40E+00	5.82E+01	1.7E+00	6.9E-02
COPPER	1.27E+02	7.50E-03	6.67E+02	7.71E-01	9.56E-04	4.31E+01	4.38E+01	5.82E+00	8.14E+01	7.5E+00	5.4E-01
LEAD	4.10E+03	1.36E-02	2.49E+03	2.49E+01	1.73E-03	1.61E+02	1.86E+02	4.70E+00	1.86E+02	3.9E+01	1.0E+00
MERCURY	2.90E+00	0.00E+00	8.32E+00	1.76E-02	0.00E+00	5.37E-01	5.55E-01	3.20E-02	1.60E-01	1.7E+01	3.5E+00
NICKEL	1.02E+02	2.00E-03	2.37E+02	6.19E-01	2.55E-04	1.53E+01	1.59E+01	1.70E+00	1.48E+01	9.4E+00	1.1E+00
SILVER	4.90E+00	0.00E+00	4.90E+00	2.97E-02	0.00E+00	3.16E-01	3.46E-01	2.38E+00	2.38E+01	1.5E-01	1.5E-02
ZINC	8.40E+02	0.00E+00	6.32E+03	5.10E+00	0.00E+00	4.08E+02	4.13E+02	7.54E+01	2.98E+02	5.5E+00	1.4E+00

Cells are shaded if the value is greater than 1.0

Body Weight = (BW)	3.67E+00	kg
Food Ingestion Rate = (If)	2.37E-01	kg/day
Water Ingestion Rate = (Iw)	4.68E-01	L/day
Sediment Ingestion Rate = (Is)	2.23E-02	kg/day
Home Range = (HR)	Assume 100% on site	
Contaminated Area = (CA)	Assume equal to home range	

Dose (sediment) = (Cs * Is)(H)/BW
Dose (tissue) = (Ct * If)(H)/BW
Dose (water) = (Cw * Iw)(H)/BW
Ct = Contaminant concentration in tissue
Cs = Contaminant concentration in sediment
Cw = Contaminant concentration in water
Total Dose = Dose (sediment) + Dose (tissue) + Dose (water)
H=HR/CA (Assume = to 1)

Conc = Concentration
LOAEL = Lowest Observed Adverse Effects Concentration
NOAEL = No Observed Adverse Effects Concentration
Sed = Sediment
SW = Surface Water

The calculation of the contaminant concentration in tissue (Ct) is provided in Table D-2.

TABLE D-20

RACCOON - AVERAGE INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION
SITE 36 - CLOSED LANDFILL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	Avg Sed Conc. (mg/kg)	Avg SW Conc. (mg/L)	Tissue Conc. (mg/kg)	Dose (mg/kg/d) from: Sediment	Surface Water	Tissue	Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients NOAEL	LOAEL
Inorganics											
CADMIUM	2.27E+00	2.00E-04	1.36E+00	6.97E-03	1.65E-05	4.45E-02	5.14E-02	7.70E-01	6.90E+00	6.7E-02	7.5E-03
CHROMIUM	2.99E+01	6.40E-04	2.99E+00	9.18E-02	5.28E-05	9.76E-02	1.89E-01	2.40E+00	5.82E+01	7.9E-02	3.3E-03
COPPER	4.62E+01	1.95E-03	7.19E+01	1.42E-01	1.61E-04	2.35E+00	2.49E+00	5.82E+00	8.14E+01	4.3E-01	3.1E-02
LEAD	3.26E+02	3.40E-03	2.31E+01	1.00E+00	2.81E-04	7.56E-01	1.76E+00	4.70E+00	1.86E+02	3.7E-01	9.4E-03
MERCURY	3.50E-01	0.00E+00	3.98E-01	1.07E-03	0.00E+00	1.30E-02	1.41E-02	3.20E-02	1.60E-01	4.4E-01	8.8E-02
NICKEL	2.51E+01	1.47E-03	1.22E+01	7.70E-02	1.21E-04	3.98E-01	4.75E-01	1.70E+00	1.48E+01	2.8E-01	3.2E-02
ZINC	2.02E+02	0.00E+00	3.91E+02	6.20E-01	0.00E+00	1.28E+01	1.34E+01	7.54E+01	2.98E+02	1.8E-01	4.5E-02

Cells are shaded if the value is greater than 1.0

Body Weight = (BW)	5.64E+00	kg
Food Ingestion Rate = (If)	1.84E-01	kg/day
Water Ingestion Rate = (Iw)	4.65E-01	L/day
Sediment Ingestion Rate = (Is)	1.73E-02	kg/day
Home Range = (HR)	1.56E+03	acres
Contaminated Area = (CA)	Assume equal to home range	

Dose (sediment) = (Cs * Is)(H)/BW
Dose (tissue) = (Ct * If)(H)/BW
Dose (water) = (Cw * Iw)(H)/BW
Ct = Contaminant concentration in tissue
Cs = Contaminant concentration in sediment
Cw = Contaminant concentration in water
Total Dose = Dose (sediment) + Dose (tissue) + Dose (water)
H=HR/CA (Assume = to 1)

Conc = Concentration
LOAEL = Lowest Observed Adverse Effects Concentration
NOAEL = No Observed Adverse Effects Concentration
Sed = Sediment
SW = Surface Water

The calculation of the contaminant concentration in tissue (Ct) is provided in Table D-2.