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REMEDIAL INVESTIGATION REPORT

SITE 43 – TOLUENE DISPOSAL AREA

NAVAL SUPPORT FACILITY INDIAN HEAD
INDIAN HEAD, MARYLAND

Naval Facilities Engineering Command
Washington

Contract Number N62472-03-D-0057
Contract Task Order 114

October 2014

FINAL

REMEDIAL INVESTIGATION REPORT
SITE 43 – TOLUENE DISPOSAL AREA

NAVAL SUPPORT FACILITY INDIAN HEAD
INDIAN HEAD, MARYLAND

Submitted to:
Naval Facilities Engineering Command Washington
1314 Harwood Street, S.E.
Washington Navy Yard, D.C., 20374-5018

Submitted by:
Tetra Tech, Inc.
234 Mall Boulevard Suite 260
King of Prussia, Pennsylvania, 19406

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PREPARED UNDER THE DIRECTION OF:

ROBERT M. SOK, P.G.
PROJECT MANAGER
TETRA TECH, INC.
NORFOLK, VIRGINIA

APPROVED FOR SUBMISSION BY:

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

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ACRONYM LIST

1,1-DCA	1,1-dichloroethane
1,1-DCE	1,1-dichloroethene
1,2-DCA	1,2-dichloroethane
ADAF	Age-Dependent Adjustment Factors
AF	Attenuation Factors
ATSDR	Agency for Toxic Substances and Disease Registry
BERA	Baseline Ecological Risk Assessment
bgs	below ground surface
BRAC	Base Realignment and Closure
BTAG	Biological Technical Assistance Group
Cal EPA	California Environmental Protection Agency
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cis-1,2-DCE	cis-1,2-dichloroethene
CLEAN	Comprehensive Long-Term Environmental Action Navy
COC	Chemical of Concern
COPC	Chemical of Potential Concern
CSF	Cancer slope factor
CSM	Conceptual Site Model
CTE	Central tendency exposure
CTO	Contract Task Order
DAF	Dilution Attenuation Factor
DNAPL	Dense Non-Aqueous Phase Liquid
DO	Dissolved Oxygen
DOD	Department of Defense
DPT	Direct Push Technology
E/A&H	ENSAFE/Allen & Hoshall
EC	Exposure Concentration
EEQ	Ecological Effect Quotient
EOD	Explosive Ordnance Disposal
EPC	Exposure Point Concentration
ERA	Ecological Risk Assessment
EU	Exposure Unit
FFA	Federal Facilities Agreement
FS	Feasibility Study

ACRONYMS (CONTINUED)

GPS	Global Positioning System
HEAST	Health Effects Assessment Summary Tables
HHRA	Human Health Risk Assessment
HI	Hazard Index
HQ	Hazard Quotient
HSA	Hollow Stem Auger
ID	Inner Diameter
IDW	Investigation-Derived Waste
IH	Indian Head
IHDIV-NSWC	Indian Head Division – Naval Surface Warfare Center
ILCR	Incremental Life-time Cancer Risk
IRIS	Integrated Risk Information System
IUR	Inhalation Unit Risk
LOEC	Lowest Observed Effects Concentration
MCL	Maximum Contaminant Level
MDE	Maryland Department of the Environment
MEE	Methane, Ethane, Ethene
MIP	Membrane Interface Probe
mg/kg	Milligrams per Kilogram
mg/cm^2	Milligrams per square centimeter
MRL	Minimal Risk Levels
MSL	Mean Seal Level
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NAD	North American Datum
NAVEODTECHDIV	Naval Explosive Ordnance Disposal Technical Division
NAVSCOLEOD	Naval School Explosive Ordnance Disposal
NAVFAC	Naval Facilities Engineering Command
NCEA	National Center for Environmental Assessment
NDW-IH	Naval District Washington – Indian Head
NOS	Naval Ordnance Station
NRWQC	National Recommended Water Quality Criteria
NSF	Naval Support Facility
NTUs	Nephelometric Turbidity Units
OD	Outer Diameter

ACRONYMS (CONTINUED)

ORP	Oxidation-Reduction Potential
PA	Preliminary Assessment
PEF	Particulate Emissions Factor
PID	Photoionization Detector
PRT	Post-Run Tubing
PPRTV	Provisional Peer Reviewed Toxicity Values
PSL	Project Screening Level
PVC	Polyvinyl Chloride
QA/QC	Quality Assurance/Quality Control
RAGS	Risk Assessment Guidance for Superfund
RBA	Relative Bioavailability
RfC	Reference Concentration
RfD	Reference Dose
RI	Remedial Investigation
RME	Reasonable Maximum Exposure
RSL	Regional Screening Level
SAP	Sampling and Analysis Plan
SI	Site Investigation
Site	Site 43 – Toluene Disposal Area
SLERA	Screening Level Ecological Risk Assessment
SSL	Soil Screening Levels
SSP	Site Screening Process
TCE	Trichloroethene
TCL	Target Compound List
TCR	Target Cancer Risk
Tetra Tech	Tetra Tech, Inc.
TOC	Total Organic Carbon
Trans-1,2-DCE	Trans-1,2-dichloroethene
UCL	Upper Confidence Limit
UFP	Uniform Federal Policy
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
VOC	Volatile Organic Compound
µg/kg	micrograms per kilogram
µg/L	microgram per liter
$\mu g/m^3$	micrograms per cubic meter

EXECUTIVE SUMMARY

This report presents the remedial investigation (RI) for Site 43 – Toluene Disposal Area (Site) at Naval Support Facility Indian Head (NSF-IH). The report provides a summary of investigative activities, nature and extent of contamination, and presents the human health risk assessment, ecological risk screening, and the conclusions of the RI. The RI includes data, results, and conclusions related to work conducted by Tetra Tech Inc. (Tetra Tech) between 2005 and 2013.

NSF-IH is located in Charles County, Maryland, 30 miles south of Washington, D.C. The facility is positioned along the Potomac River at its confluence with Mattawoman Creek. NSF-IH has been active since 1890 and assumed its current name in 2005. The primary missions of the facility are to provide services in energetics for all warfare centers through engineering, fleet and operational support, manufacturing technology, and 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.

The Site includes two distinct areas in the southwestern portion of the Main Area at NSF-IH. The first area is located in the southern portion of the Site near a utility pole along Gallery road approximately 30 feet northwest of Building 1041. The second area is located in the northern portion of the Site on the northern corner of Building 1040. The Site is in an industrial area where active research, testing, and production of energetics still occur.

Between the late 1950s and 1989, unknown quantities of spent solvents were used in the Cast Plant (Building 720) to remove propellants and oily residues from various metal parts. Some of these spent solvents were disposed of directly on the ground outside Building 1040 (acetone), near the drainage ditch north of Building 1040, and at the utility pole across from Building 1041 (acetone and toluene). Dumping took place two or three times per week (approximately 15-20 gallons per week) for a period of more than 2 years.

A multi-site Preliminary Assessment (PA) was performed in 1991 and recommended a Site Inspection (SI) for the area near the utility pole across the road from Building 1041, which was completed in 1993. Toluene and chlorinated solvents were detected in soil-gas samples collected near the utility pole. The SI recommended additional sampling to determine whether volatile organic compounds (VOCs) were present in subsurface soil across a larger area and revealed acetone was used in Building 1040 (Parts Cleaning House) and trichloroethene (TCE) was reportedly used for production processes in Building 720, which is adjacent to Building 1040. The duration of use and quantities of TCE used are unknown and not documented. The Site Screening Process (SSP) began in 2005 and a multi-phase investigation

around Buildings 1040 and 1041 was conducted to determine whether residual contamination in soil and groundwater at Site 43 posed potential risks to human health or the environment. A screening-level human health risk assessment was performed and results indicated potential unacceptable human health risk from exposure to VOCs in groundwater (TCE was detected at >36,000 µg/L near Building 1040). Results indicated no additional investigation was necessary in the vicinity of Building 1041 except to verify the groundwater screening results for cobalt detections. The SSP recommended proceeding to an RI to determine the source and extent of shallow groundwater contamination around Building 1040.

The RI was conducted in three phases to delineate site-related contamination in soil, groundwater, and soil vapor near Building 1040, verify and delineate cobalt in groundwater near Building 1041, assess the vapor intrusion pathway in Buildings 716 and 720, complete a human health risk assessment (HHRA) and screening-level ecological risk assessment (SLERA), and determine whether further corrective action is necessary at Site 43. The initial Project Quality Objectives were presented in the 2011 Uniform Federal Policy Sampling and Analysis Plan (UFP SAP) to address the goals of the RI. To fully define the nature and extent of contamination at Site 43, two additional SAP Addendums were completed and subsequent investigative activities were conducted in 2012 and 2013.

The following summary of conclusions for Site 43 is based on the activities conducted as part of the RI:

CONCLUSIONS

Soil Conclusions

- Soil sampling defined the potential soil source area along the ditch north of Building 1040.
- TCE was the only VOC detected at concentrations above the Project Screening Level (PSL) (United States Environmental Protection Agency regional screening level [USEPA RSL] of 910 micrograms per kilogram [µg/kg])
- Seven metals (aluminum, cadmium, chromium, cobalt, iron and manganese) were detected at concentrations above both the PSLs and NSF-IH background values.
- All surface soil chromium concentrations were above the USEPA carcinogenic RSL for hexavalent chromium (based on Target Cancer Risk [TCR]=1×10^{-6}). However, only one surface soil sample chromium concentration (37.5 milligrams per kilogram [mg/kg]) was above the NSF Indian Head background value of 33.4 mg/kg. Hexavalent chromium is unstable and extremely water-soluble, so if present in soil it would be from a direct source and it should be elevated in groundwater. However, there is no known historical use of hexavalent chromium at the site, and chromium concentrations in groundwater are not elevated (equal to or within background levels).

Groundwater Conclusions

- Groundwater essentially flows to the south-southwest at Site 43; however, water level data also indicates a potential groundwater divide with shallow groundwater east of Building 1040 flowing in a south-easterly direction.
- Groundwater sampling has adequately defined the horizontal and vertical extent of groundwater contamination at Site 43 to proceed with the Feasibility Study (FS).
- VOCs and metals in groundwater represent the primary contaminants and medium of concern at Site 43. Specifically TCE, cis-1,2-dichloroethene (cis-1,2-DCE), vinyl chloride, arsenic, cobalt and iron were identified as Chemicals of Potential Concern (COPCs).
- Arsenic was identified as a COPC in groundwater; however, only one monitoring well had concentrations above the USEPA maximum contaminant level (MCL) of 10 micrograms per liter (µg/L).
- 2,6-dinitrotoluene was identified as a COPC in groundwater; however, was only detected in two of the 31 groundwater samples and was not detected in the associated field duplicate sample at one of those sample locations.

Surface Water and Sediment Conclusions

- Only TCE, iron, and manganese exceeded the PSLs in the surface water samples.
- Only arsenic, cobalt, and iron exceeded the PSLs in sediment samples; however, none of these metals were retained as COPCs in the HHRA or SLERA.

HHRA Conclusions

- The HHRA identified that Hazard Index (HIs) (Reasonable Maximum Exposure [RME] scenario) for maintenance workers, industrial workers, construction workers, child residents, and adult residents exposed to surface soil, subsurface soil, and surface water are less than or equal to unity (1), indicating that adverse non-carcinogenic effects are not anticipated for these receptors under the defined exposure conditions.
- The RME scenario identified HIs greater than 1 for construction workers, child residents, and adult residents exposed to groundwater. The risk driver for construction workers exposed to groundwater is TCE. The main risk drivers for child residents exposed to groundwater are TCE, iron, cis-1,2-DCE, and cobalt. The main risk drivers for adult residents exposed to groundwater are TCE, cis-1,2-DCE, and cobalt.
- The RME scenario cumulative Incremental Life-time Cancer Risks (ILCRs) for maintenance workers, industrial workers, and construction workers are within USEPA's target risk range. ILCRs for child residents exposed to subsurface soil, adult residents exposed to surface soil, subsurface soil, and surface water, and lifelong residents exposed to subsurface soil and surface water are also within USEPA's target risk range.

- The RME scenario ILCR for child residents exposed to surface soil and groundwater, adult residents exposed to groundwater, and lifelong residents exposed to surface soil and groundwater are greater than USEPA's target risk range. The main risk drivers for child residents are from exposure to chromium (assumed hexavalent, Cr^{+6}) in surface soil, and from exposure to TCE, vinyl chloride, arsenic, and 2,6-dinitrotoluene in groundwater. The main risk drivers for adult residents exposed to groundwater are TCE, vinyl chloride, arsenic, and 2,6-dinitrotoluene. For lifelong residents, the main risk driver for surface soil exposure is chromium, and the main risk drivers for groundwater exposure are TCE, vinyl chloride, arsenic, and 2,6-dinitrotoluene. However, 2,6-dinitrotoluene is not being retained as a risk driver since it was only detected in two of 31 groundwater samples and was not detected in the associated field duplicate sample at one of those sample locations.
- Chromium speciation was not performed on surface soil samples; therefore, chromium was evaluated conservatively as hexavalent chromium in the HHRA. If chromium had been evaluated as trivalent chromium, then all ILCRs would have been within USEPA's target risk levels.

Soil Gas and Indoor Air Conclusions

- Groundwater sampling identified the highest concentrations of VOCs in groundwater near and beneath Buildings 720 and 716 that posed vapor intrusion concerns. In addition, several other periphery buildings are within 100 feet of criteria exceedances. Additional evaluation for vapor intrusion will be performed during the FS.
- Soil gas sampling identified elevated levels of VOCs in soil vapor near Buildings 720 and 716 that posed vapor intrusion concerns.
- Indoor air risks, based on measured indoor air concentrations at Buildings 716 and 720, are within USEPA target risk range for hypothetical future residents and industrial workers.
- Measured indoor air concentrations suggest that there is no significant vapor intrusion pathway into Buildings 716 or 720. TCE was detected in groundwater and soil gas, but was not detected at concentrations in indoor air that would result in unacceptable risk to hypothetical future residents or industrial workers.
- Indoor air concentrations of TCE and vinyl chloride in Building 716 are comparable to ambient air concentrations that were concurrently measured.
- At Building 720, benzene and chloromethane were identified as COPCs in indoor air. These VOCs were not identified as COPCs in groundwater and benzene was not identified as a COPC in soil gas. Indoor air concentrations of these two contaminants were comparable to their corresponding ambient air concentrations.

Ecological Risk Screening Conclusions

- The SLERA did not identify excess risk from COPCs to ecological receptors (sediment invertebrates or aquatic organisms) in the western downgradient portion of Site 43.

RECOMMENDATIONS

The following recommendations are based on the results and conclusions of the RI at Site 43:

- No action is recommended for surface water and sediment at Site 43.
- Based on the evidence supporting chromium in Site 43 soils being in the trivalent form (Cr+3) instead of the hexavalent form (Cr+6), and only one concentration exceeding background, no additional action is required to address chromium in soil at Site 43.
- Arsenic should be evaluated in the FS to determine if it will be retained as a chemical of concern (COC) for groundwater and addressed in future remedial action at Site 43.
- Proceed with the FS at Site 43 to address unacceptable risks associated with COCs in groundwater (TCE, cis-1,2-DCE, vinyl chloride, and cobalt).
- Further evaluate potential vapor intrusion risk in the FS for buildings at Site 43 within 100 feet of TCE and vinyl chloride MCL exceedances and recommend future action regarding vapor intrusion.

1.0 INTRODUCTION

This remedial investigation (RI) report has been prepared by Tetra Tech, Inc. (Tetra Tech) for Naval Facilities Engineering Command (NAVFAC) Washington under the Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract Number N62472-03-D-0057 Contract Task Order (CTO) 114. The RI report for Site 43 – Toluene Disposal Area (Site) at Naval Support Facility Indian Head (NSF-IH) provides a summary of investigative activities, nature and extent of contamination, and presents the human health risk assessment, ecological risk screening, and conclusions for Site 43. This investigation was conducted in accordance with a Federal Facilities Agreement (FFA) between NAVFAC, the United States Environmental Protection Agency (USEPA), and the Maryland Department of the Environment (MDE) that requires investigation and, if necessary, corrective actions at Site 43.

1.1 PURPOSE

The purpose of this RI is to present and interpret the results of investigations at Site 43 and evaluate the potential human health and ecological risks associated with the Site. Results from historical sampling indicated contaminants were present in Site 43 media that could pose an unacceptable level of human health risk. Historical investigations at Site 43 recommended proceeding to an RI. The goals and objectives of the RI were to delineate site-related contamination in soil, groundwater, and soil vapor near Building 1040, verify the presence of cobalt in groundwater near Building 1041, assess the potential risk from the vapor intrusion pathway, complete a human health risk assessment (HHRA), and determine whether further corrective action is necessary at Site 43. The Project Quality Objectives in the 2011 Uniform Federal Policy (UFP) Sampling Analysis Plan (SAP) were developed to address the goals of the RI. To fully define the nature and extent of contamination at Site 43, two additional SAPs were completed. The three SAPs completed at Site 43 are discussed in the following paragraphs.

The UFP SAP (Tetra Tech, 2011) stated that soil and groundwater at Site 43 – Toluene Disposal Area has been impacted by historical dumping. The project team determined that further characterization of the nature and extent of volatile organic compounds (VOCs), energetic/explosives, and metals contamination in soil and groundwater near Building 1040 and confirmation of VOC and metals contamination in groundwater near Building 1041 was needed to refine the Conceptual Site Model (CSM) and evaluate the need for future corrective action at Site 43.

Because the 2011 field investigation did not fully achieve the Project Quality Objectives, a Phase 2 SAP addendum was completed that presented new and refined Project Quality Objectives (Tetra Tech, 2012). The new and refined objectives targeted data gaps and further refinement of the nature and extent of contamination at Site 43.

The new and refined RI objectives in the 2012 investigation included additional investigation of soil contamination near Building 1040, determination of groundwater flow direction, further delineation of the extent of groundwater contamination, further evaluation of potential vapor intrusion at Building 720, and an investigation of the extent of cobalt contamination in groundwater near Building 1041. Elevated concentrations of VOCs in soil and soil vapor found during the 2011 field investigation indicated a potential soil source along the ditch south of Schuyler Road, east of the assumed disposal area near Building 1040. Therefore, the 2012 investigation included delineation of this potential soil source area and further delineation of groundwater contamination, which was found to extend east along an unnamed creek and west towards the Potomac River. Groundwater flow direction at the Site in 2011 was anomalous, likely due to a leaking water line near Building 1040. Concentrations of VOCs detected in soil gas samples in 2011 posed a concern for vapor intrusion into Building 720. Indoor air samples were collected to assess risk to vapor intrusion on workers inside Building 720.

Based on the results from the 2012 investigation, a Phase 3 SAP Addendum (Tetra Tech, 2013) was developed to present new RI objectives including evaluation of the potential impacts of groundwater discharge to downgradient surface water and sediment, evaluation of potential vapor intrusion at Building 716, and an ecological screening to evaluate potential ecological risks on surface water, sediment, and porewater. Groundwater contamination was confirmed to be discharging into two drainage channels west of the source area and eventually flowing into the Potomac River. Soil gas and indoor air samples in and around Building 716 showed that vapor intrusion was minimal and concentrations are well within acceptable levels. Ecological risks from media within the drainage channels were also within acceptable levels.

Analytical data from the previous investigations dating back to the 2005 Site Screening Process (SSP) were used for evaluating human health risks in the baseline HHRA at Site 43.

1.2 FACILITY HISTORY

NSF-IH, formerly called Naval District Washington-Indian Head (NDW-IH), Indian Head Division, Naval Surface Warfare Center (IHDIV-NSWC), Naval Ordnance Station (NOS), Naval Propellant Plant, Naval Powder Factory, and Naval Proving Grounds, is located in Charles County, Maryland, 30 miles south of Washington, D.C. The facility is positioned along the Potomac River at its confluence with Mattawoman Creek, as shown on Figures 1-1 and 1-2, and comprises about 3,500 acres. The Main Area, on Cornwallis Neck Peninsula, is approximately 2,500 acres. The Stump Neck Annex is approximately 1,000 acres and is separated from the Main Area by Mattawoman Creek. NSF-IH has been active since 1890 and assumed its current name in 2005.

Operations are primarily located on the Main Area and the principal missions of the facility are as follows:

- Provide services in energetics for all warfare centers through engineering, fleet and operational support, manufacturing technology, limited production, and industrial base support.
- 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.
- Provide support to all warfare centers, military departments, and the ordnance industry for special weapons, explosive safety, and ordnance environmental issues.

The Stump Neck Annex of NSF-IH is primarily occupied by tenant commands. Until recently, the Stump Neck Annex was occupied by two tenant commands: the Naval School Explosive Ordnance Disposal (NAVSCOLEOD) and Naval Explosive Ordnance Disposal Technology Division (NAVEODTECHDIV). The mission of NAVSCOLEOD was the training of active military personnel in performing explosive ordnance disposal (EOD) operations. In 1998, most operations at NAVSCOLEOD were relocated to Pensacola, Florida. Currently, NAVEODTECHDIV is the primary tenant command at the Stump Neck Annex. The missions of NAVEODTECHDIV are as follows:

- Provide EOD technology and logistics management.
- Develop war-essential elements of intelligence, equipment, and procedures to counter munitions, both United States and foreign, as required to support Department of Defense (DOD) components and the peacetime security needs of other agencies.

1.3 SITE BACKGROUND

Site 43 - Toluene Disposal Area includes two distinct areas in the southwestern portion of the Main Area (Figure 1-2). Figure 1-3 provides a site layout map of Site 43. The first area, Building 1041 Area, is located in the southern portion of the Site near a utility pole approximately 30 feet northwest of, and across Gallery Road from, Building 1041. The second area, Building 1040 Area, is located in the northern portion of the Site on the northern corner of Building 1040. The Site is an industrial area where research, testing, and the production of energetics still occur in Building 720.

Between the late 1950s and 1989, when the Site was active, approximately 23,000 to 30,000 gallons of spent solvents were used in the Cast Plant (Buildings 1040 and 1041) to remove propellants and oily residues from various metal parts. These solvents were disposed of directly on the ground outside Building 1040 (acetone), at the drainage ditch just south of Schuyler Road and at the utility pole across from Building 1041 (acetone and toluene) (NEESA, 1992). This dumping took place two or three times

per week for a period of more than 2 years at Building 1041. No signs of stressed vegetation or solvent dumping stains have been observed at the Site (NEESA, 1992; Tetra Tech, 2011).

During the (SSP), operational history and/or functions of nearby buildings were reviewed to evaluate other potential sources of groundwater contamination (Tetra Tech, 2009). According to the Ensafe/Allen & Hoshall (E/A&H 1994) Site Investigation (SI) Report, acetone was used in Building 1040 (Parts Cleaning House). Based on information provided by NSF-IH, trichloroethene (TCE) was reportedly used for production processes in Building 720 (Grain Manufacture and Motor Load Building), which is adjacent to Building 1040 (Figure 1-3). The duration of use and quantities of TCE are unknown and not documented. Other buildings near Building 1040 include Building 1360 (Scrap Powder Shed; approximately 80 feet south), Building 1257 (Transformer Station; approximately 110 feet north-northwest), and Building 821 (Toilet Building; approximately 150 feet west-southwest). It is not likely that these other buildings are the source of TCE detected in shallow groundwater.

A review of sewer lines was conducted to determine whether a leaking sewer could be a source of TCE detected in shallow groundwater (Tetra Tech, 2007). There are no sanitary sewers in the immediate vicinity of Building 1040 (Figure 1-3). The nearest sanitary sewer begins at Building 821 (Toilet Building), located across Gallery Road from Buildings 720 and 1040, and runs approximately 300 feet northwest and north to the former sewage treatment plant. Another sanitary sewer is located approximately 200 feet northwest of, and parallel to, Gallery Road. There are also sanitary sewers associated with Building 713, Building 714, and Buildings 812 and 813, all located north to north-northwest of Building 1040 near the former sewage treatment plant. The distance between the former sewage treatment plant and Building 1040 is approximately 400 feet. These observations indicate that the sewers are not a likely source of the localized shallow TCE contamination near Building 1040.

A short length of storm sewer originates from Building 720 and empties into a drainage ditch adjacent to Building 1040 and Schuyler Road (Figure 1-3). Based on site topography and visual observations during investigative activities, water discharged to the ditch flows to the southeast.

The building descriptions above are from the report entitled *Water Pollution Study at the Naval Ordnance Station* (Dodohara, 1976). Although the building uses may have changed since 1976, this older report provides a historical perspective of nearby activities and sewer lines that are a potential source of groundwater contamination. Based on the historical uses of buildings served by sanitary sewers at Site 43, sanitary sewers do not appear to be sources of contaminants detected in shallow groundwater.

1.4 PREVIOUS SITE INVESTIGATIONS

A multi-site Preliminary Assessment (PA) was performed in 1991 (NEESA, 1992). The PA recommended a SI for the area near the utility pole across the road from Building 1041. A SI was performed in the Building 1041 Area in 1993 (E/A&H, 1994). Toluene and chlorinated solvents were detected in soil-gas samples collected near the utility pole. The SI recommended additional sampling to determine whether VOCs were present in subsurface soil across a larger area.

A multi-phase SSP Investigation began in 2005 around Buildings 1040 and 1041 to determine whether residual contamination in soil and groundwater at the Site poses potential risks to human health or the environment (Tetra Tech, 2009). Results from the multi-phase SSP Investigation are discussed in the following paragraphs.

Soil borings were installed during the 2005 SSP Investigation near Building 1041, one of which was converted into a shallow groundwater monitoring well (SW43-MW002). Soil samples and a groundwater sample were collected and analyzed for target compound list (TCL) VOCs, explosives, metals, and cyanide. Several VOCs (2-butanone, acetone, carbon disulfide, methylene chloride, and toluene), one explosive (3-nitrotoluene), and several metals were detected in the soil samples. In addition, TCE was detected in shallow groundwater at 1.3 micrograms per liter (µg/L). A screening risk evaluation was performed using the limited surface and subsurface soil data. The risk evaluation concluded there were no unacceptable risks to human health or the environment from chemicals detected in soil and shallow groundwater under a residential use scenario at Building 1041. Therefore, no additional investigation was proposed in this vicinity except to verify the groundwater screening results with additional sampling.

During the 2005 SSP Investigation in the Building 1040 vicinity, seven soil borings were advanced and soil samples were collected. One soil boring, just north of Building 1040, was converted into a shallow groundwater monitoring well (S43-MW001), which was later sampled. The soil and groundwater samples were analyzed for VOCs, nitroaromatics, metals, and cyanide. TCE and methylene chloride, one explosive constituent (nitrocellulose), and several metals were detected in soils. A screening level risk evaluation was performed and concluded that there were no unacceptable risks to human health or the environment from chemicals detected in soil, under a residential scenario. However, TCE (54,000 µg/L) and cis-1,2-dichloroethene (cis-1,2-DCE) (530 µg/L) were detected in shallow groundwater in monitoring well S43-MW001, posing potential risks to human health under a residential use scenario. A soil source area for this groundwater contamination was not found. The SSP investigation concluded that additional investigations were warranted to determine the source and extent of shallow groundwater contamination detected near Building 1040.

Supplemental SSP investigations continued at the Site in 2007 in the Building 1040 and 1041 Areas. Membrane interface probe (MIP) technology was used to detect VOCs and help define the extent of VOC contamination in the subsurface at Site 43 (Tetra Tech, 2009). MIP responses indicating the presence of chlorinated (or brominated) VOCs occurred at depths of approximately 19 to 27 feet below ground surface (bgs) near Building 1040. Soil conductivity sensor data suggested the presence of a basal clay layer beginning at approximately 25 feet bgs. Direct Push Technology (DPT) groundwater grab samples were collected from select locations around Buildings 1040 and 1041 and groundwater samples were collected from existing wells S43-MW001 and S43-MW002 to confirm the MIP results. Groundwater samples were analyzed for VOCs and were evaluated for the presence of dense non-aqueous phase liquid (DNAPL) using the Oil Red O dye field test. The field test did not indicate the presence of DNAPL; however, several VOCs were detected in groundwater samples collected near Building 1040 and 1041. TCE was the only VOC detected at a significant concentration (>36,000 µg/L) in groundwater samples. TCE was detected at Building 1041 in monitoring well S43-MW002 (3.2 µg/L).

Based on the results of the 2005 and 2007 investigations, a supplemental SSP effort (termed Supplemental Phase 1A SSP) was recommended to further delineate VOCs in shallow groundwater at the Site. MIP field screening was utilized again during this 2009 effort (Tetra Tech, 2008). At Building 1040, MIPs were advanced to depths ranging from approximately 25 to 29 feet bgs. Elevated MIP readings indicated the presence of halogenated compounds around monitoring well S43-MW001, the location of high TCE concentrations in 2005 and 2007. At Building 1041, probes were advanced to depths ranging from approximately 19 to 25 feet bgs. No significant readings were obtained from any of the locations near Building 1041.

The Tetra Tech 2009 SSP Summary Report compiled and presented the 2005, 2007, and 2009 SSP investigative results, and the risk screening evaluation. The vapor intrusion pathway was not assessed during SSP activities. Results from soil and groundwater samples collected around Building 1040 identified chromium as a Chemical of Potential Concern (COPC) for surface soil; manganese as a COPC for subsurface soil; and bromoform, TCE, antimony, cobalt, iron, and manganese as COPCs for shallow groundwater. The risk characterization resulted in a total Incremental Life-time Cancer Risk (ILCR) of 2 $x10^{-2}$, which is not within the USEPA acceptable risk range. The total HI was 5, which exceeds the unity of 1.0. The unacceptable cancer risk was driven primarily by the high detection (36,000 µg/L) of TCE in shallow groundwater. The noncancer risk was driven by cobalt in shallow groundwater.

The high TCE concentration observed in groundwater near Building 1040 (MW01, at approximately 15 feet bgs) indicated the potential for a soil source area and migration of TCE from soil to groundwater; however, the source of this groundwater contamination was not found during the SSP. Considering the potential unacceptable human health risk primarily from exposure to TCE in groundwater near Building

1040, the 2009 SSP Summary Report recommended proceeding to an RI and FS. The 2009 SSP Summary Report also recommended collecting additional groundwater data to assess the potential risk from exposure to cobalt in groundwater near Building 1041. The activities and results of the 2011, 2012, and 2013 RI field investigations are discussed further in Sections 2, 3, and 4 of this report.

1.5 REPORT ORGANIZATION

This report consists of five sections. Section 1.0 provides this introduction, the scope, general objectives of the field investigation, and a summary of the facility background, site history, and previous site investigations. Section 2.0 provides a summary of site activities conducted during the RI. Section 3.0 provides a summary of the Site's physical characteristics. Section 4.0 details the nature and extent of contamination and Section 5.0 presents the contaminant fate and transport analysis. Section 6.0 details the human health risk assessment and Section 7.0 presents ecological risk screening. Section 8.0 provides the conclusions and recommendations of the RI at Site 43.

2.0 FIELD INVESTIGATIVE ACTIVITIES

This section summarizes field investigation activities that took place during the three RI field events. Pre-2011 investigation field activities are not included in this section.

2.1 REMEDIAL INVESTIGATION FIELD ACTIVITIES

Field activities for the RI at Site 43 were carried out in three phases: June 2011, April 2012 through July 2012, and April 2013 to October 2013. These field events were designed to further characterize the nature and extent of contamination, gather data to assess human health and ecological risks, including potential vapor intrusion into buildings, and support future corrective action decisions at Site 43. Field activities for each phase or field event are summarized below.

June 2011

- Advanced 13 soil borings with macrocores
- Collected 20 subsurface soil samples
- Collected 7 groundwater grab samples
- Installed and developed 4 monitoring wells
- Developed 1 existing monitoring well
- Collected 6 groundwater samples from monitoring wells
- Collected 4 soil gas samples and 1 outdoor air sample around Buildings 720 and 1040
- Conducted slug testing
- Surveyed monitoring wells
- Gauged monitoring well water levels

April 2012 through July 2012

- Completed a phase 1 archaeological survey
- Advanced 29 soil borings with macrocores
- Collected 12 soil samples from 6 locations along ditch north of Building 1040
- Collected 81 groundwater grab samples and 2 seep samples
- Installed and developed 23 monitoring wells
- Collected 29 groundwater samples from monitoring wells
- Collected 2 indoor air samples and 1 outdoor air sample at Building 720
- Surveyed monitoring wells
- Gauged monitoring well water levels

April 2013 through October 2013

- Advanced 13 soil borings with macrocores
- Collected 2 seep samples
- Installed and developed 4 monitoring wells and 4 piezometers
- Collected 37 groundwater samples from monitoring wells
- Collected 4 soil gas samples around Building 716
- Collected 2 indoor air samples and 1 outdoor air sample at Building 716
- Collected 3 surface water/sediment samples, 1 culvert sample, and 1 outfall sample
- Surveyed monitoring wells
- Gauged monitoring well water levels (2 rounds)

Sample locations for all investigations conducted at Site 43 (pre-2011, 2011, 2012, and 2013 investigations) are presented on Figures 2-1 through 2-4, although only the three RI field events (2011, 2012, and 2013) are summarized in this section. Locations of soil borings are presented on Figure 2-1; temporary wells, monitoring wells, and piezometers are shown on Figure 2-2; soil gas and indoor air sample locations for Building 716 and 720 are presented on Figures 2-3 and 2-4; and surface water, sediment, seep, culvert, and outfall samples are shown on Figure 2-4.

2.1.1 Soil Borings and Soil Sampling

A Geoprobe® DPT drill rig utilizing both continuous and discrete drilling methods was used during all three RI field events at Site 43. Continuous soil coring was mainly used above the water table, while discrete soil coring was used below the water table. All soil cores were screened with a photoionization detector (PID), their lithology was logged, and they were visually inspected for evidence of contamination.

During the 2011 investigation, 13 soil borings were advanced around the north end of Building 720 (Figure 2-1). Soil samples were collected from each of the 13 soil borings. Eleven soil samples (S43-SB008 through S43-SB018) were collected just above the water table (approximately 7 feet bgs) and analyzed for VOCs, metals, total cyanide, total organic carbon (TOC), explosives, and perchlorate. Soil samples were also collected just above the water table at S43-SB019 and S43-SB022 and analyzed for VOCs only. Grain size samples were collected at S43-SB008 (6 to 8 feet bgs), S43-SB017 (15 to 17 feet bgs), and S43-SB018 (33 to 35 feet bgs). A bulk density sample was collected from 6 to 8 feet bgs at S43-SB008 and a shelby tube was collected from the dark gray basal clay unit at S43-SB011 from 33 to 35 feet bgs. Three total oxidant demand samples were collected from 13 to 15 feet bgs, two within the suspected source area (S43-SB019 and S43-SB022) and one outside the suspected source area (S43-SB011).

As part of the 2012 investigation, Tetra Tech conducted a Phase 1 Archaeological Survey (Appendix A) to determine whether proposed drilling could be conducted in the area south of Leary Road between Strauss Avenue and Gallery Road at archeological site 18CH258 (Figure 1-3). The archaeological survey provided an inventory of previously unrecorded historic properties, sites, or resources located within this area.

During the 2012 investigation, a total of 29 soil borings were advanced with soil samples collected at 6 soil borings (S43-SB023 through S43-SB028) and analyzed for VOCs (Figure 2-1). Twenty-three of the soil borings advanced in 2012 were co-located with temporary wells or monitoring wells to interpret lithology. Soil samples were not collected at these locations. The 6 soil borings from which soil samples were collected were evenly spaced (approximately 70 feet apart) along the ditch just south of Schuyler Road, beginning at the culvert northwest of Building 1040 and then moving east past Glennon Road. . Two soil samples were collected at each of these six boring locations: a surface soil sample from 0 to 1 feet bgs and a subsurface soil sample just above the water table (approximately 7 feet bgs). Surface soil samples were collected via hand auger, after the rip rap and the geotextile lining were removed in the ditch. The collection of subsurface soil samples was attempted within the ditch but was unsuccessful. Drill rig safety concerns prevented the rig from accessing the locations and attempts with a hand driven DPT setup were unsuccessful in obtaining subsurface soil cores. Therefore the subsurface soil samples were obtained with a DPT rig approximately 4 feet north of the ditch.

During the 2013 investigation, 13 additional soil borings were advanced to obtain lithologic information. Soil samples and temporary wells were not associated with these 13 soil borings. Figure 2-1 provides the location of the 2013 soil borings.

Soil samples for chemical analysis were sent to Empirical Laboratories, of Nashville, Tennessee. Geotechnical samples were sent to GeoTesting Express of Acton, Massachusetts. Total oxidant demand samples were sent to Redox Tech LLC of Cary, North Carolina.

Soil boring logs for the three RI sampling events are provided as Appendix B. Table 2-1 provides a summary of RI soil samples and RI soil sample log sheets are provided as Appendix C.

2.1.2 Groundwater Grab Sampling

Groundwater grab samples were collected in 2011 and 2012 using DPT drilling methods to advance 4-foot-long retractable stainless steel screen drive points to specific depths based on lithology or projected lithology. These locations were designated as temporary wells and samples were collected at multiple depths, ranging from just below the water table from 10 to 14 feet bgs to as deep as 40 to 44 feet bgs. A

peristaltic pump and/or mechanical foot valves were used to purge the screened interval for a minimum of 15 minutes, with approximately 2 gallons taken out at most temporary wells prior to sampling. Sometimes the screened zone produced very little water and went dry during purging. In these instances, the screened interval was allowed to recharge before sampling, the screen-point sampler was pulled up in 1- to 3-foot increments to attempt sample collection, or the temporary well was pulled out and re-advanced a few feet away. After multiple failed sampling attempts, the location was abandoned all together. Many of the deeper groundwater grab samples (>22 feet bgs) south of Leary Road and west of Strauss Avenue proved to be in a very tight clay unit where water was not present. Section 3.3 presents a more detailed discussion of the hydrogeology in the area. Water quality parameters for each groundwater grab sample were recorded with a Horiba U-52 meter and LaMotte 2020 turbidity meter. All groundwater grab samples were sent to Empirical Laboratories of Nashville, Tennessee, for analysis.

During the 2011 field event there were seven temporary well locations (S43-TW006 through S43-TW012) from which six groundwater grab samples were collected (Figure 2-2). Temporary well S43-TW10 did not produce groundwater after multiple attempts and therefore was abandoned and not sampled. The six groundwater grab samples were analyzed for VOCs, total and dissolved (0.45 micron field-filtered) metals, total cyanide, explosives, and perchlorate (0.2 micron field-filtered). In addition, field test kits were used to evaluate ferrous iron and DNAPL at each of the temporary well locations. Two of the samples (S43-TW007 and S43-TW009) were also analyzed for anions; alkalinity; methane, ethane, and ethene (MEE); sulfide; and filtered TOC.

During the 2012 fieldwork there were 48 temporary well locations (S43-TW013 though S43-TW057 and S43-TWSA01 though S43-TWSA03) from which 81 groundwater grab samples were collected (Figure 2-2). At each temporary well location up to 3 groundwater grab samples were collected, each from a different depth. Nine locations (S43-TW027, TW044, TW045, TW046, TW048, TW049, TW050, TW052, and TWSA03) had at least one interval where groundwater could not be collected. Groundwater grab samples were analyzed for VOCs only with a 24- or 48-hour turnaround time. Test kits were not used during the 2012 temporary well program.

Table 2-2 provides a summary of the groundwater grab samples and Appendix D provides the groundwater grab sample log sheets and low flow purge data sheets.

2.1.3 Monitoring Well Installation and Development

Thirty-one monitoring wells (S43-MW003 through S43-MW030) and four piezometers were installed from 2011 to 2013. The monitoring wells were installed with a Geoprobe® 6620DT DPT rig with 6-inch outer diameter (OD) hollow stem augers (HSA) to construct the 2-inch inner diameter (ID) monitoring wells and

3.25-inch OD casing to construct the 1-inch ID monitoring wells/piezometers. Schedule 40 polyvinyl chloride (PVC) well casing was used for riser pipes and screens for both types of wells. Screens for both the 2-inch and 1-inch monitoring wells consisted of 5-foot sections of PVC with slots measuring 0.010-inch that were installed in 5-to 15-foot-long sections depending on lithological conditions. The 1-inch monitoring well/piezometer screens were wrapped with a stainless steel mesh pre-packed with No. 1 silica sand, making the screen assembly 1.7-inch in diameter. For both the 2-inch and 1-inch monitoring wells, No.1 silica sand was added from the bottom of the screen to approximately 2 feet above the screen. A bentonite seal (3- to 4-foot long) was placed on top of the sand pack and allowed to hydrate before the remainder of the annulus was filled with cement/bentonite grout to ground surface. Monitoring wells S43-MW005, S43-MW006, S43-MW012, and S43-MW015 were completed as flush-mount wells with concrete pads. The remaining monitoring wells were completed as stick up wells with a lockable steel protective casing and concrete pad. Table 2-3 provides a summary of the monitoring well construction details, Figure 2-2 presents the locations of the monitoring wells, and Appendix E provides monitoring well construction log sheets.

Five monitoring wells, existing well S43-MW001 and the four new wells (S43-MW003 through S43-MW006), were developed in 2011. The 23 additional monitoring wells (S43-MW007 through S43-MW026) were developed in 2012 and the 8 monitoring wells/piezometers installed in 2013 (S43-MW027 though S43-MW030 and S43-PZ01 through S43-PZ04) were also developed prior to sampling. Development of the 2-inch monitoring wells consisted of purging and surging with a submersible pump. Development of the 1-inch monitoring wells/piezometers consisted of hand surging/purging with a check valve. Water quality readings were recorded during development and are provided on monitoring well development records in Appendix E.

2.1.4 Groundwater Sampling

Six monitoring wells (existing wells S43-MW001 and S43-MW002 and new wells S43-MW004 through S43-MW006) were sampled during the 2011 field investigation, 29 monitoring wells were sampled during the 2012 field investigation, and 37 monitoring wells were sampled during the 2013 field investigation. Groundwater samples were collected via low-flow sampling methods and water quality parameters were measured during purging (pH, conductivity, temperature, turbidity, dissolved oxygen [DO], and oxidation-reduction potential [ORP]). Groundwater samples were collected after parameter stabilization and sent to Empirical Laboratories of Nashville, Tennessee, for analysis. Groundwater sample log sheets and low-flow purge data sheets are presented in Appendix F. One round of synoptic groundwater level measurements was recorded for each of the 2011 and 2012 investigations while two rounds were collected for the 2013 investigation, due to abnormally high amounts of rain. The groundwater level measurement sheets are presented in Appendix G.

Groundwater samples collected during the 2011 sampling event were analyzed for VOCs, total and dissolved metals, total cyanide, energetics, and wet chemistry parameters (anions, MEE, sulfide, alkalinity, and dissolved TOC). A groundwater monitoring well sample summary is provided in Table 2-4. The sample collected at S43-MW002 was only analyzed for TCE and total and dissolved cobalt. Groundwater samples from S43-MW001 and S43-MW003 through S43-MW006 were analyzed for VOCs, total and dissolved metals, total cyanide, explosives and perchlorate. In addition to the chemical analyses listed, samples collected at S43-MW001, S43-MW002, S43-MW004, and S43-MW006 were analyzed for wet chemistry parameters. Field test kits and Red O dye were used to test for ferrous iron and DNAPL at each monitoring well.

Groundwater samples collected during the 2012 groundwater sampling event were analyzed for VOCs, total and dissolved metals, and energetics. A groundwater monitoring well sample summary is provided in Table 2-4. Groundwater samples collected from S43-MW002 and S43-MW013 through S43-MW016 were analyzed for TCE and total and dissolved cobalt. Groundwater samples from S43-MW001, S43-MW003 through S43-MW012, and S43-MW017S though S43-MW026 were analyzed for VOCs, total and dissolved metals, total cyanide, and explosives. Field test kits and Red O dye were used at select monitoring wells to test for ferrous iron and DNAPL.

Groundwater samples collected in 2013 were analyzed for site-specific VOCs and metals, and if turbidity was elevated a dissolved metal sample was also collected. After the 2012 sampling event, a risk ratio analysis was conducted and a reduced site-specific compound list of VOCs and metals was created. There are 10 reportable VOCs (bromoform, chloroform, 1,1-dichloroethane (1,1-DCA), 1,2-dichloroethane (1,2-DCA), 1,1-dichloroethene (1,1-DCE), cis-1,2-DCE, trans-1,2-dichloroethene (trans-1,2-DCE), methylene chloride, TCE, and vinyl chloride) and 4 reportable metals (arsenic, cobalt, iron, and manganese). A groundwater monitoring well sample summary is provided in Table 2-4. Field test kits were not used during this sampling event.

2.1.5 Slug Testing

Falling head and rising head slug tests were performed at S43-MW001, S43-MW003, and S43-MW005 during the 2011 field investigation. An In-Situ Level TROLL® transducer was inserted into the screen interval and a 5-foot by 1.5-inch PVC slug was used to displace water for each slug test. The transducer recorded the pressure of the water column over time to estimate the hydraulic conductivity of the geologic formation in which the monitoring well was screened. The geometric mean of the four slug tests at S43-MW001 were 61.94 feet/day for the rising head test and 50.16 feet/day for the falling head test. The geometric mean of the three slug tests at S43-MW005 were 39.34 feet/day for the falling head test and

33.38 feet/day for the rising head test. A hydraulic conductivity range of 33.38 to 61.94 feet/day was used in the fate and transport evaluation in Section 5. At S43-MW003 the slug tests produced hydraulic conductivity values which seem to be anomalously low when considering the lithology of the aquifer and the results from S43-MW001 and S43-MW005. A slug test summary table and evaluation sheets are provided in Appendix H.

2.1.6 Soil Gas, Indoor Air, and Outdoor Air Sampling

Soil gas, indoor air, and outdoor air samples were collected in and around Buildings 1040, 720, and 716 during each phase of the RI (2011 through 2013) to evaluate potential for vapor intrusion Table 2-5 and Figure 2-3 provide summary of soil gas and air samples collected at Buildings 1040 and 720 while Table 2-5 and Figure 2-4 provide summary of soil gas and air samples collected at Buildings 716. Soil gas, indoor air, and outdoor air sample log sheets are provided in Appendix I.

Soil gas samples were collected using a Geoprobe® rig with either a Post-Run Tubing (PRT) system or soil vapor implants. To collect soil gas samples using the PRT system, drill rods were advanced to depth and pulled up to expose the screened sampling ports at the desired depth, which enabled collection of a subsurface soil gas sample. To collect soil gas samples using soil vapor implants, the implant (a pre-fabricated 6 inch long stainless steel screen) is attached to polyethylene tubing and installed within the drill rods at the desired depth. Clean filter sand was placed around each implant to protect the screen from clogging with finer grained soils and a hydrated bentonite seal was installed above the implant to isolate a 1-foot sample interval. Prior to sampling at each location, at least three tubing volumes were purged and screened with the PID. Helium leak tests were also performed to verify sample integrity. Each soil gas sample was collected using a 6-liter Summa canister fitted with a 30-minute regulator.

Indoor air samples were also collected from Buildings 720 and 716 using 6-liter Summa canisters, but fitted with 24-hour regulators.

All samples were sent to Air Toxics of Folsom, California, for VOC analysis (method USEPA TO-15).

Building 720

During the 2011 investigation three soil gas samples (S43-SG01, S43-SG03, and S43-SG04) were collected using a PRT system deployed above the water table in the vicinity of Buildings 1040 and 720 (Figure 2-3). An outdoor air sample was also collected over an 8-hour period during the soil gas and indoor air sampling to evaluate outside ambient air conditions during the time of sampling. A tight geologic formation (silt and clay dominant) was encountered just above the water table, which caused the

sampling durations at S43-SG01, S43-SG03, and S43-SG04 to exceed 30 minutes. This tight formation likely prevented the soil gas collection at S43-SG02 where no sample was obtained after several attempts were made.

Based on the elevated soil gas results near Building 720 and the potential for vapor intrusion, two indoor air samples (S43-IND01 and S43-IND02) were collected from Building 720 in 2012, along with an outdoor air sample, to evaluate the vapor intrusion pathway.

Building 716

During the 2013 investigation four soil gas samples (S43-716-SG05, S43-716-SG06, S43-716-SG07, and S43-716-SG08) were collected above the water table, one from each side of Building 716 (Figure 2-4).

Based on the elevated soil gas results, two indoor air samples (S43-716-IND01 and S43-716-IND02) were collected from Building 720 in 2013, along with an outdoor air sample, to evaluate the vapor intrusion pathway.

2.1.7 Seep, Surface Water, and Sediment Sampling

During both 2012 and 2013, a seep sample was collected from each of two drainage channels west of Strauss Avenue that drain into the Potomac River (Figure 2-4). For discussion purposes in this RI, the drainage channel between Buildings 715 and 716 is referred to as the northern drainage channel and the drainage channel between Buildings 716 and 717 is referred to as the southern drainage channel. The seep in the southern drainage channel (S43-SP01) formed where groundwater was daylighting just below the concrete culvert originating from a ditch north of Building 1134. The seep in the northern drainage channel (S43-SP02) was midway down the drainage channel on the southern slope. S43-SP02 is approximately 75 feet west of the culvert in the northern drainage channel. No water flows through this northern culvert, except during significant rain events.

In 2012 the seep samples were collected without a drive point. Stainless steel drive points were installed before sampling in 2013. Seep samples were sent to Empirical Laboratories of Nashville, Tennessee, for VOC analysis in 2012 and VOC and metals analysis in 2013. Table 2-6 provides a summary of the seep samples and Appendix J provides the seep sample log sheets.

In 2013, surface water and sediment samples were collected at three locations in the drainage channels (one in the northern and two in the southern) in addition to two surface water samples collected from the culvert and outfall of the southern drainage channel (Table 2-6 and Figure 2-4). In the northern drainage

channel, only the downstream (northwestern) portion could be sampled (location S43-SD04/S43-SW04). Sediment and surface water samples could not be collected from two planned locations in the northern drainage channel (one at the culvert approximately 100 feet west of Strauss Avenue and one in the upstream portion of the channel). The proposed culvert sample could not be collected because water was not discharging through the culvert and the upstream portion of the channel could not be sampled because the channel was dry. In the southern drainage channel, surface water and sediment samples were collected from both the upstream (S43-SW01/S43-SD01) and downstream (S43-SW02/S43-SD02) portions of the channel.

In addition, two surface water samples were collected at two locations in the southern drainage channel (Table 2-6 and Figure 2-4). One surface water sample was collected from water discharging through the culvert at the upstream end of the channel (S43-CL01), and one surface water sample was collected from the outfall that discharges into the Potomac River (S43-OF01).

Surface water samples were collected by direct fill and sediment was sampled with disposable equipment. Surface water and sediment samples were sent to Empirical Laboratories of Nashville, Tennessee, for VOC and metals analysis (Table 2-6). Surface water and sediment sample log sheets are provided in Appendix J.

2.1.8 Surveying

A Maryland-licensed surveyor surveyed the newly installed monitoring wells and refurbished wells in August 2011, August 2012, and August and September 2013. The soil borings, temporary wells, and soil gas points which were not surveyed were located with a hand-held mapping-grade global position system (GPS). The horizontal (± to 0.1 foot) coordinates and vertical (± to 0.01 foot) elevations were surveyed in North American Datum (NAD) 1983, Maryland State Plane Coordinate System relative to the coordinates of established Site benchmarks or the nearest United States. Geological Survey (USGS) benchmark. The survey results are provided in Appendix K.

2.1.9 Quality Assurance and Investigation Derived Waste

Quality Assurance/Quality Control (QA/QC) samples collected during the investigation included field duplicate samples and laboratory Matrix Spike/Matrix Spike Duplicate (MS/MSD) samples. Equipment rinsate blanks and field blank samples were also collected as part of the investigation. QA/QC sample log sheets are provided in Appendix L.

Investigation derived waste (IDW) generated during the investigation consisted of soil cuttings, purge water, and decontamination water. All IDW was containerized in 55-gallon drums. The temporary IDW drum storage area was located at the NSF-IH waste storage area near Building 289.

3.0 SITE CHARACTERISTICS

3.1 SURFACE FEATURES

The Main Area of NSF-IH, located on the Cornwallis Neck Peninsula, 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. The peninsula is located in the Atlantic Coastal Plain Physiographic Province, approximately 8 to 10 miles east of the fall line that marks the western extent of this physiographic province (Figure 1-1). The facility has gently rolling to undulating topography with elevations ranging from sea level to more than 100 feet above mean sea level (msl). The eastern portion of the facility has higher elevations, and the land surface generally slopes to the southwest and southeast. The portion of NSF-IH along the Potomac River is characterized by 20- to 100-foot bluffs. The portion along Mattawoman Creek is more gently sloping.

Site 43 is an industrial area with a few buildings, paved roads, relatively steep earthen grass-covered bunkers, drainage ditches, and drainage channels (Figure 1-3). Site 43 is mostly covered with mowed grasses but some isolated wooded areas exist. There is very little topographic relief at Site 43, but to the west of Strauss Avenue there are two steep drainage channels that flow to the Potomac River. The drainage channels drop down approximately 20 feet from grade and are vegetated with mature trees. Drainage ditches parallel most of the roads, and many contain standing water. The northern drainage channel is located between Buildings 715 and 716 and the southern drainage channel is located between Buildings 716 and 717. Steep cliffs, approximately 20 feet high, exist along the Potomac, with a thin sandy beach that is currently protected from erosion by rip rap rock used in recent restoration activities.

Site 43 contains two areas of concern. The larger of the two areas is approximately 25 acres (700 feet long from north to south and 1,550 wide from east to west) and is centered on the drainage ditch south of Schuyler Road, north of Building 1040. From this drainage ditch the contamination emanating from Building 1040 extends approximately 1,200 feet west to west-southwest to the Potomac River and 500 feet east to southeast along a small stream. This small stream flows to the southeast and is partially fed by the drainage ditch along Schuyler Road. The smaller of the two areas is approximately 125 feet by 100 feet and centered on a utility pole outside Building 1041 along Gallery Road. Relatively steep earthen, grass-covered bunkers bound this area to the east and west. The area northeast of this area is covered with mowed grasses and a few trees. A photo log is included as Appendix M.

3.2 GEOLOGY

Southern Maryland is located in the Atlantic Coastal Plain, which is an eastward-thickening wedge of interbedded sand and clay units deposited in fluvial and marine environments. These deposits range in thickness from 650 feet to 900 feet (Vroblesky and Fleck, 1991) and were deposited during the Pleistocene and Cretaceous Periods, when sea level was much higher (up to several hundred feet), in a bay-like indention of the coast line known as the Salisbury Embayment (Ward and Powars, 2004). From the Cretaceous to Quaternary Periods sea level fluctuated due to a series of transgressions and regressions (sea level rise and fall relative to the land). During the early Cretaceous to the middle Paleogene Periods, sedimentary units (either of fluvial-deltaic or shallow marine in origin) were deposited on top of earlier sedimentary units or, in certain instances, on top of bedrock, which has been encountered at Indian Head at approximately 650 to 900 feet bgs (CH2M HILL, 2003). These sedimentary units dip gently to the east-southeast away from the continental shelf. The Potomac River system then cut and re-worked these units from the Neogene to the Quaternary Periods as the glaciers receded and the land surface rebounded. The youngest geological units are fluvial, fluvial shelf, or alluvial in origin and have no regional dip. Quaternary deposits comprise most of the surficial geology of southern Maryland.

The units encountered at the site include the early Cretaceous Period Patapsco Formation of the Potomac Group, the Neogene Period Terrace deposits 2, and the Pleistocene Epoch Terrace deposit (Glaser, 2002). The Patapsco is the deepest and oldest unit encountered at the Site. Glaser (2002) defines the Patapsco as a tough and compact gray clay that is interbedded with yellow to light gray fine- to medium-grained sand that coarsens with depth. The clay portion of this formation contains a unit described as a "…dark-colored, massive and more or less lignitic" (Clark and Bibbins,1897). Glaser (2002) defines the Terrace deposit 2 as a gray or orangish-brown fine- to medium-grained sand that grades to silt/clay with a pebbly sand near the bottom of the unit. The Terrace deposit 1 is similar to the Terrace deposit 2 except that it is interbedded with silt/clay that can contain plant fragments.

The surficial soils in this area consist of silty and sandy loams, with minor amounts of gravel. These surficial soils tend to have low permeability and low shrink-swell potential.

The geology of Site 43 varies both laterally and vertically due to the fluvial depositional environment, and many units swell/pinch depending on the direction. The geologic units at Site 43, down to 50 feet bgs, consist of clay and sand layers, with very little dip, which overlie an organic rich basal clay or hard expanding silty clay layer. Figure 3-1 illustrates on plan view the transects A-A', B-B', C-C', D-D', and E-E'. Figures 3-2 (A-A' and B-B'), 3-3 (C-C' and D-D'), and 3-4 (E-E') present each respective cross-section

with the associated geology, corresponding monitoring wells, and actual sample intervals for groundwater collected along each section.

The lithology of the top 20 feet at Site 43 is fairly consistent, except in areas where the subsurface has been reworked. In undisturbed areas the top 7 feet is predominately silty clay and in areas that have been disturbed (roads, buildings, regrading, etc.,) is sandy gravel. From 7 to 20 feet bgs, the lithology is predominately sand with a varying silty clay layer that can pinch out or swell. This silty clay layer ranges in thickness from less than a foot to more than 10 feet thick (southeast corner) and includes varying amounts of silt with a smaller percentage of sand. The silty clay is gray in color and has a high plasticity. The sand, below the silty clay layer, is poorly sorted fine to medium grained with varying amounts of silt and very little gravel and is tan, brown, or grayish-brown in color.

In a few areas at Site 43 the lithology in the top 20 feet differs from the general lithology described above. In the southeastern corner of the Site, around S43-TW010, S43-TW026/S43-MW010, and S43-TW039/S43-MW009S, the sand is found in thin layers (less than a foot thick) or consists of a higher percentage of silt/clay than seen elsewhere. In the southwestern corner of the Site, around S43-TW046/S43-MW024, S43-TW047/S43-MW025, S43-TW048, and S43-TW052, the area appears to have been reworked with 5 to 16 feet of fill consisting of large gravel (>2 inches in diameter), sand, and silt.

Below 20 feet the lithology is drastically different across Site 43. In the northern and central portions of the Site the lithology is predominately sand with a silty clay layer that can pinch out or swell. This silty clay layer exhibits the same properties as the silty clay layer commonly found from 7 to 20 feet bgs. The sand found deeper than 20 feet is generally coarser, better sorted, and contains less silt. Gravel, anywhere from half an inch to in excess of two inches in diameter, was found within the sand but at varying percentages and of limited extents. Underlying this sand is a dark gray to black organic rich clay (basal clay) which is found at depths ranging from 28 (in the northern portion) to 37 (in the central portion) feet bgs. The top of this basal clay dips slightly to the south and was found to be in excess of 15 feet thick. Plant debris, including wood and decaying leaves, was seen in almost all cases to varying degrees. In the southern portion of the Site a dense gray, sometimes greenish-gray or reddish-gray, hard, expanding silty clay was encountered anywhere from 15 to 20 feet bgs. At S43-TW043 this expanding silty clay was found to be in excess of 20 feet thick.

The transition from the lithology observed in the northern and central portion to the southern portion occurs very abruptly along a line running WNW to ESE just north of S43-TW052 to just south of S43-TW045. The silty clay found 20 feet bgs in the southern portion of the Site had much lower moisture content than the shallower silty clay layers or basal clay seen elsewhere. Drilling into this silty clay proved very difficult. The drill rig either hit refusal and/or the silty clay stuffed tooling which made

determining its thickness, the geology below it, and whether deep groundwater grabs could be collected unfeasible. Although no water-bearing zones were seen in macrocore samples, multiple attempts were made to collect deeper groundwater grab samples. Screen-point samplers were advanced into the subsurface until refusal and then pulled up incrementally to attempt, groundwater sampling at multiple depths. In almost every attempt each interval was dry. The only successful blind groundwater grab sample was collected at S43-TW048 from 40 to 44 feet bgs. The exact lithology of this interval and whether it connects to water bearing units upgradient cannot be determined, although it freely produced water.

3.3 HYDROGEOLOGY

The shallow groundwater beneath Site 43 is unconfined. The water table at Site 43 was consistently encountered between 7.5 and 20 feet bgs. The water table is recharged by precipitation that infiltrates the ground surface.

The drainage ditches at Site 43 are mostly dry except during heavy or prolonged rain events, with the majority of the precipitation infiltrating into the soil. However, during dry periods, standing water is present in the ditches just north of Leary Road, west of Gallery Road, and south of Schuyler Road, which may have been due to the leaking water line in this area. A surficial water divide exists halfway between Strauss Avenue and Gallery Road. Ditches to the east of the divide flow east and ditches west of the divide flow west. Ditches with standing water are all located east of the divide. The ditches on the west side of the surficial water divide are all dry except during significant rain events. Ditches east of the divide ultimately flow into a small stream that starts approximately 100 feet north of the intersection of Schuyler and Gallery Roads and flows southeast, just north of the S43-MW009 monitoring well cluster (Figure 1-3). Brown and Root Environmental (1997) reported that combined runoff at the Site eventually discharges to Mattawoman Creek through a series of drainage ditches and storm water pipes. The discharge point is more than 2,000 feet south of the Site. Ditches on the west side of the divide flow west through culverts into drainage channels west of Strauss Avenue, and ultimately into the Potomac River. These drainage channels are fed by storm water runoff and shallow groundwater daylighting in seeps west of Strauss Avenue. Evidence of heavy rain events can be seen on the thin sandy beach between the cliff and the Potomac River where several rills scour the surface before entering the river.

Potentiometric surface maps were generated from water levels collected during the 2012 and 2013 events. Groundwater elevations are presented in Table 3-1. A potable water line leaking near the Site may have affected the local water table and actual groundwater flow in 2012, but the water line was repaired before the 2013 field event. Figures 3-5, 3-6 and 3-7 present the potentiometric surface maps for July 2012, May 2013, and October 2013, respectively. Groundwater flow around Building 720 is to the

south-southwest. In the western portion of the Site, the two drainage channels direct groundwater flow west towards discharge points (seeps) in these channels. These seeps likely discharge a good portion of the groundwater originating from the Site. These drainage channels also influence groundwater flow in the southern portion of the Site where groundwater flows to the northwest towards these discharge points. In May 2013 approximately 2.2 inches of rainfall fell the week prior to measuring groundwater levels compared to 0.9 inches in July 2012 and 0.03 inches in October 2013. The water levels were 4 to 5 feet higher in May 2013 and groundwater contours in the suspected source area showed groundwater flow to be more southerly with a much steeper gradient. The May 2013 water levels likely represent a high water mark while July 2012 and October 2013 represent more typical groundwater levels.

3.4 DEMOGRAPHY AND LAND USE

Site 43 is located in an industrial area where the production of energetics and other related processes (remote operations, cleaning, storage, etc.,) still occur. The suspected source area and a portion of the study area is located within the explosive arcs of Buildings 720 and 730, where access is very limited due to operations at these buildings. There are no residences or offices in this area.

3.5 ECOLOGY

Ecological receptors may be present in the drainage channels located in the downgradient area of the groundwater plume. Groundwater seeps feed the drainage channels, which drain directly into the Potomac River. An ecological risk screening will be conducted for surface water, sediment, and porewater (presented in Section 7.0) to determine if ecological risk is a concern at Site 43 and if further evaluation or consideration is necessary during the FS.

4.0 NATURE AND EXTENT OF CONTAMINATION

The nature and extent of contamination at Site 43 is discussed in this section. Soil, groundwater, soil gas, indoor air, surface water, and sediment results dating back to 2005 from the SSP and three RI field events were used to evaluate Site 43. Sample location maps containing all samples collected at Site 43 for soil, groundwater, soil gas/indoor air, and surface water/sediment are presented as Figures 2-1, 2-2, 2-3, and 2-4.

The nature and extent discussion begins with refining detected constituents by comparing them to project screening levels (PSLs) and site background data (Tetra Tech, 2002). For soil, the selected PSLs were the most stringent of either the USEPA regional screening levels (RSLs) or MDE standard for residential soils. PSLs selected for groundwater were the lower or more stringent of either the USEPA RSL for tapwater or the MDE standard for groundwater. The USEPA RSLs for residential indoor air were used as PSLs for soil gas and indoor air. The USEPA Biological Technical Assistance Group (BTAG) screening benchmarks were used as PSLs for surface water. The MDE Numerical Criteria for Toxic Substances in Surface Waters were also used to evaluate surface water concentrations; however, arsenic was the only contaminant with a screening criterion exceeding the BTAG screening benchmark. The sediment PSLs were the more stringent of the USEPA BTAG, USEPA RSL, or MDE standard for residential soil.

A risk ratio evaluation was conducted for VOCs and metals after the 2012 sampling event. From this risk evaluation, a reduced list of VOCs and metals to be analyzed in the 2013 field investigation (for all media) was developed and presented in the 2013 SAP Addendum. All samples collected for all media during the 2013 field investigation were analyzed based on this reduced list of 10 VOCs and 4 metals. The reduced list of VOCs consisted of bromoform, chloroform, 1,1-DCA, 1,2-DCA, 1,1-DCE, cis-1,2-DCE, trans-1,2-DCE, methylene chloride, TCE, and vinyl chloride. The reduced list of metals consisted of arsenic, cobalt, iron, and manganese.

Chain of custodies documenting the samples collected and sent to the laboratories are provided in Appendix N. Validation letters and tables of the results are provided in Appendix O. The full set of analytical results for all media is provided in Appendix P.

4.1 SOIL

Between the late 1950s and 1989, approximately 23,000 to 30,000 gallons of spent solvents were stored in Buildings 1040 and 1041 and used to remove propellants and oily residues from various metal parts. Unknown quantities were disposed of directly on the ground in the drainage ditch north of Building 1040 and at the utility pole across from Building 1041 (Figure 1-3).

Between 2005 and 2012, 12 surface soil and 25 subsurface soil samples were collected at Site 43 and analyzed for explosives, metals, and VOCs. Analytical results are presented on Table 4-1 and analytical results for samples with concentrations of chemicals that exceeded PSLs are shown on Figure 4-1.

Geotechnical and total oxidant demand samples were collected during the 2011 field event. Geotechnical samples were analyzed for grain size, bulk density, and effective porosity in addition to permeability via a Shelby tube collection. Geotechnical samples were sent to GeoTesting Express of Acton, Massachusetts. Total oxidant demand samples were collected from three locations and sent to Redox Tech LLC of Cary, North Carolina. Results from the geotechnical and total oxidant demand samples are provided in Appendix P.

VOCs

Elevated concentrations of VOCs were detected in soils along the ditch just north of Building 1040. VOC analytical detections are presented on Table 4-1 and results with concentrations that exceeded the PSLs are shown on Figure 4-1. TCE was the only VOC detected with concentrations that exceeded the PSL (910 micrograms per kilogram [µg/kg]). The highest concentration (4,790 µg/kg) was found in subsurface soil at 7 to 8 feet bgs at S43-SB027 just west of the culvert going underneath Glennon Road. The only surface soil exceedance of TCE (2,720 µg/kg) was also located at S43-SB027. The remaining four PSL exceedances of TCE occurred in the subsurface directly above the water table (5 and 8 feet bgs). The extent of TCE contamination in soil along the ditch is approximately 250 feet long (from S43-SB024 to S43-SB027) and likely no more than 50 feet wide. TCE was not detected in the soil samples collected east of Glennon Road.

It should also be noted that other VOCs (e.g., acetone, 2-butanone, 4-methyl-2-pentanone, and cis-1,2-DCE) were also detected in soils, although the concentrations were below the PSLs. The most significant detections were found in S43-SB022 just north of Building 720 and SB023 located just north of Building 1040.

Explosives

Explosives were detected in a few soil samples at very low concentrations and below their respective PSLs. The six explosives detected in soils were 1,3,5-trinitrobenzene (0.032 milligrams per kilogram [mg/kg]), 1,3-dinitrobenzene (0.037 mg/kg), 3-nitrotoluene (0.043 mg/kg), 4-nitrotoluene (0.064 mg/kg), nitrocellulose (9 mg/kg), and nitroguanidine (0.476 mg/kg). See Table 4-1 for a more detailed summary of detections of explosives in soil.

Metals

Of the 22 metals detected in soils at Site 43, only five (aluminum, cadmium, chromium, iron, and manganese) exceeded their respective PSLs and background values (Background Soil Investigation Report, Tetra Tech, 2002). Aluminum, cadmium, and chromium exceeded the PSLs and soil background values in only one surface soil sample S43-SB023 (Al at 20,200 mg/kg), S43-SB028 (Cd at 12.2 mg/kg), and S43-SB002 (Cr at 37.5 mg/kg). Manganese and iron exceeded the PSL and background values in one subsurface sample each, S43-SB002 (227 mg/kg) and S43-SB003 (41,500 mg/kg), respectively. Analytical detections for metals are presented on Table 4-1 and analytical results for metals that exceeded the PSLs are shown on Figure 4-1.

Arsenic, chromium, and cobalt were detected above their respective PSLs (0.61, 0.29, and 2.3 mg/kg). However, none of the soil samples contained concentrations of arsenic or cobalt above their respective surface or subsurface soil background values. In all soil samples except S43-SB013, iron exceeded the PSL of 5,500 mg/kg, but did not exceed the surface or subsurface background values of 38,500 and 3,520 mg/kg, respectively.

The distribution of metal detections above both PSLs and background values are isolated and located along the ditch north of Building 1040, except for iron in S43-SB003, which is located across Gallery Rd from Building 1041 (See Figure 2-1).

4.2 GROUNDWATER

Groundwater investigative activities were performed from 2005 to 2013 to determine the extent of groundwater contamination at Site 43. VOCs and metals are the primary contaminants in groundwater at the Site. Analytical results for VOCs in groundwater grab and monitoring well samples are provided in Tables 4-2 and 4-3, respectively, and metals and explosives analytical results for monitoring well samples are provided in Table 4-4. USEPA RSLs for tap water and MDE Cleanup Standards for groundwater are included for comparison and the most conservative values were used as the PSL for each constituent.

In 2005, to determine if solvents had leached into groundwater near the areas of suspected contamination, monitoring wells S43-MW001 and S43-MW002 were installed near Buildings 1040 and 1041, respectively, and analyzed for explosives, total metals, and VOCs. Several VOCs detected in S43-MW01 exceeded the screening criteria, initiating further groundwater investigation in the drainage ditch adjacent to Building 1040 and throughout Site 43.

Between 2005 and 2013, 94 groundwater grab samples were collected from 59 temporary well locations. Most of the groundwater grab samples were analyzed for VOCs only (quick turn lab analysis) to delineate the groundwater plume at Site 43 and help determine placement of permanent monitoring wells. However, additional analytical parameters were collected from the six initial groundwater grab samples collected in 2011. These six samples were analyzed for VOCs, total and dissolved metals, total cyanide, explosives, and perchlorate. In addition, field test kits were used to evaluate ferrous iron and DNAPL at each of the temporary well locations and two of the samples (S43-TW007 and S43-TW009) were also analyzed for anions; alkalinity; methane, ethane, and ethene (MEE); sulfide; and filtered TOC. This additional geochemical and analytical data will be used to help evaluate remedial alternatives and was presented in the Final Interim Data Summary Report Phase 1 Remedial Investigation and Phase 2 SAP Addendum (Tetra Tech, 2012).

Based on the analytical results from the groundwater grab samples, an additional 35 monitoring wells/piezometers (S43-MW003 to S43-MW030 and S43-PZ01 to S43-PZ04) were installed at Site 43 (Figure 2-2). In 2011 and 2012 all monitoring wells, except those around Building 1041, were sampled and analyzed for explosives, total and dissolved metals, and VOCs. Explosives and perchlorate were dropped from the analytical program during the 2013 sampling event due to very low and isolated detections in 2011 and 2012. During the 2013 groundwater sampling event, samples were analyzed for a site specific list of VOCs (bromoform, chloroform, 1,1-DCA, 1,2-DCA, 1,1-DCE, cis-1,2-DCE, trans-1,2-DCE, methylene chloride, TCE, and vinyl chloride) and metals (arsenic, cobalt, iron, and manganese) as presented in the 2013 SAP Addendum. The monitoring wells around Building 1041 (S43-MW002 and S43-MW013 through S43-MW016) were sampled for TCE and cobalt in 2011 and 2012 and in 2013 these wells were sampled for the site-specific list of VOCs and metals presented above.

The monitoring well network covers approximately 28 acres (see Figure 4-3), from north of Schuyler Road, east to Building 724, south to Building 730, and west along the Potomac River. Groundwater grab results were used to define VOC plume boundaries and help position monitoring wells. Monitoring well analytical results are summarized in Tables 4-3 (VOCs) and 4-4 (metals and explosives) and analytical results for samples with concentrations of VOCs that exceeded PSLs and total metals that exceeded the PSLs and background are shown on Figures 4-3 and 4-4, respectively. Explosives and perchlorate were removed from the analytical program after the 2012 sampling event, but their analytical results will be discussed below. Analytical results for samples with concentrations of explosives that exceeded the PSLs are shown on Figure 4-5.

Groundwater flow direction has fluctuated but generally flows south-southwest across much of the Site. Around Buildings 1040 and 720 there is evidence of a groundwater divide with flow both to south-southwest and south-southeast. This divide seems to migrate depending on the amount of precipitation

the site receives, but has generally been assumed to exist between Gallery Road and Glennon Road. South of Leary Road and west of Gallery road groundwater flow takes a more westerly direction towards the southern drainage channel and the Potomac River.

VOCs

Six VOCs exceeded their respective PSLs in multiple groundwater samples collected from monitoring wells at Site 43: 1,1-DCA (2.4 µg/L), 1,1-DCE (7 µg/L), 1,2-DCA (0.15 µg/L), cis-1,2-DCE (2.8 µg/L), TCE (0.44 µg/L), and vinyl chloride (0.015 µg/L). Three other VOCs were only detected in one sample above the PSLs including concentrations of bromoform in 2007, chloroform in 2011 at S43-MW001 and methylene chloride in S43-MW004 in 2013. A summary of analytical results is presented in Table 4-3 and analytical results for samples with concentrations of the primary VOCs that exceeded PSLs are shown on Figure 4-3.

TCE is the primary or most frequently detected VOC in groundwater with concentrations exceeding the PSL in 22 of the 37 monitoring wells during the 2013 sampling. The maximum TCE concentration during the 2013 sampling event (9,060 µg/L) was detected at S43-MW001, down from 55,000 µg/L detected in the first sampling event in 2005. S43-MW001 is in the assumed source area and TCE can be found in groundwater to the east and west. To the east of S43-MW001, TCE was detected at S43-MW006 (3,230 µg/L), S43-MW009S (63.2 µg/L), and in the eastern most monitoring well S43-MW028 at 2.14 µg/L. TCE was detected just below the PSL at S43-MW009D (0.41 µg/L) and not detected at either S43-MW027 or S43-MW029, which suggests that contamination remains at shallow depths paralleling the ditch east of Glennon Road. West of S43-MW001, the centerline of the main TCE plume seems to run through S43-MW004 (903 µg/L), S43-MW017S (1,280 µg/L), S43-MW017D (1,100 µg/L), S43-MW019S (1,690 µg/L), S43-MW020 (1,800 µg/L), and S43-MW030 (101 µg/L) before it likely either discharges in the drainage channels (S43-SP01, TCE at 156 µg/L) or the Potomac River (S43-PZ03, TCE at 41.8 µg/L).

Figure 4-6 presents the isoconcentration contour map for TCE and represents the estimated horizontal extent of TCE-contaminated groundwater (above the PSL) at Site 43. The plume area measures approximately 11 acres.

Detections of cis-1,2-DCE and vinyl chloride are located within the footprint of the TCE plume and represent the second and third most frequently detected VOCs, respectively. Concentrations of cis-1,2-DCE exceeded the PSL at 11 of the 37 monitoring wells with the highest concentration observed in 2013 occurring at S43-MW017D (217 µg/L). Isoconcentration contours of cis-1,2-DCE above the PSL show a similar footprint to TCE, but the cis-1,2-DCE boundary is slightly narrower than the TCE plume (Figure 4-7). Vinyl chloride exceeded the PSL at 9 of the 37 monitoring wells with the highest concentration in 2013

also observed at S43-MW017D (56 µg/L). The vinyl chloride boundary is not continuous but diverges from S43-MW001 where it is detected below the PSL near the source area and highest concentration of TCE. The vinyl chloride isoconcentration map shows the boundary is very similar to the TCE and cis-1,2-DCE plumes but is slightly smaller spatially (Figure 4-8).

Concentrations of 1,1-DCA exceeded the PSL in 6 of the 37 monitoring wells in 2013 with the majority of detections located near Building 1041. The highest concentrations were observed at S43-MW013 (20.5 µg/L) and S43-MW024 (41.9 µg/L), which are both south of the main VOC plume emanating from near Building 1040. 1,1-DCE concentrations exceeded the PSL at only 2 of the 37 monitoring wells, S43-MW024 (7.6 µg/L) and S43-MW019S (16 µg/L). It should be noted that the detections of 1,1-DCA and 1,1-DCE in S43-MW024 do not appear to be site related due to the abnormally high groundwater elevation and suspected perched water at this well location.

The only other VOC detected above its PSL was 1,2-DCE at only S43-MW013 (0.36 µg/L). This detection is near Building 1041 and occurs with low concentrations of 1,1-DCA and TCE in this area outside the main VOC plume originating near Building 1040.

The vertical extent of VOC-contaminated groundwater is depicted on Figure 4-9, which is a modified version of cross-section E-E' and essentially represents the centerline of the VOC plume. VOC-contaminated groundwater is encountered throughout the cross-section view beginning at approximately 8 feet bgs and extending to approximately 38 feet bgs. The area surrounding Building 1040 (the source area) includes the highest concentration of VOCs and the plume follows the sand (varying silt/clay) layers underneath the silt/clay to the east and west, including the thin zone above the Basal Clay unit, as it flows towards the Potomac River.

Figure 4-10 presents the revised CSM based on the results from the RI at Site 43. VOCs in groundwater (primarily TCE, cis-1,2-DCE and vinyl chloride) emanating from the source area near Building 1040 where historical dumping occurred is flowing southwest towards the Potomac River and also flowing east in shallow groundwater towards Mattawoman Creek. The source area dumping and subsequent infiltration and migration of VOCs and metals has created a groundwater plume with a lateral extent covering approximately 11 acres representing the primary concern at Site 43. The smaller area of groundwater contamination associated with the dumping across Gallery Road from Building 1041 is not shown on the CSM figure. This area did show some evidence of residual VOCs, but cobalt is the primary contaminant in groundwater.

Metals

Both total and dissolved metals were collected at all monitoring well locations in 2011 and 2012, but in 2013 only total metals were collected unless turbidity measurements exceeded 10 nephelometric turbidity units (NTUs) during sampling. Of the fifteen metals that were detected in groundwater, six of them (arsenic, barium, cobalt, iron, manganese, and nickel) exceeded the PSLs and background values. Arsenic does not have a background value, but all detections of arsenic were above the PSL. After the 2012 sampling, the risk ratio evaluation indicated potential unacceptable risk with arsenic, cobalt, iron, and manganese. These four metals were retained and carried forward into the groundwater sampling event in 2013.

Groundwater samples collected at Site 43 contained detections of arsenic ranging from 1 to 16.9 µg/L. Arsenic was detected in 13 of the 37 monitoring wells and every detection and concentration exceeded the USEPA RSL for tapwater (0.045 µg/L). There is no reliable background value for arsenic in groundwater at NSF-IH. However, only the arsenic concentrations in S43-MW003 exceeded the USEPA Maximum Contaminant Level (MCL) of 10 µg/L (16.9 µg/L in 2011, 12.2 µg/L in 2012, and 12 µg/L in 2013).

Cobalt exceeded the PSL of 0.47 µg/L and background value of 15.6 µg/L in 17 of the 37 monitoring wells during the 2013 sampling. Concentrations of cobalt ranging from 3.22 µg/L to 147 µg/L have been detected during the groundwater sampling at Site 43. The highest concentrations of cobalt were found in S43-MW013 (130 µg/L) and MW016 (122 µg/L) located across Gallery Road from Building 1041 and also in S43-MW019S (147 µg/L) located just west of the intersection of Strauss Avenue and Leary Road. Figure 4-11 presents the distribution of total cobalt throughout the study area.

Iron concentrations exceeded the PSL of 300 µg/L and background value of 19,900 µg/L in 12 of the 37 monitoring wells. The concentrations of iron in monitoring wells S43-MW003 (39,800 µg/L), S43-MW006 (41,300 µg/L), and S43-MW012 (32,300 µg/L) represent the highest concentrations of iron observed in groundwater.

All the manganese concentrations detected in groundwater at Site 43 exceed the PSL of 32 µg/L. However, the background screening value of manganese is significantly higher at 825 µg/L. Manganese exceeded the PSL and background value in only four monitoring well samples collected during investigative activities at Site 43. Detections of manganese at S43-MW019S in 2012 (1,140 µg/L), and 2013 (1,160 µg/L), at S43-PZ001 (2,060 µg/L), and also at S43-MW021 in 2012 (888 µg/L) are the only concentrations observed above both background and the PSLs.

Explosives

As presented in the 2013 SAP addendum (Tetra Tech, 2013) six explosives were retained as COPCs for groundwater in the risk ratio evaluation. Of those six, only nitrobenzene and nitroglycerin had adverse risks associated with the exposure point concentration (EPC) calculated for these compounds. However, nitroglycerin was only detected in 6 of the 35 samples and the 2 highest concentrations driving the EPC, detected in S43-MW001 and S43-MW006 in 2011, were not detected in either of these wells during the 2012 sampling event. Nitrobenzene was only detected in 2 of 35 groundwater samples with detections above the PSL of 0.12 µg/L at S43-MW024 (0.865 B µg/L) and S43-MW010 (0.234 B µg/L). The "B" qualifier for these samples indicated that these compounds were also detected in the associated field blank sample (0.45 µg/L), which indicated that the detection may have been associated with ambient air or laboratory contamination. Based on the limited occurrence, distribution, and non-reproducibility of the suspect detections of explosives, explosives were not included for the 2013 sampling event.

During the 2012 sampling event, only three explosives were detected above the PSLs in samples not effected by blank contamination including 1,3-dinitrobenzene (PSL of 0.15 µg/L), 2,6-dinitrotoluene (PSL of 0.042 µg/L), and 3-nitrotoluene (PSL of 0.13 µg/L). Maximum concentrations of these explosives were: 1,3-dinitrobenzene (0.212 J µg/L) at S43-MW024, 2,6-dinitrotoluene (0.504 J µg/L) at S43-MW010, and 3-nitrotoluene (0.871 µg/L) at S43-MW006 (Table 4-4). It should be noted that the only other detection of 2,6-dinitrotoluene at S43-MW001 in 2012 of 0.185 µg/L was not reproduced in the duplicate sample collected at the same monitoring well and also 1,3-dinitrobenzene detected at S43-MW006 was not detected in the subsequent sampling in 2012. 3-nitrotoluene and 4-nitrotoluene were the most frequently detected explosives and these detections were at estimated or trace levels near the respective PSLs. The distribution of explosives is presented on Figure 4-5.

4.3 SOIL GAS AND INDOOR AIR

Concentrations of VOCs in soil and groundwater near Buildings 720 and 1040 led to concern that vapor intrusion may be occurring and soil gas and indoor air sampling was conducted in 2011 and 2012. Delineation of the downgradient portion of the VOC groundwater plume indicated the plume was underneath Building 716. Therefore, soil gas sampling and subsequent indoor air sampling was conducted at Building 716. The analytical results for soil gas and indoor air are provided in Tables 4-5 and 4-6 and Figures 4-12 and 4-13. For soil gas samples, analytical results for VOCs that exceeded the PSLs are shown on Figures 4-12 and 4-13. For indoor air samples, analytical detections of VOCs are presented on Figures 4-12 and 4-13.

Buildings 1040 and 720

Soil gas samples were collected in the vadose zone around Buildings 1040 and 720 in 2011. Samples were collected at approximately 6 feet bgs above the water table and analyzed for VOCs via the TO-15 method. Concentrations of acetone (690,000 micrograms per cubic meter [µg/m^3]), cis-1,2-DCE (29,000 µg/m^3), and vinyl chloride (30,000 µg/m^3) exceeded the PSLs of 3,200 µg/m^3, 6.3 µg/m^3 and 0.16 µg/m^3, respectively. These soil gas results indicated potential concern for vapor intrusion to occur into Building 720 (Table 4-5 and Figure 4-12).

Due to the high results in soil gas around Buildings 720 and 1040, indoor air samples were collected inside Building 720 to determine whether vapor intrusion is occurring, the exposure pathway was complete, and if concentrations of VOCs may be of concern for industrial workers in the building. Building 1040 is currently used for chemical storage with no full-time occupants and therefore indoor air was not sampled. In Building 720, low concentrations of VOCs were detected in indoor air and only 1,2-DCA (0.098 B µg/m^3) and benzene (0.45 µg/m^3) exceeded the PSLs of 0.094 µg/m^3 and 0.31 µg/m^3, respectively (Table 4-5 and Figure 4-12). However, both of these compounds were detected in the ambient (outdoor) air sample collected outside of Building 720. These outdoor air detections of 1,2-DCA (0.46 J µg/m^3) and benzene (0.31 µg/m^3) likely affected the measured concentrations in the building due to infiltration.

Building 716

Soil gas samples were collected in the vadose zone on each side of Building 716 in 2013. Samples were collected above the water table and analyzed for VOCs via the TO-15 method. TCE was the primary VOC of concern with elevated concentrations in soil gas samples collected on the southeast and southwest sides of Building 716. TCE concentrations exceeded the PSL of 0.43 µg/m^3 at all four soil gas locations, with the highest concentrations of TCE detected at S43-SG06 (1,200 µg/m^3) and at S43-SG07 (1,400 µg/m^3) as shown on Figure 4-13. Ethylbenzene and benzene were the only other compounds that exceeded their respective PSLs (0.97 µg/m^3 and 0.31 µg/m^3) at all four soil gas locations, with maximum concentrations of 34 µg/m^3 and 13 µg/m^3, respectively. The maximum concentrations of the other VOCs that exceeded their respective PSLs were 1,1-DCA (6.7 µg/m^3), 1,1-DCE (28 µg/m^3), 2-hexanone (12 µg/m^3), carbon disulfide (220 µg/m^3), chloroform (19 µg/m^3), cis-1,2-DCE (24 µg/m^3), and vinyl chloride (22 µg/m^3). These soil gas results indicated potential for vapor intrusion to occur into Building 716 (Table 4-6 and Figure 4-13).

Based on these soil gas results, indoor air samples were collected inside Building 716 to determine whether vapor intrusion may be occurring and if concentrations of VOCs could be of concern to industrial workers. Building 716 is currently used for only storage (northern side) and a part-time workshop (southern side) with no full-time occupants or operations occurring in this building. The indoor air results showed that concentrations of VOCs did not exceed the PSLs in indoor air at Building 716 (Table 4-6 and Figure 4-13).

4.4 SEEP, SURFACE WATER, AND SEDIMENT

Seep, surface water, and sediment samples were collected from the two drainage channels that empty into the Potomac River in the western portion of the Site. Based on results from groundwater in 2012, only the 10 site-specific VOCs and 4 metals were analyzed in sampling conducted in 2013. Analytical results are presented in Tables 4-7, 4-8, and 4-9 and Figure 4-14.

VOCs

Tables 4-7, 4-8, and 4-9 and Figure 4-14 provide a summary of the VOC concentrations in seep, surface water, and sediment samples collected at Site 43.

Water flow in both of the drainage channels (northern and southern) is partially and/or completely influenced by groundwater discharge and the amount of surface water runoff coming from the east of Strauss Avenue. The seep that discharges into the southern drainage channel is located a few feet from the culvert and, based on field observations, water flow in the seep and culvert appears to be continuous most of the year. The seep in the northern drainage channel is located about halfway down the channel on the southern slope and the flow is much lower than the flow observed from the seep in the northern drainage channel. The culvert feeding the northern drainage channel only flows during significant rainfall events. Seep samples were evaluated as surface water samples and the USEPA BTAG values were selected as PSLs. TCE was the only VOC detected in the two seep samples at concentrations exceeding the PSL of 21 µg/L. TCE was detected in the southern drainage channel at S43-SP01 at 354 µg/L in 2012 and 156 µg/L in 2013. TCE was detected in the northern drainage channel at S43-SP02 at 28.7 µg/L in 2012 and 1.86 µg/L in 2013. The decrease in concentrations from 2012 to 2013 may be due to seasonal variations or the sampling method as a stainless steel drive point was installed in 2013. Maximum concentrations of other VOCs detected in the seep samples, all of which were below their PSLs, include: 1,1,1-TCA (2.36 µg/L), 1,1-DCA (0.84 µg/L), 1,1-DCE (4.43 µg/L), cis-1,2-DCE (195 µg/L), methylene chloride (1 µg/L), PCE (0.24 µg/L), trans-1,2-DCE (1.09 µg/L), and vinyl chloride (1.16 µg/L).

Five VOCs were detected in surface water samples collected from the drainage channels (non-seep samples): 1,1-DCA, 1,1-DCE, cis-1,2-DCE, TCE, and vinyl chloride. TCE was the only VOC detected at concentrations exceeding the PSL of 21 µg/L. VOCs were not detected in the surface water sample collected directly from the culvert in the southern drainage channel. TCE was detected at 27.2 µg/L in sample S43-SW01 (upstream portion of the southern drainage channel), and at a concentration (10.2 µg/L) in sample S43-SW02 (downstream portion of the southern drainage channel). TCE was detected at a concentration of 4.98 µg/L in the outfall sample (S43-OF01) collected where the southern drainage channel discharges into the Potomac River. Samples were not collected from the culvert or upstream portion of the northern drainage channel because no water was present during the sampling event. At S43-SW04, collected downgradient of the northern drainage channel seep location, TCE was detected above the PSL at a concentration of 30.5 µg/L. Maximum concentrations of the other VOCs detected in the surface water samples were 0.75 µg/L for 1,1-DCA (S43-SW01), 0.7 µg/L for 1,1-DCE (S43-SW04), 48.2 µg/L for cis-1,2-DCE (S43-SW04), and 1.26 µg/L for vinyl chloride (S43-SW04), all of which were below their respective PSL.

Three VOCs were detected in the sediment samples: cis-1,2-DCE, methylene chloride, and TCE. Concentrations of these VOCs did not exceed the PSLs in any sediment sample. S43-SD01 exhibited the highest concentrations of these three compounds: cis-1,2-DCE (5.87 mg/kg), methylene chloride (222 mg/kg), TCE (22.1 mg/kg).

Metals

Tables 4-7, 4-8, and 4-9 and Figure 4-14 provide a summary of the metal concentrations in seep, surface water, and sediment samples.

As stated above, seep samples were treated as surface water samples and the USEPA BTAG values were selected as PSLs. Arsenic was not detected in either seep sample. Cobalt, iron, and manganese exceeded their PSLs (23, 300, and 120 µg/L respectively) in at least one location. Iron and manganese were both detected above the PSLs in the southern drainage seep sample (S43-SP01) at 1,290 µg/L and 134 µg/L, respectively. Cobalt and iron were both detected above PSLs in the northern drainage channel at S43-SP02 at 25.9 µg/L and 761 µg/L, respectively.

In the surface water samples, iron and manganese were the only metals detected at concentrations exceeding their PSLs (300 and 120 µg/L, respectively). The surface water sample from the culvert in the southern drainage channel had an iron concentration of 2,590 µg/L that exceeded the PSL. Downstream of the southern culvert, iron and manganese concentrations also exceeded the PSLs in both S43-SW01 (1,450 µg/L and 128 µg/L, respectively) and S43-SW02 (3,340 µg/L and 192 µg/L, respectively). The

southern drainage outfall sample S43-OF01, had detections of iron and manganese (1,750 µg/L and 189 µg/L, respectively) that also exceeded the PSLs. Samples were not collected from the culvert or the upstream portion of the northern drainage channel. In the downstream surface water sample in the northern drainage channel (S43-SW04), iron and manganese were detected at concentrations of (1,670 µg/L and 256 µg/L, respectively) above the PSLs. Maximum concentrations of the other metals analyzed in surface water (arsenic at 1.21 µg/L and cobalt at 10.7 µg/L) did not exceed their PSLs (5 µg/L for arsenic and 23 µg/L for cobalt).

Concentrations of arsenic, cobalt, and iron in sediment samples all exceeded their PSLs (0.43, 2.3, and 5,500 µg/L, respectively). In the southern drainage channel, S43-SD01 had the highest concentrations of arsenic (2.55 µg/L), cobalt (10.3 µg/L), and iron (6,920 µg/L), all of which exceeded their PSLs. In the northern drainage channel, S43-SD04 had detections of arsenic (2.07 µg/L), cobalt (13 µg/L), and iron (17,100 µg/L) that exceeded their PSLs. Sediment at all three locations was very fine to fine grained sand, with the northern drainage channel containing slightly more fine organics and silt with less water flowing through it at a lower velocity.

5.0 CONTAMINANT FATE AND TRANSPORT ANALYSIS

This section provides an evaluation of contaminant fate and transport at Site 43 to support the discussion of potential risks from contaminant migration in Sections 6.0 and 7.0. To support the contaminant fate and transport evaluation, a discussion of the physical and chemical properties of contaminants associated with Site 43 sources and their potential persistence, migration, dispersion, and degradation pathways is presented below.

5.1 PHYSICAL AND CHEMICAL PROPERTIES

Persistence of various classes of contaminants and their chemical and physical properties in soil-water environments are discussed in this section. Several chemical transformation mechanisms affect contaminant persistence, including hydrolysis, biodegradation, photolysis, and oxidation/reduction reactions. As discussed in Section 4.0, the following Site 43 contaminants were identified as exceeding screening levels:

- Explosives
- Metals
- VOCs

5.1.1 Metals

Fate and transport of inorganics (metals) are controlled mainly by the mobility of soil particles and dissolution into water present in the immediate environment. Metals are persistent and do not degrade like most organic chemicals. The major fate mechanisms for metals are adsorption to the soil matrix and bioaccumulation. Mobility of metals is influenced primarily by their physical and chemical properties, in combination with the physical and chemical characteristics of the soil matrix. Soil/pore water pH, soil/pore water Eh, and cation exchange capacity can help predict mobility of inorganic species. Mobility of metals generally increases with decreasing soil pH, Eh, and cation exchange capacity.

In some cases metals are found at concentrations or in forms (e.g., oxidation states) in which they may migrate in solution. It is possible that some industrial activities could saturate all available cation exchange sites in soil and result in a metal being mobilized. Metals are also more mobile under acidic conditions, which may exist in areas where plating-type activities have occurred. In these cases, it is possible for metals to migrate vertically through the soil column to groundwater. Therefore, metals detected in groundwater samples at Site 43 may represent the total of dissolved metals and metals adhering to any suspended soil material that are present in the samples.

5.1.2 VOCs

VOCs are generally more soluble in water than other chemicals and do not adsorb to soil organic carbon. Therefore, VOCs are typically the most frequently detected organic chemicals in groundwater. In the case of a spill, VOCs may migrate through the soil column or infiltrating precipitation may solubilize VOCs from buried waste. Soil retains a fraction of VOCs, but most will migrate to the water table, primarily through lateral migration with the hydraulic gradient.

5.1.3 Explosives

Explosives have little to moderate potential to adsorb to soil and sediment; therefore, they are highly mobile in soils and sediment and migrate to groundwater (Talmage et al., 1999).

5.2 CONCEPTUAL SITE MODEL OF CONTAMINANT MIGRATION

Based on historical investigations conducted at Site 43, VOCs are the primary contaminants of concern. It is assumed that the contamination resulted from releases to surface soil during historical dumping of solvents outside of Buildings 1040 and 1041. Ancillary metals and explosives contamination could have resulted from the cleaning of metal parts with the solvents. See Figure 4-10 for the graphical CSM at Site 43.

Contaminants from the historical dumping of solvents outside of Buildings 1040 and 1041 and from the cleaning of metal parts with solvents may have migrated via several pathways as discussed in Section 5.2.1.

5.2.1 Potential Contaminant Migration Pathways

Potential contaminant migration pathways at Site 43 consist of the following:

- Migration of VOCs, explosives, and/or inorganics via leaching from soils to groundwater and subsequent groundwater discharge to downgradient surface water/sediment.
- Migration of VOCs and/or inorganics from surface water via drainage channels to the Potomac River
- Migration of dissolved VOCs, explosives, and/or inorganics in groundwater through groundwater flow and, if present, by preferential flow pathways.
- Migration of VOCs via vaporization/volatilization. Volatile VOCs (e.g., TCE) in groundwater may volatilize and migrate through building foundations into indoor air.

6.0 HUMAN HEALTH RISK ASSESSMENT

This section presents the baseline HHRA for Site 43-Toluene Disposal Area at NSF-IH. The objective of the HHRA was to determine whether detected concentrations of chemicals within the study areas pose a significant threat to potential human receptors under current and/or future land use. The potential risks to human receptors were estimated assuming that no actions will be taken to control contaminant releases.

6.1 INTRODUCTION

The following current USEPA guidance documents were used to develop the framework for the baseline HHRA:

- Risk Assessment Guidance for Superfund: Volume I, Human Health Evaluation Manual (Part A) (USEPA, 1989).
- Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors (USEPA, 1991).
- Distribution of Preliminary Review Draft: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure (USEPA, 1993).
- Exposure Factors Handbook. (USEPA, 1997a).
- Risk Assessment Guidance for Superfund: Volume 1 - Human Health Evaluation Manual (Part D, Standardized Planning, Reporting, and Review of Superfund Risk Assessments) (USEPA, 2001).
- OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance), Draft Guidance (USEPA, 2002d)
- Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment), Final Guidance (USEPA, 2004).
- Guidelines for Carcinogen Risk Assessment (USEPA, 2005a).
- Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005b).
- Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment) (USEPA, 2009).
- EPA's Vapor Intrusion Database: Evaluation and Characterization of Attenuation Factors for Chlorinated Volatile Organic Compounds and Residential Buildings (USEPA, 2012b)

A HHRA consists of five components: data evaluation, exposure assessment, toxicity assessment, risk characterization, and uncertainty analysis. Sections 6.2 through 6.6 contain detailed discussions of the five components of the HHRA. A schematic diagram of the general risk assessment process is provided as Figure 6-1.

Three major aspects of chemical contamination and environmental fate and transport must be considered to evaluate potential risks: (1) contaminants with toxic characteristics must be found in environmental media and must be released by either natural processes or by human action; (2) potential exposure points must exist; and (3) human receptors must be present at the point of exposure. Risk is a function of both toxicity and exposure. If any one of these factors is absent at a site, the exposure route is regarded as incomplete and no potential risks are considered to exist for human receptors.

6.2 DATA EVALUATION

Data evaluation, the first component of a baseline HHRA, is a medium-specific task involving the compilation and evaluation of analytical data. The main objective of data evaluation is to develop a medium-specific list of COPCs that will be used to quantitatively determine potential human health risks for site media. The results of the data evaluation and data quality review are presented in Appendix O.

Data from soil samples collected from 2005 to 2013 were used to assess risks to potential human receptors. Surface soil samples were collected from 0 to 1 foot bgs. Subsurface soil samples were collected from 1 foot bgs to just above the water table (approximately 7 feet bgs). For groundwater, data collected from monitoring wells in the last two complete rounds of groundwater sampling in 2012 and 2013 were used to assess risks to potential human receptors. Groundwater samples were analyzed for total (unfiltered) and dissolved (filtered) metals but in accordance with USEPA guidance only the total results were used in this HHRA. Indoor and ambient air samples were collected for Building 720 in April 2012 and for Building 716 in July 2013. Soil gas samples were collected for Buildings 720 and 716 in June 2011 and May 2013, respectively.

Typically, screening by risk-based concentrations is used to focus the risk assessment on meaningful chemicals (i.e., the COPCs) and exposure routes. As discussed previously in Section 1, the potential source of contaminants at Site 43 was from historical dumping of solvents outside Buildings 1040 and 1041. Surface soil, subsurface soil, and groundwater samples were analyzed for VOCs, energetics/explosives, and inorganics and sediment and surface water samples were analyzed for VOCs and inorganics. Indoor air, ambient air, and soil gas samples were analyzed for VOCs. The following sections define the screening criteria used to determine the COPCs for Site 43 soil, groundwater, sediment, surface water, soil gas, and air.

6.2.1 Derivation of Screening Criteria

To identify COPCs for Site 43, screening concentrations were calculated using USEPA RSLs (USEPA, 2013). USEPA RSLs correspond to a Hazard Index (HI) of 0.1 (for noncarcinogens) or an ILCR of $1x10^{-6}$ (for carcinogens).

Soil

Screening concentrations based on the following criteria were used to select COPCs for surface and subsurface soil:

- USEPA RSLs for Residential Soil (USEPA, 2013).
- USEPA generic soil screening levels (SSLs) for migration from soil to groundwater (USEPA, 2013).

Because of the different exposure scenarios for potential human receptors, COPCs were identified for surface and subsurface soil. Surface soil was defined as the first two feet of soil. Subsurface soil was defined as soil deeper than the first two feet of soil.

USEPA SSLs with a dilution attenuation factor (DAF) of 20 was not used for COPC selection but was presented in the table to allow a qualitative evaluation of the potential for chemical migration from soil to groundwater. Chemicals with concentrations exceeding SSLs may potentially migrate from soil to groundwater in sufficient quantities to pose concerns about groundwater quality. Soil screening levels are presented on Table 6-1.

Groundwater

USEPA RSLs for tap water (USEPA, 2013) were used as screening criteria for groundwater from the 2012 and 2013 data set. A chemical detected in groundwater was selected as a COPC if the maximum detected concentration exceeded the USEPA RSL for tap water. Groundwater screening levels are presented on Table 6-2.

Sediment

No specific screening levels exist for human exposure to sediment. COPCs were selected for sediment by comparing detected site concentrations to USEPA RSLs (USEPA, 2013) for residential soil multiplied by ten. Soil RSLs were multiplied by ten to account for reduced exposure to sediment. A chemical

detected in sediments was selected as a COPC for sediments if the maximum detected concentration exceeded the calculated screening level. Sediment screening levels are presented on Table 6-1.

Surface water

No specific screening levels exist for human exposure to surface water. COPCs were selected for surface water by comparing detected site concentrations to screening levels based on USEPA RSLs for tap water (USEPA, May 2013) multiplied by ten. RSLs were multiplied by ten to account for reduced exposure to surface water. A chemical detected in surface water was selected as a COPC for surface water if the maximum detected concentration exceeded the calculated screening level. USEPA National Recommended Water Quality Criteria were not used for COPC selection because fishing does not occur at the site. Surface water screening levels are presented on Table 6-2.

Indoor Air, Ambient Air, and Soil Gas

USEPA RSLs for residential air (USEPA, 2013) were used as screening criteria for indoor air from the 2012 and 2013 data set. A chemical detected in indoor air was selected as a COPC if the maximum detected concentration exceeded the USEPA RSL for indoor air. Adjusted USEPA RSLs for residential air were used as screening criteria for soil gas concentrations. The residential air RSLs were multiplied by a factor of 10 to account for an attenuation factor of 0.1 to account for an assumed ten-fold dilution between soil gas and indoor air. Indoor air and soil gas screening levels are presented on Table 6-3.

Screening Levels for Chromium

Chromium speciation was not performed on soil and groundwater samples collected at Site 43. Therefore, as a conservative approach for assessing chromium, screening levels for hexavalent chromium were used to select COPCs.

Site Data-to-Background Data Comparisons

Maximum detected concentrations of inorganics in surface soil (Table 6-4), subsurface soil (Table 6-5), and groundwater (Table 6-6) at Site 43 were compared to NSF-IH Background soil and groundwater levels. The comparison of maximum detected concentrations to NSF-IH Background soil and groundwater levels is also presented in the Risk Assessment Guidance for Superfund (RAGs) Table 2s in Appendix Q.1. No background data was available for surface water and the limited sediment background data was not used for the risk evaluation. Maximum detected concentrations of indoor air were compared

to ambient air concentrations collected as part of the vapor intrusion investigation. The indoor air, ambient air, and soil gas data are presented in Appendix Q.10.

If the Site 43 maximum detected concentration was less than the NSF-IH Background value, site concentrations were determined to be similar to background concentrations. If the indoor air concentrations were less than the ambient air concentrations, then the concentrations were determined to be similar to ambient air and the presence of compounds were less likely to be related to vapor intrusion. If the results of the background comparison evaluation indicated that Site 43 chemical concentrations were similar to background concentrations, that chemical was not selected as a COPC and was not carried through the quantitative risk assessment. However, chemicals present at concentrations exceeding toxicity screening criteria but not selected as COPCs on the basis of the background comparison evaluation are further discussed in the uncertainty analysis section.

Elimination of chemicals as site-related COPCs on the basis of background comparisons follows Navy Policy on the Use of Background Chemical Levels (Navy, 2004). This document also presents the Navy's interpretation of USEPA guidance provided in the document titled Role of Background in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Cleanup Program (USEPA, 2002a) and details the methodology to be used in evaluating background under the Navy's Environmental Restoration and Base Realignment and Closure (BRAC) programs. Navy policy applies to both the screening-level and baseline risk assessments and requires the following:

1. A clear and concise understanding of chemicals released from a site thus ensuring the Navy is focusing on remediating the release.
2. The use of background data in the screening-level risk assessment.
   a. The comparison of site chemical levels to risk-based screening criteria.
   b. The comparison of site chemical levels to background concentrations.
   c. The identification of site-related COPCs based on screening criteria comparisons and background comparisons. Site-related COPCs are those chemicals with concentrations exceeding risk-based screening criteria and background concentrations. To the extent possible, site-related COPCs are further evaluated quantitatively in the baseline risk assessment. Non-site-related COPCs are further discussed in the risk characterization sections of the baseline risk assessments.
3. The consideration of background in the baseline risk assessment.
   a. The calculation of risk estimates for site-related COPCs only.
   b. The further evaluation of non-site-related COPCs in the risk characterization section only (e.g., the qualitative evaluation of chemicals detected at concentrations exceeding screening criteria but less than background concentrations). The Navy considers this evaluation to be

consistent with USEPA's Role of Background in the CERCLA Cleanup Program (USEPA, 2002a).

4. The selection of site cleanup remedial goals at levels not less than background levels. Additionally, cleanup levels should not be developed for chemicals not identified as chemicals of concern (COCs). As defined in Navy guidance, COCs are site-related COPCs found to be the risk drivers in the baseline risk assessment and that may pose unacceptable human or ecological risks.

6.2.2 Decision Rules for Establishing COPCs

The following decision rules were used to select initial lists of COPCs for Site 43:

- A chemical detected in soil was selected as a COPC for soil if any detected chemical concentration exceeded screening levels for residential exposures to soils and, for inorganics, the chemical was greater than the NSF-IH Background value.
- A chemical detected in groundwater was selected as a COPC for groundwater if any detected concentration exceeded the screening level for groundwater and, for inorganics; the chemical was greater than the NSF-IH Background value.
- A chemical detected in sediment was selected as a COPC for sediment if any detected concentration exceeded the screening level for sediment.
- A chemical detected in surface water was selected as a COPC for surface water if any detected concentration exceeded the screening level for surface water.
- A chemical detected in indoor air was selected as a COPC for indoor air if any detected concentration exceeded the screening level for indoor air and the ambient air concentration.
- A chemical detected in soil gas was selected as a COPC for soil gas if any detected soil gas concentration exceeded the screening level for soil gas.

6.2.3 COPCs Selected for HHRA

Chemicals of potential concern at Site 43 were selected for surface soil and subsurface soil, groundwater, surface water, sediment, and indoor air using the risk-based COPC screening levels described in Section 6.2.1. A discussion of chemicals identified as COPCs and the rationale for COPC selection is provided in the following subsections. The following subsections do not discuss the nature and extent of chemicals detected in site media. A detailed discussion of nature and extent of contamination is presented in Section 4. The RAGS Part D tables for COPC selection are included in Appendix Q.

6.2.3.1 Surface Soil

Explosives, metals, and VOCs were detected in eight surface soil samples collected at Site 43. Table 6-4 (RAGS-Part D Table 2.1, also presented in Appendix Q.1), shows the results of the comparison of maximum detected surface soil concentrations at Site 43 to USEPA residential soil RSLs and, for inorganics, NSF-IH background surface soil values. None of the concentrations of explosives detected in surface soil exceeded USEPA soil RSLs for residential exposure. Maximum concentrations of arsenic, cobalt, iron, manganese, thallium, and vanadium exceeded USEPA soil RSLs for residential exposure but were less than NSF-IH background soil values so were not retained as soil COPCs. Maximum concentrations of aluminum, cadmium, and chromium exceeded both USEPA residential soil RSLs and NSF-IH background soil values and TCE exceeded the USEPA residential soil RSL. Therefore, aluminum, cadmium, chromium, and TCE were retained as surface soil COPCs.

RAGS-Part D Table 2.2, presented in Appendix Q.1, shows the results of the comparison of maximum detected surface soil concentrations at Site 43 to USEPA SSLs for chemical migration from soil to groundwater and NSF-IH background surface soil values. None of the explosives detected in surface soil exceeded USEPA SSLs. Maximum detected concentrations of arsenic, cobalt, iron, manganese, and thallium were greater than USEPA SSLs but were less than NSF-IH background values. Therefore, these chemicals were not retained as COPCs for migration from surface soil to groundwater. Maximum detected concentrations of cadmium and chromium exceeded both USEPA SSLs and NSF-IH background values and cis-1,2-DCE, TCE, and vinyl chloride exceeded USEPA SSLs. Therefore, cadmium, chromium, cis-1,2-DCE, TCE, and vinyl chloride were retained as COPCs for migration from surface soil to groundwater. All five of these chemicals were detected in groundwater at concentrations exceeding USEPA tapwater RSLs. However, concentrations of cadmium and chromium were detected at concentrations below NSF-IH groundwater background concentrations.

6.2.3.2 Subsurface Soil

Explosives, metals, VOCs, cyanide and perchlorate were detected in 20 subsurface soil samples collected at Site 43. Samples were collected at one or two-foot intervals at depths from 4 to 10 feet. Table 6-5 (RAGS-Part D Table 2.3, also presented in Appendix Q.1), shows the results of the comparison of maximum detected surface soil concentrations at Site 43 to USEPA residential soil RSLs and NSF-IH background subsurface soil values. None of the explosives detected in surface soil exceeded USEPA soil RSLs for residential exposure. Maximum detected concentrations of aluminum, arsenic, chromium, cobalt, and iron were greater than USEPA residential soil RSLs but were less than NSF-IH background subsurface soil values. Therefore, aluminum, arsenic, chromium, cobalt, and iron were not retained as COPCs for subsurface soil. The maximum detected concentration of manganese exceeded the USEPA

soil RSL for residential exposure and the NSF-IH background subsurface soil value and the maximum detected concentration of TCE exceeded the USEPA soil RSL for residential exposure. Therefore, manganese and TCE were retained as subsurface soil COPCs.

RAGS-Part D Table 2.4, presented in Appendix Q.1, shows the results of the comparison of maximum detected subsurface soil concentrations at Site 43 to USEPA SSLs for chemical migration from soil to groundwater and NSF-IH background subsurface soil values. Maximum detected concentrations of arsenic, chromium, cobalt, and iron exceeded USEPA SSLs but were less than NSF-IH background subsurface soil values and were therefore not retained as COPCs. 1,3-Dinitrobenzene, cyanide, 2-hexanone, 4-methyl-2-pentanone, acetone, cis-1,2-DCE, toluene, TCE, and vinyl chloride were detected at concentrations exceeding surface soil USEPA SSLs and were retained as subsurface soil COPCs for migration from soil to groundwater. Cyanide, 2-hexanone, 4-methyl-2-pentanone, and toluene were not detected in groundwater. Acetone was detected in groundwater but at concentrations below the USEPA tapwater RSL. 1,3-dinitrobenzene, cis-1,2-DCE, TCE, and vinyl chloride were detected in groundwater at concentrations exceeding USEPA tapwater RSLs.

6.2.3.3 Groundwater

Explosives, metals, and VOCs were detected in 61 groundwater samples collected at Site 43. Data used for this comparison were based on unfiltered groundwater samples. Table 6-6 (RAGS-Part D Table 2.5, also presented in Appendix Q.1), shows the results of the comparison of maximum detected groundwater concentrations to USEPA tapwater RSLs and NSF-IH background groundwater values. Maximum detected concentrations of cadmium, chromium and vanadium exceeded USEPA tapwater RSLs but were less than NSF-IH background groundwater values; therefore, these chemicals were not retained as COPCs. Maximum concentrations of 1,3-dinitrobenzene, 2,6-dinitrotoluene, 3-nitrotoluene, 1,1-DCA, 1,1-DCE, 1,2-DCA, cis-1,2-DCE, TCE, and vinyl chloride exceeded USEPA tapwater RSLs. Maximum concentrations of arsenic, barium, beryllium, cobalt, iron, manganese, nickel, and thallium exceeded USEPA tapwater RSLs and NSF-IH background groundwater values. Therefore, 1,3-dinitrobenzene, 2,6-dinitrotoluene, 3-nitrotoluene, 1,1-DCA, 1,1-DCE, 1,2-DCA, cis-1,2-DCE, TCE, vinyl chloride, arsenic, barium, beryllium, cobalt, iron, manganese, nickel, and thallium were retained as groundwater COPCs.

6.2.3.4 Sediment

Metals and VOCs were detected in Site 43 sediment. Table 6-7 (RAGS-Part D Table 2.6, also presented in Appendix Q.1), shows the results of the comparison of maximum detected sediment concentrations to adjusted USEPA soil RSLs. None of the chemicals detected in sediment exceeded the adjusted USEPA soil RSL. Therefore, no chemicals were retained as sediment COPCs.

6.2.3.5 Surface water

Metals and VOCs were detected in Site 43 surface water. Table 6-8 (RAGS-Part D Table 2.7, also presented in Appendix Q.1), shows the results of the comparison of maximum detected surface water concentrations to adjusted USEPA tapwater RSLs. Maximum detected concentrations of arsenic, cobalt, cis-1,2-DCE, TCE, and vinyl chloride exceeded adjusted USEPA tapwater RSLs and, therefore, these chemicals were retained as surface water COPCs.

6.2.3.6 Indoor Air

Groundwater analytical results indicated that chlorinated hydrocarbons are COPCs at this site and could be potential COPCs for indoor air as a result of vapor intrusion. These groundwater COPCs include: TCE, cis-1,2-DCE, 1,1-DCA, 1,2-DCA, 1,1-DCE, and vinyl chloride.

At Building 716, no detected contaminants were present at concentrations greater than residential indoor air screening levels (Table 6-9). However, 1,2-DCA, cis-1,2-DCE, and TCE were detected in indoor air. Concentrations of 1,2-DCA were less than their respective ambient air concentrations. TCE and cis-1,2-DCE were not detected in the ambient air. At Building 720, maximum detected concentrations of benzene and chloromethane were present at concentrations greater than residential indoor air screening levels (Table 6-10); however, benzene and chloromethane were not identified as COPCs in groundwater. Also, benzene and chloromethane were not detected in ambient air. The groundwater COPCs, TCE, cis-1,2-DCE, and vinyl chloride, were detected in the indoor air of Building 720. 1,2-DCA, a groundwater COPC, was detected in the indoor air, but its detection was related to blank contamination.

At Building 716, benzene, chloroform, and TCE were detected at concentrations greater than soil gas screening levels (Table 6-11). Of these, only TCE was identified as a COPC in groundwater and only TCE was detected in indoor air. At Building 720, acetone, chloromethane, cis-1,2-DCE, and vinyl chloride were detected at concentrations greater than soil gas screening levels (Table 6-12). Of these, only cis-1,2-DCE and vinyl chloride were identified as COPCs in groundwater and only chloromethane was identified as a COPC in indoor air. All four soil gas COPCs were detected in the indoor air of Building 720.

Based on the comparison to indoor air screening levels, and the relationship of contaminant concentrations among indoor air, soil gas, and groundwater, the indoor air COPCs for assessing vapor intrusion are:

- Building 716 – TCE and cis-1,2-DCE

- Building 720 – TCE, cis-1,2-DCE, vinyl chloride, benzene, and chloromethane

6.2.3.7 Summary of COPCs

Table 6-13 presents of summary of the COPCs for all media that were investigated.

6.3 EXPOSURE ASSESSMENT

This portion of the risk assessment defines and evaluates, quantitatively or qualitatively, the type and magnitude of human exposure to chemicals present at or migrating from a site. The exposure assessment is designed to depict the physical setting of the site, to identify potentially exposed populations and applicable exposure pathways, to calculate concentrations of COPCs to which receptors might be exposed, and to estimate chemical intakes under the identified exposure scenarios.

Actual or potential exposures at Site 43 were determined based on the most likely pathways of contaminant release and transport, as well as human activity patterns. A complete exposure pathway has three components: a source of chemicals that can be released to the environment, a route of contaminant transport through an environmental medium, and an exposure or contact point for a human receptor.

6.3.1 Conceptual Site Model

This section discusses the CSM for Site 43. A CSM facilitates consistent and comprehensive evaluation of potential risks to human health by creating a framework for identifying pathways by which human receptors may come in contact with contaminated media. A CSM depicts the relationships among the following elements, which are necessary for defining complete exposure pathways:

- Site sources of contamination
- Contaminant release mechanisms and transport/migration pathways
- Exposure routes
- Potential receptors

The elements of the CSM (contaminant source, release mechanisms, transport/migration pathways, exposure routes, and potential receptors) establish the manner and degree to which a potential receptor may be exposed to chemicals present at the site. The degree of risk incurred by a potential receptor varies according to the means of exposure, the duration of exposure, and the specific chemical to which the receptor is exposed. An exposure, however long in duration, does not necessarily result in an

“unacceptable” health or environmental risk, although risks generally increase with increased frequency and/or duration of exposure.

Site background, physical setting, previous investigations, and hazard identification were presented in Section 1.0. Site 43 - Toluene Disposal includes two separate areas in the southwestern portion of the Main Area of NSF-IH. The first is near a utility pole approximately 30 feet northwest of, and across the road from, Building 1041 and the second is the northern corner of Building 1040. It is estimated that, for a period of more than 2 years during parts-cleaning operations, unknown quantities of spent solvents were improperly disposed of in the drainage ditch outside the door (northeast) of Building 1040 (acetone) and at the base of the pole by Building 1041 (acetone and toluene). The Site is an industrial area where the production and assembly of energetics still occurs in Building 720.

A relatively steep earthen, grass-covered bunker is located immediately northwest of the utility pole near Building 1041. The area northeast of this vicinity is relatively flat and covered with mowed grasses and a few trees. The area near Building 1040 also is relatively flat. The area surrounding the building southwest of Schuyler Road is mostly covered with mowed grasses. The area northeast of Schuyler Road is mostly covered with unmowed grasses and trees.

Figure 6-2 illustrates the human exposure CSM for Site 43. The elements of the CSM, including how they pertain to Site 43, are discussed below. Sources of contamination, contaminant release mechanisms, transport and migration pathways, exposure routes, and potential receptors are defined. Table 6-14 provides a summary of potential receptors evaluated for Site 43. A summary of exposure routes addressed quantitatively for each human receptor is provided in Table 6-15.

Site Sources of Environmental Contamination

Based on the results of historical investigations conducted at Site 43, VOCs represent the primary COPCs. It is assumed that contamination resulted from releases to surface soil during historical dumping of solvents outside of Buildings 1040 and 1041. Ancillary metals and explosives contamination could have resulted from cleaning of metal parts with solvents.

Potential Contaminant Release Mechanisms and Transport/Migration Pathways

Based on historical information, plausible contaminant release and migration mechanisms for Site 43 include the following:

- Migration of VOCs, explosives, and/or inorganics via leaching from soils to groundwater and subsequent groundwater discharge to downgradient surface water/sediment.
- Migration of VOCs and/or inorganics from surface water via drainage channels to the Potomac River
- Migration of dissolved VOCs, explosives, and/or inorganics in groundwater through groundwater flow and, if present, by preferential flow pathways.
- Migration of VOCs via vaporization/volatilization. Volatile VOCs (e.g., TCE) in the groundwater may volatilize and migrate through building foundations as vapor into indoor air.

Potential Current and Future Receptors of Concern and Exposure Pathways

Future site use is uncertain, but is anticipated to be industrial considering the base mission. Current site users include occupational workers in buildings, maintenance workers (e.g., utilities), and construction workers. However, because future land use is unknown, for purposes of completeness the baseline risk assessment considered receptor exposure under residential land use scenarios. Based on current and potential future land use, the following potential receptors may be exposed to contaminated environmental media (surface soil, subsurface soil, surface water, and groundwater) within the study area:

- **Future Construction Workers** – A plausible receptor under current and future land use. This receptor could be exposed to surface and subsurface soils (incidental ingestion and dermal contact), air (inhalation), groundwater (incidental ingestion, dermal contact, and inhalation), and surface water (incidental ingestion and dermal contact).

- **Maintenance Worker** – A plausible receptor under current and future land use. This receptor may be exposed to potentially contaminated surface soil (incidental ingestion and dermal contact), air (inhalation), and surface water (dermal contact). Direct contact with groundwater is not anticipated for this receptor. Maintenance worker exposure to subsurface soil is unlikely; however, because future construction could potentially bring subsurface soil to the surface, exposure to subsurface soil via incidental ingestion, dermal contact, and inhalation was evaluated for this receptor to support risk management decision making.

- **Industrial Worker** – A plausible receptor under current and future land use. This includes adult military or civilian personnel assigned to routine daily work tasks in the Site 43 area. This receptor could be exposed to surface soil (incidental ingestion and dermal contact) and air (inhalation). It is anticipated that this receptor would not be routinely exposed to groundwater, sediments, or surface water. Industrial worker exposure to subsurface soil is unlikely; however,

because future construction could potentially bring subsurface soil to the surface, exposure to subsurface soil via incidental ingestion, dermal contact, and inhalation was evaluated for this receptor to support risk management decision making. This receptor is expected to be exposed to surface soil on a more frequent basis than the maintenance or construction worker. If this receptor were to work in an on-site structure, this receptor could be exposed to VOCs migrating from contaminated groundwater to the indoor air of a building.

- **On-Base Residents** – An unlikely receptor under future land use. Although this scenario is highly unlikely, a future residential scenario is typically evaluated in a risk assessment for decision-making purposes. For example, the need for deed restrictions at a site may be eliminated prior to site closure if minimal risks are estimated for residential receptors. It is assumed that a hypothetical resident may be exposed to surface soils (incidental ingestion and dermal contract) and air (inhalation), groundwater (incidental ingestion, dermal contact, and inhalation), surface water (incidental ingestion and dermal contact). Also, hypothetical residents could be exposed to VOCs migrating from contaminated groundwater to the indoor air of a home. Potential exposures to surface water were limited to wading because the streams at the sites are not deep enough for swimming. Receptor exposure to subsurface soil would only occur if subsurface soil was excavated and deposited on existing surface soil. Although this is an unlikely scenario, it is included in this HHRA to assess the need for deed restrictions.

No COPCs were identified for sediments; therefore, potential exposures to sediments were not evaluated in this HHRA. Details regarding the assumed receptor characteristics (e.g., intake rate, frequency, duration of exposure) are defined in Section 6.3.4.

6.3.2 Central Tendency Exposure vs. Reasonable Maximum Exposure

Traditionally, exposures evaluated in the HHRA were based on the concept of a reasonable maximum exposure (RME) only, which is defined as "the maximum exposure that is reasonably expected to occur at a site" (USEPA, 1989). However, subsequent risk assessment guidance (USEPA, 1992) and Navy guidance (Navy, 2001) indicates the need to address an average case or central tendency exposure (CTE).

To provide a full characterization of potential exposure, both RME and CTE scenarios were evaluated in the HHRA for Site 43. The available guidance (USEPA, 1993) concerning the evaluation of CTE is limited and at times vague. Therefore, professional judgment was exercised when defining CTE conditions for a particular receptor at a site.

6.3.3 Exposure Point Concentrations

The EPC, which is calculated for COPCs only, is an estimate of the chemical concentration within an exposure unit (EU) likely to be contacted over time by a receptor and is used to estimate exposure intakes. An exposure unit is defined as the area typically encountered/traversed by a receptor under a particular land use scenario. For example, a residential lot size of ¼ acre to 2 acres is often used to evaluate exposure for a hypothetical future resident. However, the size of an EU is typically based on the distribution of the chemical concentrations in a medium as well as on presumed receptor activity patterns.

The following guidelines were used to calculate the EPCs:

- If a data set contained fewer than 8 samples, the EPC for the RME and CTE case was defined as the maximum detected concentration.
- If a data set for an EU contains 8 or more samples and at least three detected samples, the 95 percent upper confidence limit (UCL) on the arithmetic mean, which was based on the distribution of the data set, was selected as the EPC for the RME and CTE cases. EPCs were calculated following the USEPA's UCL Calculator (Pro UCL Version 4.1.01) (USEPA, 2010) which implements the recommendations in USEPA's Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites (USEPA, 2002b).
- Non-detected values were evaluated in accordance with the ProUCL guidance. Duplicates were averaged for purposes of calculating EPCs for COPCs in environmental media. In calculating the averages, if one sample was detected and the other was non-detected then the average was calculated using the detected value and one half the non-detected value.
- The same EPCs were used for both the RME and CTE scenarios.

Table 6-16 summarizes the EPCs used in this HHRA. Details of the EPCs are presented in Appendix Q.2.

6.3.4 Chemical Intake Estimation

The methodologies and techniques used to estimate exposure intakes are presented in this section. Intakes for the identified potential receptor groups were calculated using current USEPA risk assessment guidance (e.g., USEPA, 1991, 1997a, and 2004) and presented in the risk assessment spreadsheets. All quantitative risk assessment results are presented in RAGS Part D format tables (Appendix Q).

Noncarcinogenic intakes were estimated using the concept of an average annual exposure. Carcinogenic intakes were calculated as an incremental lifetime exposure, which assumed a life

expectancy of 70 years. Assumptions regarding exposure for RME and CTE scenarios are presented in Appendix Q.2.

6.3.4.1 Dermal Contact with Soil

Direct physical contact with soil may result in the dermal absorption of chemicals. Exposures associated with the dermal route were estimated in the following manner (USEPA, 2004):

$$Intake_{si} = \frac{(C_{si})(SA)(AF)(ABS)(CF)(EV)(EF)(ED)}{(BW)(AT)}$$

Where:

$Intake_{si}$	=	amount of chemical "i" absorbed during contact with soil/sediment (mg/kg/day)
C_{si}	=	concentration of chemical "i" in soil/sediment (mg/kg)
SA	=	skin surface area available for contact (cm^2)
AF	=	skin adherence factor (mg/cm^2)
ABS	=	absorption factor (dimensionless)
CF	=	conversion factor (1×10^{-6} kg/mg)
EV	=	event frequency (events/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
BW	=	body weight (kg)
AT	=	averaging time (days); for noncarcinogens, AT = ED x 365 days/year; for carcinogens, AT = 70 years x 365 days/year

Exposed surface areas of the body available for dermal contact are determined on a receptor-specific basis because they correspond with assumed human activities and clothing worn during exposure events. Current guidance documents (USEPA, 1997a and 2004) were used to develop the default assumptions concerning the amount of skin surface area available for contact for a receptor. The rationales used to select the skin areas available for contact with contaminated soils or sediments were as follows:

- For construction workers, maintenance workers, and industrial workers exposed to surface soil or sediment, the surface area available for soil contact was assumed to be the head, hands, and forearms. A value of 3,300 cm^2 was used to estimate the exposed skin surface area for the CTE and RME scenarios, which represents the 50th-percentile areas for the head, hands, and forearms (USEPA, 2004).

- For adult residents exposed to surface soil/sediment, the USEPA-recommended value of 5,700 cm^2 was used to estimate the exposed surface area available for contact for the RME and CTE scenarios (USEPA 2004). This value assumes that the adult resident is wearing a short-sleeved shirt, shorts, and shoes; therefore, the exposed skin surface is limited to the head, hands, forearms, and lower legs. For a child resident, the recommended value of 2,800 cm^2 was used to estimate the exposed skin surface area for the RME and CTE scenarios (USEPA, 2004). This value assumes that the child resident is wearing a short-sleeved shirt, shorts, and no shoes; therefore, the exposed skin surface area is limited to the head, hands, forearms, lower legs, and feet.

The following values of soil adherence factors provided in RAGS Part E (USEPA, 2004) were used to evaluate risks from exposure to soil and sediment:

- Construction workers - 0.3 milligrams per square centimeter (mg/cm^2) for the RME and 0.1 mg/cm^2 for the CTE. These values are the 95th-percentile and geometric mean values for construction workers, respectively (USEPA, 2002b and 2004).
- Industrial workers and maintenance workers - 0.2 mg/cm^2 for the RME and 0.02 mg/cm^2 for the CTE (USEPA, 2004).
- Child residents - 0.2 mg/cm^2 for the RME and 0.04 mg/cm^2 for the CTE. These values are the 95th-percentile and geometric mean values presented for soccer players (teens) playing in moist conditions (USEPA, 2004).
- Adult residents - 0.07 mg/cm^2 for the RME and 0.01 mg/cm^2 for the CTE (USEPA, 2004).

For the constituents identified as COPCs in soil, the following absorption factors were used (USEPA, 2003 and 2004):

- Aluminum – 0.01
- Arsenic - 0.03
- Cadmium – 0.001
- Chromium VI – 0.01
- Cobalt – 0.01
- Iron – 0.01
- Manganese – 0.01
- Thallium – 0.01
- Vanadium – 0.01
- TCE – 0.03

Other exposure parameters are typically consistent with USEPA standard default exposure assumptions. Some exposure parameters were based on professional judgment. Specifically, the exposure duration for a construction worker is assumed to be one year. The construction worker is assumed to be exposed to soil 150 days per year (exposure frequency). These assumptions are applicable for the RME and CTE. The exposure frequency for the maintenance worker is much less than the construction worker. For the RME, the exposure frequency for the maintenance worker is assumed to be 24 days per year (2 days per month), where the exposure frequency for the CTE is half that of the RME, 12 days per year.

6.3.4.2 Incidental Ingestion of Soil

Incidental ingestion of soil by potential receptors coincides with dermal exposure. Exposures associated with incidental ingestion were estimated in the following manner (USEPA, 1989):

$$Intake_{si} = \frac{(C_{si})(IR_s)(RBA)(FI)(EF)(ED)(CF)}{(BW)(AT)}$$

Where:

$Intake_{si}$	=	intake of contaminant "i" from soil or sediment (mg/kg/day)
C_{si}	=	concentration of contaminant "i" in soil or sediment (mg/kg)
IR_s	=	ingestion rate (mg/day)
RBA	=	relative bioavailability (unitless)
FI	=	fraction ingested from contaminated source (dimensionless)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (year)
CF	=	conversion factor (1×10^{-6} kg/mg)
BW	=	body weight (kg)
AT	=	averaging time (days);
		for noncarcinogens, AT = ED x 365 days/year;
		for carcinogens, AT = 70 years x 365 days/year

The same exposure frequencies and durations used in the estimation of dermal intakes were used to estimate exposure via incidental ingestion. A value of 0.6 was used for the relative bioavailability (RBA) for arsenic (USEPA, 2012a) and a value of 1 was used for all other chemicals.

6.3.4.3 Inhalation of Air Containing Fugitive Dust/Volatiles Emitted from Soil

Intake of both particulates and vapors/gases is calculated using the same equation, as follows (USEPA, 2009):

$$EC = \frac{(C_{air})(ET)(EF)(ED)}{AT}$$

Where:	EC	=	exposure concentration (mg/m^3)
	C_{air}	=	concentration of chemical in air (mg/m^3)
	ET	=	exposure time (hours/day)
	EF	=	exposure frequency (days/yr)
	ED	=	exposure duration (yr)
	AT	=	averaging time (hours);
		=	ED x 365 days/yr x 24 hrs/day for non-carcinogens
		=	70 yr x 365 days/yr x 24 hrs/day for carcinogens

Some of the exposure assumptions used to estimate chemical intakes from inhalation of fugitive dusts/volatile emissions from surface and subsurface soil were based on default assumptions described in standard USEPA guidance and are shown in Appendix Q.3 in the RAGS Part D RME table. The same exposure frequencies and durations used to estimate incidental ingestion of soil intakes were used to estimate exposure via inhalation of fugitive dust/volatile emissions for surface and subsurface soil. Exposure time was assumed to be 24 hours per day for child and adult residents; and 8 hours per day for maintenance workers, industrial workers, and construction workers (USEPA, 1991).

Concentrations of chemicals in air resulting from emissions from soil were developed following procedures presented in USEPA Soil Screening Guidance (USEPA, 2002c). Chemical concentrations in air were calculated as follows:

$$C_{air} = C_{soil} \times \left[\frac{1}{PEF} + \frac{1}{VF} \right]$$

Where:	C_{air}	=	chemical concentration in air (mg/m^3)
	C_s	=	chemical concentration in soil (mg/Kg)
	PEF	=	particulate emission factor (m^3/kg)
	VF	=	volatilization factor (m^3/kg)

The particulate emissions factor (PEF) relates the concentration of the chemical in soil to the concentration of dust particles in air. A PEF value of $3.23 \times 10^{+9}$ m^3/kg was obtained from USEPA's Soil Screening internet site at http://rais.ornl.gov/epa/ssl1.shtml. This is the default value for Philadelphia, Pennsylvania, which is the closest city to Site 43 listed on the Internet site. and is for fugitive dust

emissions resulting from wind erosion. Because fugitive dust emissions resulting from wind erosion are different than dust emissions generated during construction activities, a separate PEF was used for construction activities. The PEF for construction workers (1.62 x 10^{+6} m^3/kg) was calculated using the equations presented in the supplemental SSL guidance document (USEPA, 2002c). A sample calculation showing how the PEF for construction workers was calculated is presented in Appendix Q.3.

Ambient air concentrations resulting from the volatilization of COPCs from soil are chemical dependent and were calculated using the following equation from USEPA's Soil Screening Guidance:

$$VF = \frac{Q/C \times (3.14 \times D_a \times T)^{0.5} \times 10^{-4} \ (m^2/cm^2)}{(2 \times \rho_b \times D_a)}$$

and

$$D_a = \frac{[(\theta_a^{10/3} \times D_i \times H' + \theta_w^{10/3} \times D_w)/n^2]}{\rho_b \times K_d + \theta_w + \theta_a \times H'}$$

where:

VF	=	volatilization factor (m^3-air/kg-soil)
Q/C	=	inverse of the mean concentration at the center of source (gm/m^2-sec per kg/m^3)
D_a	=	apparent diffusivity, chemical specific, (cm^2/sec)
T	=	exposure interval, exposure specific, (sec)
ρ_b	=	dry bulk soil particle density (g/cm^3)
θ_a	=	air-filled soil porosity (L_{air}/L_{soil})
D_i	=	diffusivity in air, chemical specific, (cm^2/sec)
n	=	total soil porosity (L_{pore}/L_{soil})
θ_w	=	water-filled soil porosity (L_{air}/L_{soil})
D_w	=	diffusivity in water, chemical specific, (cm^2/sec)
K_d	=	soil-water partition coefficient, chemical specific
H'	=	dimensionless Henry's law constant, chemical specific

Chemical properties were obtained from the current USEPA RSL table (2013).

6.3.4.4 Dermal Contact with Groundwater and Surface Water

Direct physical contact with groundwater and surface water may result in dermal absorption of chemicals. Exposures associated with the dermal route were estimated in the following manner (USEPA 2004):

$$Intake_{si} = \frac{(C_{wi})(SA)(DA_{event})(EV)(EF)(ED)}{(BW)(AT)}$$

Where:

$Intake_{si}$	=	amount of chemical "i" absorbed during contact with groundwater or surface water (mg/kg/day)
C_{wi}	=	concentration of chemical "i" in groundwater or surface water (µg/L)
SA	=	skin surface area available for contact (cm^2)
DA_{event}	=	absorbed dose per event (mg/cm^2-event)
EV	=	event frequency (events/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
BW	=	body weight (kg)
AT	=	averaging time (days); for noncarcinogens, AT = ED x 365 days/year; for carcinogens, AT = 70 years x 365 days/year

The absorbed dose per event (DA_{event}) was estimated using a non-steady-state approach for organic compounds and a traditional steady-state approach for inorganics. For organics, the following equations apply:

$$\text{If } t_{event} < t^*, \text{ then: } DA_{event} = (2)(K_p)(FA)(C_{wi})(CF)\left(\sqrt{\frac{6\,\tau\, t_{event}}{\pi}}\right)$$

$$\text{If } t_{event} > t^*, \text{ then: } DA_{event} = (K_p)(FA)(C_w)(CF)\left(\frac{t_{event}}{1+B} + 2\,\tau\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right)$$

Where:

t_{event}	=	duration of event (hour/event)
t^*	=	time it takes to reach steady-state conditions (hour)
K_p	=	permeability coefficient from water through skin (cm/hour)
FA	=	chemical-specific fraction absorbed (dimensionless)
C_{wi}	=	concentration of chemical "i" in water (mg/L)
τ	=	lag time (hour)
π	=	Pi (dimensionless; equal to 3.1416)
CF	=	conversion factor (0.001 L/cm^3)
B	=	dimensionless ratio of the permeability of the stratum corneum relative to the permeability across the viable epidermis.

Values for the chemical-specific parameters (t*, K_p, FA, τ, and B) were obtained from the current dermal guidance (USEPA, 2004, Exhibit B-3). If published values were not available for a particular compound, they were calculated using equations provided in the USEPA dermal guidance.

The following steady-state equation was used to estimate DA_{event} for inorganics:

$$DA_{event} = (K_p)(C_{wi})(t_{event})$$

The dermal permeability coefficient (K_p) values recommended in the USEPA dermal guidance (USEPA, 2004) were used to calculate DA_{event} for inorganic COPCs.

For exposure to groundwater and surface water, professional judgment is applied to estimating the exposure frequency and event duration for the construction worker. The exposure frequency for the construction worker is assumed to be 90 days per year for the RME and 30 days for the CTE with event durations of 4 hours per event (day) for the RME and 2 hours per day for the CTE.

6.3.4.5 Direct/Incidental Ingestion of Groundwater and Surface Water

Direct ingestion of groundwater is expected to be limited to exposure that would occur under a future hypothetical residential scenario. Incidental ingestion of groundwater and surface water by construction workers may occur during excavation activities. In addition, maintenance workers and hypothetical residents may incidentally ingest surface water while at the Site 43. Intakes associated with ingestion of groundwater and surface water were estimated in the following manner (USEPA, 1989):

$$Intake_{si} = \frac{(C_{wi})(IR_W)(EF)(ED)(CF)}{(BW)(AT)}$$

Where:

$Intake_{si}$	=	intake of contaminant "i" from groundwater or surface water (mg/kg/day)
C_{wi}	=	concentration of contaminant "i" in groundwater or surface water (µg/L)
IR_w	=	ingestion rate for groundwater (L/day)
IR_w	=	surface water ingestion rate (L/day) = (CR)(ET)
CR	=	contact rate (L/hour)
ET	=	exposure time (hr/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (year)
CF	=	conversion factor (0.001 ug/mg)
BW	=	body weight (kg)

AT	=	averaging time (days);
		for noncarcinogens, AT = ED x 365 days/year;
		for carcinogens, AT = 70 years x 365 days/year

It was assumed that construction workers would ingest 0.01 L/day of tap water under the RME and CTE scenarios. It was also assumed adult residents and child residents would ingest 2 L/day and 1 L/day, respectively, (USEPA, 1991) of tap water under the RME scenario and 1.4 L/day and 0.66 L/day of tap water, respectively, under the CTE scenario (USEPA, 1993 and 1997a). The same exposure frequencies and durations used to estimate dermal intakes were used to estimate exposure via incidental ingestion.

6.3.4.6 Inhalation of VOCs During Showering

Showering exposure was considered for the adult resident. The Foster and Chrostowski showering model was applied to estimate time-varying air concentrations of volatile COPCs and inhaled dose during the time spent showering and while in the bathroom after showering. Showering model input assumptions were adopted from USEPA guidance (USEPA, 2004) and as recommended by the model developers (Foster and Chrostowski, 1987). Henry's Law constants and other parameters used in this model were obtained from several sources, including USEPA (2002d) and Foster and Chrostowski (1987). Input parameters are shown in Appendix Q.3 in RAGS Part D RME and CTE tables numbered 4.18 RME and 4.18 CTE. Exposures associated with inhalation while showering were estimated in the following manner (USEPA, 2009):

$$EC = \frac{(C_{air})(ET)(EF)(ED)}{AT}$$

Where:	EC	=	exposure concentration (mg/m^3)
	C_{air}	=	concentration of chemical in shower (mg/m^3) (from Foster & Chrostowski model)
	ET	=	exposure time (hours/day)
	EF	=	exposure frequency (days/yr)
	ED	=	exposure duration (yr)
	AT	=	averaging time (hours);
		=	ED x 365 days/yr x 24 hrs/day for non-carcinogens
		=	70 yr x 365 days/yr x 24 hrs/day for carcinogens

6.3.4.7 Inhalation of VOCs in Groundwater During Excavation Work

For evaluating inhalation exposure to VOCs in groundwater by construction workers performing work in

an excavation trench, the Virginia Department of Environmental Quality model was used (VDEQ, 2013). The following equations were utilized:

$$EC = \frac{(C_{gw} \times VF_i)(CF)(ET)(EF)(ED)}{AT}$$

Where:	EC	=	exposure concentration (mg/m^3)
	C_{gw}	=	concentration of chemical in air in groundwater within excavation trench (µg/L)
	VF_i	=	volatilization factor for contaminant "i" from groundwater (L/m3)
	CF	=	conversion factor (0.001 mg/µg)
	ET	=	exposure time (hours/day)
	EF	=	exposure frequency (days/yr)
	ED	=	exposure duration (yr)
	AT	=	averaging time (hours);
		=	ED x 365 days/yr x 24 hrs/day for non-carcinogens
		=	70 yr x 365 days/yr x 24 hrs/day for carcinogens

Where:

$$VF_i = \frac{Ki \times A \times F \times 10^{-3} \times 10^4 \times 3600}{ACH \times V}$$

And:	Ki	=	overall mass transfer coefficient of contaminant (cm/sec)
	A	=	area of trench (m2)
	F	=	fraction of trench floor through which contaminant can enter (unitless)
	ACH	=	air exchanges per hour (1/hr)
	V	=	volume of trench (m3)
	10^{-3}	=	conversion factor (L/cm3)
	10^4	=	conversion factor (cm2/m2)
	3600	=	conversion factor (sec/hr)

The overall mass transfer coefficient (Ki) for an individual constituent in a trench was estimated using the following equation:

$$Ki = \frac{1}{\left\{\left[\frac{1}{kiL}\right] + \left[\frac{R \times T}{Hi \times kiG}\right]\right\}}$$

Where:	Ki	=	overall mass transfer coefficient of compound i (cm/sec)

kiL	=	liquid-phase mass transfer coefficient of compound i (cm/sec)
R	=	ideal gas law constant (8.2 x 10^{-5} atm-m^3/mole-°K)
T	=	average system absolute temperature (°K)
Hi	=	Henry's Law constant (atm-m^3/mole)
KiG	=	gas-phase mass transfer coefficient of compound i (cm/sec)

The liquid-phase mass transfer coefficient (KiL) for an individual compound in a trench was estimated using the following equation:

$$KiL = (MWO_2 / MWi)^{0.5} \times (T / 298) \times KL,O_2$$

Where:	KiL	=	liquid-phase mass transfer coefficient of compound i (cm/sec)
	MWO_2	=	molecular weight of oxygen (g/mole)
	MWi	=	molecular weight of compound (g/mole)
	KL,O_2	=	liquid-phase mass transfer coefficient of oxygen at 25° C (cm/sec)

The gas-phase mass transfer coefficient (KiG) for an individual compound in a trench was estimated using the following equation:

$$KiG = (MWH_2O) / MWi)^{0.335} \times (T / 298)^{1.005} \times KG,H_2O$$

Where:	KiG	=	gas-phase mass transfer coefficient of compound i (cm/sec)
	MWH_2O	=	molecular weight of water (g/mole)
	MWi	=	molecular weight of compound (g/mole)
	KG,H_2O	=	gas-phase mass transfer coefficient of water vapor at 25° C (cm/sec)

Input parameters for the trench worker inhalation model are shown in Appendix Q.3 in RAGS Part D Tables 4.4.RME and 4.4.CTE. The same exposure frequencies and durations used to estimate dermal intakes were used to estimate exposure via inhalation.

6.3.4.8 Inhalation of VOCs in Indoor Air

Inhalation exposures for hypothetical future residents and industrial workers were estimated using an air intake estimation model, as follows (USEPA, 2009):

$$EC = \frac{(C_{air})(ET)(EF)(ED)}{(AT)(24hrs/day)}$$

Where:	EC	=	exposure concentration (mg/m^3)
	C_{air}	=	chemical concentration in air (mg/m^3)
	ET	=	exposure time (hours/day)
	EF	=	exposure frequency (days/yr)
	ED	=	exposure duration (yr)
	AT	=	averaging time (days)
			for non-carcinogens, AT = ED×365 days per year
			for carcinogens, AT = 70 years×365 days per year

Hypothetical future residents were assumed to be exposed to indoor air 24 hours per day, 350 days per year for 30 years. Industrial workers were assumed to be exposed to indoor air 8 hours per day, 250 days per year for 25 years.

6.3.4.9 Summary of Exposure Parameters

A summary of the exposure input parameters for all exposure pathways is presented in RAGS Part D Table 4s in Appendix Q.3. In general, standard default parameters (e.g., USEPA, 1991; USEPA, 1997a), which combine mid-range and upper-end exposure factors, were used to assess RME conditions. CTE was assessed primarily by the use of mid-range exposure factors presented in current risk assessment guidance (USEPA, 1989 and 1993). Tables 6-17 and 6-18 provide summaries of the exposure factors used for RME and CTE, respectively.

6.4 TOXICITY ASSESSMENT

The objective of a toxicity assessment is to identify the potential for human health hazards and adverse effects in exposed populations. Quantitative estimates of the relationship between the magnitude and type of exposures and the severity or probability of human health effects are defined for the identified COPCs. Quantitative toxicity values determined during this component of the risk assessment are integrated with outputs of the exposure assessment to characterize the potential for adverse health effects for each receptor group (Section 6.5). The reference dose (RfD) is the toxicity value used to evaluate noncarcinogenic health effects for ingestion and dermal exposures. The reference concentration (RfC) is used to evaluate noncarcinogenic health effects for inhalation exposures. The RfD and RfC estimate a daily exposure level for a human population that is unlikely to pose an appreciable risk during a portion or for all of a human lifetime. It is based on a review of animal and/or human toxicity

data, with adjustments for various data uncertainties. Carcinogenic effects are quantified using the cancer slope factor (CSF) for ingestion and dermal exposures, and using inhalation unit risks (IUR) for inhalation exposure, which are plausible upper-bound estimates of the probability of developing cancer per unit intake of a particular chemical over a lifetime. These are typically based on dose-response data from human and/or animal studies.

6.4.1 Toxicity Criteria

USEPA guidance recommends the following primary literature sources for obtaining toxicity criteria (USEPA, 2003):

- Tier 1 - Integrated Risk Information System (IRIS) (online).
- Tier 2 - USEPA Provisional Peer Reviewed Toxicity Values (PPRTVs) – The Office of Research and Development/National Center for Environmental Assessment (NCEA) Superfund Health Risk Technical Support Center develops PPRTVs on a chemical-specific basis when requested by USEPA's Superfund program.
- Tier 3 - Other Toxicity Values – These sources include, but are not limited to, California Environmental Protection Agency (Cal EPA) toxicity values, the Agency for Toxic Substances and Disease Registry (ATSDR) Minimal Risk Levels (MRLs), and the Annual Health Effects Assessment Summary Tables (HEAST) (USEPA, 1997b).

Toxicity criteria for non-carcinogenic and carcinogenic effects are summarized in Appendices Q.4 and Q.5, respectively.

6.4.2 Toxicity Criteria for Dermal Exposure

RfDs and CSFs found in the literature are frequently expressed as administered doses; therefore, these values are considered to be inappropriate for estimating the risks associated with dermal routes of exposure. Oral dose-response parameters based on administered doses must be adjusted to absorbed doses before they can be compared to estimated dermal exposure intakes.

When oral absorption is essentially complete (i.e., 100%), an absorbed dose is equivalent to the administered dose, and therefore no toxicity adjustment is necessary. Conversely, when the gastrointestinal absorption of a chemical is poor (e.g., 1%), the absorbed dose is smaller than the administered dose; thus, toxicity factors based on the administered dose should be adjusted to account for the difference in the absorbed dose relative to the administered dose. USEPA (2004) recommends a 50% absorption cut-off to reflect the intrinsic variability in analyzing absorption studies. Therefore, the adjustment from administered to absorbed dose was only performed when the chemical-specific

gastrointestinal absorption efficiency was less than 50%. The adjustment from administered to absorbed dose was made using chemical-specific gastrointestinal absorption efficiencies published in available guidance (i.e., USEPA, 2004 [the primary reference]; IRIS; ATSDR toxicological profiles, etc.,) and the following equations:

$$RfD_{dermal} = (RfD_{oral})(ABS_{GI})$$

$$CSF_{dermal} = (CSF_{oral}) / (ABS_{GI})$$

Where:

ABS_{GI}	=	absorption efficiency in the gastrointestinal tract.
RfD_{dermal}	=	RfD for the dermal route of exposure
RfD_{oral}	=	RfD for the oral route of exposure
CSF_{dermal}	=	CSF for the dermal route of exposure
CSF_{oral}	=	CSF of the oral route of exposure

As noted above, the preceding adjustment of the oral toxicity criteria (i.e., RfDs and CSFs) was necessary to allow quantitative evaluation of the dermal route of exposure in the baseline risk assessment. An explanation of this procedure and the need for this procedure is presented in Appendix A of USEPA RAGS Part A.

6.4.3 Toxicity Values for Construction Workers

Under the guidelines established by the Superfund program, exposures to construction workers of one year or less are classified as subchronic exposures. Risks for noncarcinogenic effects associated with subchronic exposures should incorporate toxicity values for subchronic and non-chronic effects. RAGS Part D Tables 5.1 and 5.2 in Appendix Q.4 display the available subchronic RfDs and RfCs that were used for the construction worker. Uncertainty associated with the lack of subchronic RfCs for many chemicals is discussed in Section 6.6.3.

6.4.4 Assessing Cancer Risks from Early Life Exposures

USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005b) recommends making adjustments to the toxicity of carcinogenic chemicals that act via the mutagenic mode of action when evaluating early-life exposures. The guidance recommends using age-dependent adjustment factors (ADAFs) combined with age-specific exposure estimates when assessing cancer risks. In the absence of chemical-specific data, the supplement guidance recommends the following default adjustments, which reflect the fact that cancer risks are generally higher from early-life exposures than from similar exposures later in life:

- For exposures before 2 years of age (i.e., spanning a 2-year interval from the first day of birth until a child's second birthday), a 10-fold adjustment.
- For exposures between 2 and 16 years of age (i.e., spanning a 14-year time interval from a child's second birthday until their sixteenth birthday), a three-fold adjustment.
- For exposures after turning 16 years of age, no adjustment.

The adjustments were applied using the same method as that used by USEPA in the development of RSLs. Children were evaluated as two age groups, ages 0 to 2 years and ages 2 to 6 years, and adults were evaluated as two age groups, ages 6 to 17 and ages greater than 16 years old. Using this approach, the intakes for child and adult recreational users and hypothetical residents were calculated as follows:

$$\text{Intake}_{\text{Child}} = \text{Intake}_{(\text{ages } 0 - 2 \text{ years})} \times 10 + \text{Intake}_{(\text{ages } 2 - 6 \text{ years})} \times 3$$

$$\text{Intake}_{\text{Adult}} = \text{Intake}_{(\text{ages } 6 - 16 \text{ years})} \times 3 + \text{Intake}_{(\text{ages} > 16 \text{ years})}$$

The above approach was used only for those chemicals that are identified as mutagenic in the USEPA screening table (e.g.,TCE and hexavalent chromium). Sample calculations showing how this approach was applied are included in Appendix Q.3.

6.4.4.1 Toxicity Criteria for TCE

The toxicity factors for TCE were finalized by USEPA in September 2011. TCE has toxicity factors that address both carcinogenic and noncarcinogenic effects. Toxicological studies indicated that exposure to TCE increases the risk of kidney cancer, liver cancer, and non-Hodgkin's lymphoma. There is a sufficient weight of evidence to suggest that TCE-induced kidney tumors are a result of a mutagenic mode of action. USEPA Guidelines for Carcinogen Risk Assessment (2005a) and Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005b) specify the use of ADAFs for carcinogens that act via a mutagenic mode of action. However, the ADAFs were only applied to the portion of the CSF and IUR that is attributable to kidney-induced tumors.

The oral CSF for TCE is 4.6×10^{-2} (mg/kg-day)$^{-1}$ and the IUR is 4.1×10^{-6} (µg/m^3)$^{-1}$. For the kidney mutagenic endpoint, the oral CSF is 9.3×10^{-3} (mg/kg-day)$^{-1}$ and the IUR is 1×10^{-6} (µg/m^3)$^{-1}$. There are no chemical-specific ADAFs for the kidney mutagenic endpoint; therefore, the USEPA's default ADAFs were applied to the carcinogenic toxicity factors for the kidney-related component of TCE's carcinogenic toxicity factors. The following default ADAFs were applied: 10 for ages 0 to 2, 3 for ages 2 to 16, and 1 (no adjustment) for ages 16 to 70. For the liver cancer and non-Hodgkin's lymphoma endpoints, the oral CSF is 3.7×10^{-2} (mg/kg-day)$^{-1}$ and the IUR is 3×10^{-6} (µg/m^3)$^{-1}$. No ADAFs were applied to these values.

Noncarcinogenic effects are evaluated like all noncarcinogens in accordance with USEPA's risk assessment guidance (1989).

6.4.4.2 Toxicity of Chromium

The different forms of chromium (trivalent and hexavalent) have distinct toxicity criteria, with the hexavalent form considered to be more toxic. Rather than speciating chromium into its different valence states, it was conservatively assumed that all the chromium exists in its hexavalent form. Hexavalent chromium has carcinogenic and noncarcinogenic toxicity factors. However, hexavalent chromium is a carcinogen that acts via a mutagenic mode of action. USEPA Guidelines for Carcinogen Risk Assessment (2005a) and Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005b) specify the use of ADAFs for carcinogens that act via a mutagenic mode of action. No chemical-specific ADAF is available for hexavalent chromium; therefore, USEPA's default ADAFs were applied to the carcinogenic toxicity factors for hexavalent chromium. The following default ADAFs were applied: 10 for ages 0 to 2, 3 for ages 2 to 16, and 1 (no adjustment) for ages 16 to 70. Noncarcinogenic effects were evaluated like all noncarcinogens in accordance with USEPA's risk assessment guidance (1989).

6.5 RISK CHARACTERIZATION

This section provides a characterization of the potential human health risks associated with the potential exposures to contaminants at Site 43. Section 6.5.1 outlines the methods used to quantitatively estimate the type and magnitude of potential risks for human receptors. A summary of the risk characterization for Site 43 is provided in Section 6.5.2.

6.5.1 Quantitative Analysis

Quantitative estimates of risk were calculated according to risk assessment methods outlined in USEPA guidance (USEPA, 1989). Lifetime cancer risks are expressed in the form of dimensionless probabilities, referred to as ILCRs, based on CSFs. Noncarcinogenic risk estimates are presented in the form of hazard quotients (HQs) determined through a comparison of intakes with published RfDs.

ILCR estimates for ingestion and dermal exposures were generated for each COPC using estimated exposure intakes and published CSFs, as follows:

$$\text{ILCR} = (\text{Estimated Exposure Intake})(\text{CSF})$$

If the above equation resulted in an ILCR greater than 0.01, the following equation was used:

$$ILCR = 1-[exp(-Estimated\ Exposure\ Intake)(CSF)]$$

An ILCR of $1x10^{-6}$ indicates that the exposed receptor has a one-in-one-million chance of developing cancer under the defined exposure scenario. Alternatively, such a risk may be interpreted as representing one additional case of cancer in an exposed population of one million persons.

As mentioned previously, noncarcinogenic risks were assessed using the concepts of HQs and HIs. The HQ for a COPC is the ratio of the estimated intake to the RfD and was calculated for ingestion and dermal exposures as follows:

$$HQ = (Estimated\ Exposure\ Intake) / (RfD)$$

An HI was generated by summing the individual HQs for all COPCs. The HI is not a mathematical prediction of the severity of toxic effects and therefore is not a true "risk"; it is simply a numerical indicator of the possibility of the occurrence of noncarcinogenic (threshold) effects.

Quantitative estimates of inhalation risk for chemicals were calculated according to risk assessment methods outlined in USEPA's Risk Assessment Guidance for Superfund (Part F –Supplemental Guidance for Inhalation Risk Assessment) (2009).

ILCRs for inhalation exposures are calculated for each COPC using estimated exposure concentrations (ECs) and published IURs, as follows:

$$ILCR = (IUR)(EC)(1000\ \mu g/mg)$$

Non-carcinogenic risks are assessed using the concept of HQs and HIs. The HQ for a COPC is the ratio of the estimated intake to the RfC and is calculated as follows:

$$HQ = (EC)/(RfC)$$

Exposure assumptions for hypothetical future residents and industrial workers are identical to the assumptions used to derive USEPA residential and industrial RSLs, respectively. Therefore, to calculate inhalation risks for these COPCs, a simplistic risk-ratio approach was applied using the maximum detected indoor air concentrations of contaminants and USEPA residential or industrial air RSLs. These RSLs were derived using default exposure assumptions for residential and industrial exposure, identical to what would be done to derive ECs.

The carcinogenic RSL corresponds to a cancer risk of 1×10^{-6}; therefore, the carcinogenic risk is expressed as:

$$\text{Cancer Risk} = [\text{ Indoor Air Concentration / Carcinogenic RSL }] \times (1 \times 10^{-6})$$

The noncarcinogenic RSL corresponds to a HQ of 1; therefore, the noncarcinogenic hazard quotient is expressed as:

$$\text{HQ} = [\text{ Indoor Air Concentration / Noncarcinogenic RSL }]$$

6.5.2 Comparison of Quantitative Risk Estimates to Benchmarks

To interpret quantitative risks and to aid risk managers in determining the need for remediation at a site, quantitative risk estimates were compared to typical risk benchmarks. Calculated ILCRs were interpreted using the USEPA's "target range" ($1x10^{-6}$ to $1x10^{-4}$).

USEPA has defined the range of $1x10^{-6}$ to $1x10^{-4}$ as the ILCR "target risk range" for most hazardous waste facilities addressed under CERCLA. Individual or cumulative ILCRs greater than $1x10^{-4}$ are not typically considered as protective of human health and ILCRs less than 1×10^{-6} are not typically regarded as protective. Risk management decisions are necessary when the ILCR is within the $1x10^{-4}$ to $1x10^{-6}$ cancer risk range.

An HI exceeding unity (1) indicates that there may be potential noncarcinogenic health risks associated with exposure. If an HI exceeds unity, a segregation of target organ effects associated with exposure to COPCs is typically performed. Only those chemicals that affect the same target organ(s) or exhibit similar critical effect(s) are regarded as truly additive. Consequently, it may be possible for a cumulative HI to exceed 1, but no adverse health effects are anticipated if the COPCs do not affect the same target organ or exhibit the same critical effect.

6.5.3 Results of the Risk Characterization

This section contains a summary of the results of the risk characterization for Site 43. Quantitative risk estimates for potential human receptors were developed for chemicals detected in soils, groundwater, and surface water. Uncertainties associated with the risk estimates are discussed in Section 6.6. The methodology used to calculate the risks presented in this section is provided in Sections 6.3 and 6.4. Potential cancer risks and hazard indices were calculated for current/future occupational workers, maintenance workers, construction workers, and hypothetical residents under the RME and CTE

scenarios and are summarized in Tables 6-19 and 6-20, respectively. Sample calculations are presented in Appendix Q.8, and the results of the risk assessment in RAGS Part D format are included in Appendix Q.7. Vapor intrusion risks are summarized in Tables 6-21 and 6-22 for Buildings 716 and 720, respectively.

6.5.2.1 Noncarcinogenic Risks – RME and CTE

For the RME scenario (Table 6-19), HIs for maintenance workers, industrial workers, construction workers, and adult residents exposed to surface soil or subsurface soil and surface water are less than or equal to unity (1), indicating that adverse non-carcinogenic effects are not anticipated for these receptors under the defined exposure conditions. The HIs for the child resident exposed to surface or subsurface soil and surface water were greater than 1, but the HIs for each medium were less than or equal to 1. HIs for construction worker, child resident, and adult resident exposed to groundwater exceeded unity. TCE is the risk driver for construction workers exposed to groundwater. The main risk drivers for child residents exposed to groundwater are TCE iron, cis-1,2-DCE, and cobalt. The main risk drivers for adult residents exposed to groundwater are TCE, cis-1,2-DCE, and cobalt.

For the CTE scenario (Table 6-20), HIs for maintenance workers, industrial workers, construction workers, child residents, and adult residents exposed to surface soil or subsurface soil and surface water are less than unity (1). . The total HI for construction workers exposed to surface soil or subsurface soil, groundwater, and surface water exceeded unity; however, the HIs for exposure to each medium are all less than or equal to unity. The risk driver was TCE. HIs for the child resident, and adult resident exposed to groundwater exceeded unity. The main risk drivers for child residents exposed to groundwater are TCE, iron, and cobalt. The main risk drivers for adult residents exposed to groundwater are TCE, cis-1,2-DCE, and cobalt.

6.5.2.2 Carcinogenic Risks – RME and CTE

For the RME scenario (Table 6-19), cumulative ILCRs for maintenance workers and industrial workers exposed to subsurface soil and surface water were less than the lower end of USEPA's target risk range (1×10^{-6}); cumulative ILCRS for these receptors exposed to surface soil and surface water within the target risk range. Cumulative ILCRs for construction workers exposed to surface soil or subsurface soil, groundwater and surface water were within USEPA's target risk range. The cumulative ILCR for the child resident exposed to subsurface soil and surface water was within USEPA's target risk range; the cumulative ILCR for the child resident exposed to surface soil and surface water exceeded the target risk range. The risk driver in surface soil for the child resident was chromium. The cumuluative ILCRs for the adult resident exposed to surface or subsurface soil and surface water were within USEPA's target risk

range. The cumulative ILCRs for the lifelong resident exposed to surface soil and surface water exceeded the target risk range, but was within the target risk range for exposure to subsurface soil and surface water. ILCRs for child residents, adult residents, and lifelong residents exposed to groundwater were greater than USEPA's target risk range. The main risk drivers from exposure to groundwater for child, adult, and lifelong residents are TCE, vinyl chloride, arsenic, and 2,6-dinitrotoluene.

For the CTE scenario (Table 6-20), cumulative ILCRs for maintenance workers and industrial workers were less than or equal to the lower end of USEPA's target risk range (1×10^{-6}). The cumulative ILCR for construction workers exposed to surface soil, groundwater and surface water was within USEPA's target risk range; the cumulative ILCR for the construction worker exposed to subsurface soil, groundwater and surface water were less than target risk range. The ILCRs for the child resident, adult resident, or lifelong resident exposed to surface or subsurface soil and surface water were within USEPA's target risk range. ILCRs for child residents, adult residents, and lifelong residents exposed to groundwater were greater than USEPA's target risk range. For child residents, the main risk driver from exposure to surface soil is chromium and the main risk drivers from exposure to groundwater are TCE, vinyl chloride, and arsenic. For adult and lifelong residents, the main risk drivers are the same as for the child residents except for groundwater where 2,6-dintrotoluene is also a risk driver.

Chromium speciation was not performed on surface soil samples; therefore, chromium was evaluated as hexavalent chromium in this HHRA. If chromium had been evaluated as trivalent chromium then all ILCRs for surface soil would have been within USEPA's target risk levels.

6.5.2.3 Vapor Intrusion Risks

Maximum indoor air concentrations at Building 716 resulted in ILCRs that are less than USEPA's target risk range and an HI less than 1 for hypothetical future residents and industrial workers. A summary of risks for Building 716 is presented in Table 6-21. TCE and cis-1,2-DCE were not identified as COPCs in Building 716 based on comparison to RSLs; they were retained as COPCs because of their presence in groundwater and TCE being identified as a soil gas COPC.

Maximum indoor air concentrations at Building 720 resulted in an ILCR that is within USEPA's target risk range and an HI less than 1 for hypothetical future residents. The ILCR was less than USEPA's target risk range and the HI was less than 1 for industrial workers. A summary of risks for Building 720 is presented in Table 6-22. Benzene was the primary risk driver for hypothetical future residents, yet benzene was not identified as a COPC in groundwater or soil gas. Benzene's presence is most likely attributable to ambient or indoor sources. TCE and its degradation products were not identified as COPCs for indoor air as a result of their comparison to screening levels. These compounds were

retained for evaluation based on their presence in groundwater and being identified as soil gas COPCs (cis-1,2-DCE and vinyl chloride).

6.6 UNCERTAINTY ANALYSIS

There is uncertainty associated with all aspects of the baseline HHRA. A summary of uncertainties, including a discussion of how they may affect the final risk numbers, is provided in this section.

Uncertainty in the selection of COPCs is related to the current status of the predictive databases, the grouping of samples, the numbers, types, and distributions of samples, and the procedures used to include or exclude constituents as COPCs. Uncertainty associated with the exposure assessment includes the values used as input variables for a given intake route or scenario, the assumptions made to determine EPCs, and the predictions regarding future land use and population characteristics. Uncertainty in the toxicity assessment includes the quality of the existing toxicity data needed to support dose-response relationships and the weight-of-evidence used to determine carcinogenicity of COPCs. Uncertainty in risk characterization includes that associated with exposure to multiple chemicals and cumulative uncertainty from combining conservative assumptions made in earlier steps of the risk assessment process.

Whereas there are various sources of uncertainty, the direction of uncertainty can be influenced by the assumptions made throughout the risk assessment, including selection of COPCs and selection of values for dose-response relationships. Throughout the entire risk assessment, assumptions are biased toward a margin of safety so that the final calculated risks are overestimated.

Generally, risk assessments carry two types of uncertainty: measurement and informational uncertainty. Measurement uncertainty refers to the usual variance that accompanies scientific measurements. For example, this type of uncertainty is associated with analytical data collected for each site. The risk assessment reflects the accumulated variances of the individual values used.

Informational uncertainty stems from inadequate availability of information needed to complete toxicity and exposure assessments. Informational uncertainty is often significant, such as the absence of information on the effects of human exposure to low doses of a chemical, on the biological mechanism of action of a chemical, or the behavior of a chemical in soil.

Once the risk assessment is complete, the results must be reviewed and evaluated to identify the type and magnitude of uncertainty involved. Reliance on results from a risk assessment without consideration of uncertainties, limitations, and assumptions inherent in the process can be misleading. For example, to

account for uncertainties in the development of exposure assumptions, conservative estimates must be made to ensure that the particular assumptions made are protective of sensitive subpopulations or the maximum exposed individuals. If a number of conservative assumptions are combined in an exposure model, the resulting calculations can propagate the uncertainties associated with those assumptions, thereby producing a much larger uncertainty in the final result. This uncertainty is biased toward over predicting both carcinogenic and noncarcinogenic risks. Thus, both the results of the risk assessment and the uncertainties associated with those results must be considered when making risk management decisions.

This interpretation is especially relevant when risks exceed the point of departure for defining "acceptable" risk. For example, when risks calculated using a high degree of uncertainty are less than an acceptable risk level (i.e., $1x10^{-6}$ to $1x10^{-4}$), the interpretation of no significant risk is typically straightforward. However, when risks calculated using a high degree of uncertainty exceed an acceptable risk level (i.e., $1x10^{-4}$), a conclusion can be difficult unless uncertainty is considered.

6.6.1 Uncertainty in Data Evaluation

The most significant issues related to uncertainty in the data evaluation for this HHRA are usability of the existing database, COPC screening levels used, and the absence of screening levels for a few chemicals detected in site media. A brief discussion of the uncertainty in the data evaluation for this HHRA is provided in the remainder of this section.

Usability of Existing Databases

All data used in the HHRA were validated, as discussed in Section 3.0. Qualification of data during the formal data validation process is not expected to compromise the results of the baseline HHRA. Analytical data qualified as estimated were utilized, even though the reported positive concentrations or sample-specific quantitation limits may be somewhat imprecise. The use of estimated data adds to the uncertainty associated with the risk assessment; however, the associated uncertainty is expected to be negligible compared to the other uncertainties inherent in the risk evaluation process (i.e., uncertainties with land uses, exposure scenarios, toxicological criteria, etc.,). 1,4-Dioxane was included in the analyses, but all results for this parameter were less than detection limits and also rejected. Data for this solvent were rejected because the instrument calibrations for this compound were less than the compound's quality control limit. Because all data have been validated, uncertainty in the calculated risks associated with the data is minimal.

COPC Screening Levels

Use of risk-based screening values based on conservative land-use scenarios (i.e., residential land use for soil and ingestion of tap water for groundwater) corresponding to ILCRs of 10^{-6} and HIs of 0.1 ensured that all significant contributors to site risk were evaluated. Elimination of chemicals present at concentrations that correspond to ILCRs less than 10^{-6} and HIs less than 0.1 should not affect the conclusions of the risk assessment because those chemicals are not expected to cause a potential health concern at detected concentrations.

6.6.2 Uncertainty in the Exposure Assessment

Uncertainty in the exposure assessment arises because of the methods used to calculate EPCs, determine land use conditions, select receptors and scenarios, and select exposure parameters. Each of these is discussed below.

Land Use

Future Site use is uncertain, but is anticipated to be industrial considering the base mission. As long as NSF-IH remains open, the current receptors (maintenance workers, industrial workers, and construction workers) are the only likely future receptors. To be conservative, risks to potential hypothetical residents were estimated for the site.

Exposure Point Concentrations

Uncertainty is associated with using the 95 percent UCL of the mean concentration as the EPC. As a result of using the 95 percent UCL, estimations of potential risk for the RME scenario are most likely overstated since this is a representation of the upper limit that potential receptors would be exposed to over the entire exposure period.

Exposure Routes and Receptor Identification

Receptor groups and exposure routes of potential concern were chosen based on current land at the site and anticipated future land use. Therefore, uncertainty associated with the selected exposure routes and potential receptors is minimal because they are well defined.

Exposure Parameters

Each exposure factor (for RME and CTE scenarios) selected for use in the risk assessment has some associated uncertainty. Generally, exposure factors are based on surveys of physiological parameters and lifestyle profiles across the United States. Attributes and activities studied in these surveys generally have a broad distribution. To avoid underestimating exposure, in most cases the USEPA guidelines (USEPA, 1991 and 1993) on the RME receptor were used, which generally specify using the 95th percentile for most parameters. Therefore, values selected for the RME receptor represent the upper bound of the observed or expected habits of the majority of the population.

Generally, uncertainty can be assessed quantitatively for many assumptions made in determining factors for calculating exposures and intakes. Many of these parameters were determined from statistical analyses on human population characteristics. Often, the database used to summarize a particular exposure parameter (i.e., body weight) is quite large. Consequently, the values chosen for such variables in the RME scenario have low uncertainty.

Many of the exposure parameters used to calculate exposures and risks in this report are selected from a distribution of possible values, including USEPA guidance (USEPA, 1991, 1993) and dermal guidance (USEPA, 1997a and 2004). For the RME scenario, the value representing the 95th percentile is generally selected for each parameter to ensure that the assessment bounds the actual risks from a postulated exposure. This risk number is used in risk management decisions but does not indicate what a more average or typical exposure might be or what risk range might be expected for individuals in the exposed population.

To address these issues, USEPA (USEPA, 1992) has suggested the use of the CTE receptor, whose intake variables are often set at approximately the 50th percentile. Risks for this receptor seek to incorporate the range of uncertainty associated with various intake assumptions. Some parameters presented in this risk assessment were estimated using professional judgment, although USEPA does provide limited guidance for the CTE evaluation (USEPA, 1993).

6.6.3 Uncertainty in the Toxicological Evaluation

Uncertainty associated with the toxicity assessment is associated with hazard assessment and dose-response evaluations for COPCs. The hazard assessment characterizes the nature and strength of the evidence of causation or the likelihood that a chemical that induces adverse effects in animals will also induce adverse effects in humans. Hazard assessment of carcinogenicity is evaluated as a weight-of-evidence determination, using USEPA methods. Positive animal cancer test data suggest that

humans contain tissue(s) that may manifest a carcinogenic response; however, animal data cannot necessarily be used to predict the target tissue in humans.

Uncertainty in hazard assessment arises from the nature and quality of animal and human data. Uncertainty is reduced when similar effects are observed across species, strain, sex, and exposure route; when the magnitude of the response is clearly dose related; when pharmacokinetic data indicate a similar fate in humans and animals; when postulated mechanisms of toxicity are similar for humans and animals; and when the COC is structurally similar to other chemicals for which toxicity is more completely characterized.

Uncertainty in the dose-response evaluation includes the determination of a CSF for the carcinogenic assessment. Uncertainty is introduced from interspecies (animal to human) extrapolation, which, in the absence of quantitative pharmacokinetic or mechanistic data, is usually based on consideration of interspecies differences in basal metabolic rate. Uncertainty also results from intraspecies variation. Most toxicity experiments are performed with animals that are very similar in age and genotype, so intragroup biological variation is minimal, but the human population of concern may reflect a great deal of heterogeneity, including unusual sensitivity or tolerance to the COPC. Even toxicity data from human occupational exposure reflect a bias because only those individuals sufficiently healthy to attend work regularly (the "healthy worker effect") and those not unusually sensitive to the chemical are likely to be occupationally exposed. Finally, uncertainty arises from the quality of the key study from which the quantitative estimate is derived and the database. For cancer effects, uncertainty associated with dose-response factors is mitigated by assuming the 95 percent upper bound for the slope factor. Another source of uncertainty in carcinogenic assessment is the method by which data from high doses in animal studies are extrapolated to the dose range expected for environmentally exposed humans. The linearized multistage model, which is used in nearly all quantitative estimations of human risk from animal data, is based on a non-threshold assumption of carcinogenesis. Evidence suggests, however, that epigenetic carcinogens, as well as many genotoxic carcinogens, have a threshold below which they are noncarcinogenic. Therefore, the use of a linearized multistage model is conservative for chemicals that exhibit a threshold for carcinogenicity.

Uncertainty in the Toxicity Criteria for Chromium

Toxicity criteria are available for different forms of chromium, which is considered to be more toxic in the hexavalent state. Although there is no evidence to support the conclusion that hexavalent chromium is present at the Site, risks associated with this chemical were assessed by conservatively assuming that 100 percent of the reported chromium result is attributable to hexavalent chromium. If chromium had

been evaluated as trivalent chromium, then ILCRs for chromium would be within acceptable levels and chromium would not have been retained as a COC for surface soil.

Use of Chronic Toxicity Values for Construction Workers

Under the guidelines established by the Superfund program, the one year exposure duration assumed for construction workers should be evaluated as a subchronic exposure. Risks for noncarcinogenic effects associated with subchronic exposures should be developed using subchronic toxicity criteria, not chronic toxicity values. Subchronic toxicity values used in this HHRA were obtained from USEPA's PPRTV internet site, if available. Also, subchronic ATSDR MRLs were used as subchronic toxicity values when subchronic PPRTV values were not available. However, subchronic toxicity values are not as widely available as chronic toxicity values (e.g., subchronic toxicity criteria are not currently available for aluminum and manganese). Therefore, chronic toxicity values were used when subchronic toxicity values were not available. This likely resulted in an overestimation of potential noncarcinogenic risks for the construction worker receptor because subchronic toxicity values may be up to an order of magnitude higher than chronic toxicity values

Uncertainty with the Use of ADAFs

An Age-Dependent Adjustment Factor (ADAF) is applied as a default safety factor to risk calculations when evaluating cancer risk associated with exposure by children between the ages of birth to 16 years to chemicals that carcinogenic via a mutagenic mode of action. USEPA's *Supplemental Guidance for Assessing Susceptibility from Early-Life Exposures to Carcinogens* (EPA, March 2005) states that the ADAF should be used when chemical-specific data to evaluate differences between adults and children are unavailable.

Inherent with the use of ADAFs is uncertainty in the evaluation of risk. Specifically, the default ADAFs were derived from studies where exposures were much higher than those typically observed in the environment. Hence, the mutagenic potential of a chemical at typical environmental concentrations may be much less and may be offset by DNA repair mechanisms. Moreover, the default ADAFS were based on results of repeated exposure studies because the lifetime study design had less ability to distinguish potential increased susceptibility from early-life exposures. Finally, cell replication can vary for different tissues, thus making the window of susceptibility different for individual chemicals, depending on target tissues. Hence, using the same ADAF for all chemicals may clearly misrepresent the level of risk associated with exposure.

6.6.4 Uncertainty in the Risk Characterization

Uncertainty in risk characterization resulted from assumptions made regarding additivity of effects from exposure to multiple COPCs from various exposure routes. High uncertainty exists when summing noncancer risks for several substances across different exposure pathways. This assumes that each substance has a similar effect and/or mode of action. Even when compounds affect the same target organs they may have different mechanisms of action or differ in their fate in the body, so additivity may not have been an appropriate assumption. However, the assumption of additivity was considered acceptable because in most cases it represented a conservative estimate of risk.

Risks to any individual may also have been overestimated by summing multiple assumed exposure pathway risks for any single receptor. Although every effort was made to develop reasonable scenarios, not all individual receptors may have been exposed via all pathways considered.

Also, the risk characterization did not consider antagonistic or synergistic effects. Little or no information was available to determine the potential for antagonism or synergism for COPCs. Because chemical-specific interactions could not be predicted, the likelihood for risks to be over predicted or under predicted could not be defined, but methodology used was based on current USEPA guidance.

6.6.5 Risk Characterization including Background Chemicals

For the baseline HHRA, chemicals in surface soil, subsurface soil, and groundwater that were detected at concentrations above screening levels but below NSF-IH background levels were not selected as COPCs and therefore not evaluated in the risk calculation. The risks including chemicals detected at concentrations similar to background are presented in RAGs table 7s and 9s in Appendix Q.6 and Q.7 and the results are summarized below.

For the RME scenario, cumulative HIs for maintenance workers and industrial workers are less than unity (1). HIs for construction workers exposed to subsurface soil and surface water, child residents exposed to surface water, and adult residents exposed to surface soil or subsurface soil surface water are less than or equal to unity (1), indicating that adverse non-carcinogenic effects are not anticipated for these receptors under the defined exposure conditions. HIs for construction workers, child residents, and adult residents exposed to groundwater exceeded unity. The risk driver for construction workers exposed to groundwater is TCE. The main risk drivers for child and adult residents exposed to groundwater are TCE, cis-1,2-DCE, and cobalt. The HI for construction workers exposed to surface soil exceeded unity; the main risk drivers are aluminum and manganese.

For the CTE scenario, HIs for maintenance workers and industrial workers are less than unity (1). HIs for construction worker exposed to subsurface soil, groundwater, and surface water; child and adult residents exposed to surface soil or subsurface soil and surface water are less than or equal to unity. The HI for construction workers exposed to surface soil exceeded unity; the main risk drivers are aluminum and manganese. HIs for child residents and adult residents exposed to groundwater exceeded unity. The main risk drivers for child residents exposed to groundwater are TCE, cis-1,2-DCE, iron, and cobalt. The main risk drivers for adult residents exposed to groundwater are TCE, cis-1,2-DCE, and cobalt.
For the RME scenario, cumulative ILCRs for maintenance workers, industrial workers, and construction workers are within USEPA's target risk range. ILCRs for child residents exposed to subsurface soil, adult residents exposed to surface soil or subsurface soil and surface water, and lifelong residents exposed to subsurface soil and surface water are within USEPA's target risk range. ILCRs for child residents exposed to surface soil and groundwater, adult residents exposed to groundwater, and lifelong residents exposed to surface soil and groundwater are greater than USEPA's target risk range. The main risk drivers for child residents are chromium and arsenic from exposure to surface soil and TCE, vinyl chloride, arsenic, chromium, and 2,6-dinitrotoluene from exposure to groundwater. The main risk drivers for adult residents exposed to groundwater are TCE, vinyl chloride, arsenic, chromium, and 2,6-dinitrotoluene. For the lifelong resident, the main risk drivers for surface soil exposure are chromium and arsenic, and the main risk drivers for groundwater exposure are TCE, vinyl chloride, arsenic, chromium, and 2,6-dinitrotoluene. Chromium speciation was not performed on surface soil samples; therefore, chromium was evaluated as hexavalent chromium in this HHRA. If chromium had been evaluated as trivalent chromium then all ILCRs would have been within USEPA's target risk levels.

For the CTE scenario, cumulative ILCRs for maintenance workers are less than USEPA's target risk range, while cumulative ILCRs for industrial workers and constructions worker are within USEPA's target risk range. ILCRs for child residents exposed to surface soil or subsurface soil and surface water, adult residents exposed to surface soil or subsurface soil and surface water, and lifelong residents exposed to surface soil or subsurface soil and surface water are within USEPA's target risk range. The ILCRs for child, adult and lifelong residents exposed to groundwater are greater than USEPA's target risk range; the main risk drivers are TCE, vinyl chloride, arsenic, chromium, and 2,6-dinitrotoluene.

6.6.6 Uncertainty in the Vapor Intrusion Analysis

Interpretation of these vapor intrusion investigation results is rendered uncertain because of the limited data set. The results for this investigation are based on one point of time; results are temporally variable. Indoor air and soil gas concentrations are variabile within and below a building, respectively. Spatial and temporal variation can contribute to the uncertainty associated with evaluating the potential for vapor intrusion as well as evaluating potential health risks. Moreover, ambient air and indoor air sources

contribute to the indoor air concentrations, rendering it difficult to discern what is related to vapor intrusion. Other structures in proximity (e.g., 100 feet) to elevated VOC concentrations (i.e., criteria exceedances) in groundwater may need to be evaluated for vapor intrusion. This will be performed during the FS.

6.7 SUMMARY AND CONCLUSIONS

This section summarizes the results of the baseline HHRA for Site 43, which was performed to characterize potential risks to likely human receptors under current and potential future land use. Potential receptors under current land use are construction workers, maintenance workers, and industrial workers. Potential receptors under future land use are hypothetical child and adult residents. Although future land use is likely to be the same as current land use, the potential future receptors were evaluated in the baseline HHRA for decision-making purposes.
Direct contact COPCs for soils at Site 43 are:

- surface soil – aluminum, cadmium, chromium, and TCE.
- subsurface soil – manganese and TCE.

COPCs for chemical migration from soil to groundwater at Site 43 are:

- surface soil –cadmium, chromium, cis-1,2-DCE, TCE, and vinyl chloride.
- subsurface soil – 1, 3-dinitrobenzene, cyanide, 2-hexanone, 4-methyl-2-pentanone, acetone, cis-1,2-DCE, toluene, TCE, and vinyl chloride.

COPCs for direct contact with groundwater at Site 43 are:

- 1,3-dinitrobenzene, 2,6-dinitrotoluene, 3-nitrotoluene, arsenic, barium, beryllium, cobalt, iron, manganese, nickel, thallium, 1,1-DCA, 1-1-DCE, 1,2-DCA, cis-1,2-DCE, TCE, and vinyl chloride.

No COPCs were selected for direct contact with sediment.

COPCs for direct contact with surface water at Site 43 are:

- arsenic, cobalt, cis-1,2-DCE, TCE, and vinyl chloride.

Quantitative estimates of noncarcinogenic and carcinogenic risks (HIs and ILCRs, respectively) were developed for potential human receptors. For the RME scenario, HIs for maintenance workers, industrial

workers, construction workers, and adult residents exposed to surface soil or subsurface soil and surface water are less than or equal to unity (1), indicating that adverse non-carcinogenic effects are not anticipated for these receptors under the defined exposure conditions. The HIs for the child resident exposed to surface or subsurface soil and surface water were greater than 1, but the HIs for each medium were less than or equal to 1. HIs for construction worker, child resident, and adult resident exposed to groundwater exceeded unity. TCE is the risk driver for construction workers exposed to groundwater. The main risk drivers for child residents exposed to groundwater are TCE iron, cis-1,2-DCE, and cobalt. The main risk drivers for adult residents exposed to groundwater are TCE, cis-1,2-DCE, and cobalt.

For the CTE scenario, HIs for maintenance workers, industrial workers, construction workers, child residents, and adult residents exposed to surface soil or subsurface soil and surface water are less than unity (1). . The total HI for construction workers exposed to surface soil or subsurface soil, groundwater, and surface water exceeded unity; however, the HIs for exposure to each medium are all less than or equal to unity. The risk driver was TCE. HIs for the child resident, and adult resident exposed to groundwater exceeded unity. The main risk drivers for child residents exposed to groundwater are TCE, iron, and cobalt. The main risk drivers for adult residents exposed to groundwater are TCE, cis-1,2-DCE, and cobalt.

For the RME scenario (Table 6-19), cumulative ILCRs for maintenance workers and industrial workers exposed to subsurface soil and surface water were less than the lower end of USEPA's target risk range (1×10^{-6}); cumulative ILCRS for these receptors exposed to surface soil and surface water within the target risk range. Cumulative ILCRs for construction workers exposed to surface soil or subsurface soil, groundwater and surface water were within USEPA's target risk range. The cumulative ILCR for the child resident exposed to subsurface soil and surface water was within USEPA's target risk range; the cumulative ILCR for the child resident exposed to surface soil and surface water exceeded the target risk range. The risk driver in surface soil for the child resident was chromium. The cumuluative ILCRs for the adult resident exposed to surface or subsurface soil and surface water were within USEPA's target risk range. The cumulative ILCRs for the lifelong resident exposed to surface soil and surface water exceeded the targer risk range, but was within the target risk range for exposure to subsurface soil and surface water. ILCRs for child residents, adult residents, and lifelong residents exposed to groundwater were greater than USEPA's target risk range. The main risk drivers from exposure to groundwater for child, adult, and lifelong residents are TCE, vinyl chloride, arsenic, and 2,6-dinitrotoluene. However, arsenic is limited to one MCL exceedance in one monitoring well and 2,6-dinitrotoluene was only detected in two groundwater samples and not confirmed in the duplicate at one of these locations.

For the CTE scenario (Table 6-20), cumulative ILCRs for maintenance workers and industrial workers were less than or equal to the lower end of USEPA's target risk range (1×10^{-6}). The cumulative ILCR for construction workers exposed to surface soil, groundwater and surface water was within USEPA's target risk range; the cumulative ILCR for the construction worker exposed to subsurface soil, groundwater and surface water were less than target risk range. The ILCRs for the child resident, adult resident, or lifelong resident exposed to surface or subsurface soil and surface water were within USEPA's target risk range. ILCRs for child residents, adult residents, and lifelong residents exposed to groundwater were greater than USEPA's target risk range. For child residents, the main risk driver from exposure to surface soil is chromium and the main risk drivers from exposure to groundwater are TCE, vinyl chloride, and arsenic. For adult and lifelong residents, the main risk drivers are the same as for the child residents except for groundwater where 2,6-dintrotoluene is also a risk driver. However, as stated above, 2,6-dinitrotoluene was only detected in two groundwater samples not confirmed in the duplicate at one of these locations.

Chromium speciation was not performed on surface soil samples; therefore, chromium was evaluated as hexavalent chromium in this HHRA. If chromium had been evaluated as trivalent chromium then all ILCRs for surface soil would have been within USEPA's target risk levels.

A vapor intrusion scenario was also evaluated as part of this risk assessment. Chlorinated hydrocarbons, including TCE, cis-1,2-DCE, 1,1-DCA, 1,2-DCA, 1,1-DCE, and vinyl chloride, were identified as COPCs in groundwater and were considered to be likely candidates for vapor intrusion at Buildings 716 and 720. Measured indoor air concentrations from these buildings were used to estimate risks for residential and industrial receptors. The indoor air risks at Buildings 716 and 720 were considered acceptable. TCE was detected in groundwater, soil gas, and indoor air; however, it was not detected at concentrations in indoor air that would result in significant risk to hypothetical future residents or industrial workers. Vinyl chloride was identified as a COPC in groundwater and soil gas at Building 720, but was not detected in indoor air at Building 720 at concentrations that would result in significant risk to hypothetical future residents or indoor workers.

At Building 720, benzene and chloromethane were identified as COPCs in indoor air. However, these indoor air COPCs were not COPCs in groundwater and benzene was not a COPC in soil gas. Moreover, indoor air concentrations of these contaminants were similar to their corresponding ambient air concentrations. Likewise, indoor air concentrations of vinyl chloride were also similar to the ambient air concentrations.

Overall, TCE is present in indoor air at Buildings 716 and 720 and could be present as a result of vapor intrusion. However, it is not present at concentrations that pose significant risk to human health. VOC

plume periphery buildings (e.g., within 100 feet of criteria exceedances) were not evaluated, but will be evaluated in the FS.

7.0 ECOLOGICAL RISK SCREENING

During the SSP ecological screening (Tetra Tech, 2009), VOCs, explosives, and metals were identified as preliminary ecological COPCs. Following Step 3A, none of the chemicals were retained as COPCs and ecological concerns in the eastern portion of Site 43 were dismissed by the project team. The goal of this Screening Level Ecological Risk Assessment (SLERA) for Site 43 was to evaluate the potential for adverse ecological impacts resulting from site-related contamination in groundwater discharging in the western downgradient area near the Potomac River. This goal was accomplished by identifying COPCs detected at concentrations that exceeded screening levels, identifying the locations of these exceedances, and concluding whether or not further investigation and/or remedial action at Site 43 is warranted from an ecological perspective.

7.1 INTRODUCTION

The screening-level ERA (SLERA) methodology used at NSF-IH is in accordance with Navy and USEPA guidance documents (Navy, 1997 and 1999; USEPA, 1997c and 1998).

This ERA consists of Steps 1, 2, and 3a of the eight-step ecological risk evaluation process discussed in USEPA guidance (1997c and 1998) and the Navy Policy for Conducting ERAs (1999). The first two screening steps comprise the SLERA and correspond with Tier 1 of the Navy policy (1999), during which conservative exposure estimates are compared to screening-level and threshold toxicity values. Step 3a is the first step of a baseline ecological risk assessment (BERA) and consists of refining the Tier 1 assumptions following Steps 1 and 2 to further focus the ERA process on the chemicals of greatest concern at a site. Step 3a corresponds with the first part of Tier 2 of the Navy policy (1999). Steps 3b through 7 are conducted if additional evaluations or investigations are necessary. Aspects of Step 8, risk management, are addressed throughout the ERA process, in cooperation with regulators.

A schematic diagram of the general risk assessment process is provided on Figure 7-1.

7.2 TIER 1, STEP 1: SCREENING-LEVEL PROBLEM FORMULATION

The screening-level problem formulation is the first step of the SLERA and includes identification of potential receptor groups, COPCs, and mechanisms for contaminant fate, transport, and toxicity. Complete exposure pathways at a site are determined to facilitate receptor selection. The problem formulation process enables the risk assessor to identify: ecological resources to be protected (known as assessment endpoints); measurements used to evaluate risks to those resources (known as

measurement endpoints); and chemicals, geographic areas, and environmental media relevant to the risk assessment.

As part of receptor identification, site habitats and potential ecological receptors, as they apply to ecological risk, are described in the following subsections.

7.2.1 Environmental Setting

Site 43 - Toluene Disposal Area is located in the southwestern portion of the Main Area of NSF-IH. The Site is located in an industrial area where the handling of explosives and rocket production still occurs in Building 720. The Site is comprised of two separate areas: the first area is northwest of Building 1041 and the second area just north of Building 1040. The Site is relatively flat and covered with mowed and unmowed grasses and trees. The Potomac River borders the installation to the north and west and is located approximately 700 to 900 feet west of Buildings 1040 and 1041. Photographs of Site 43 are presented in Appendix M.

Surface water is present at the Site in a series of ditches that collect and direct water both west and east. A north south surface water divide exists between Strauss Avenue and Gallery Road. Ditches east of the divide flow east and ditches west of the divide flow west. Surface water in the ditch just north of Building 1040 flows east into an unnamed tributary that ultimately discharges into Mattawoman Creek. On the west side of the divide, the surficial ditches are mostly dry except during significant rain events. These ditches drain through culverts into drainage channels west of Strauss Avenue, and ultimately into the Potomac River. Evidence of heavy rain events is seen on the sandy beach between the cliff and the Potomac River where several rills scour the surface before entering the river.

Groundwater flow is predominantly to the south-southwest from Building 720 towards the Potomac River. To the west, seeps are present in the two main drainage channels, which results in groundwater flowing in a westerly direction. It is assumed that groundwater originating from the Site discharges into these drainage channels and/or ultimately into the Potomac River.

As presented in Section 2.1.7, the two drainage channels have been designated as the northern drainage channel and the southern drainage channel (see Figure 2-4). Seeps have been observed in these drainage channels that drain into the Potomac River (see Figure 2-4). The seep (S43-SP01) in the southern drainage channel formed where groundwater was daylighting below the culvert originating from a ditch north of Building 1134 and flows below Strauss Avenue and Building 1755. The seep in the northern drainage channel (S43-SP02) was midway down the drainage channel on the south slope. S43-

SP02 is approximately 75 feet west of the culvert in the northern drainage channel. No water flows through this northern culvert, except during significant rain events.

7.2.2 Physical and Chemical Characteristics of Contaminants

Historical activities at Site 43 include disposal of spent solvents used in Buildings 1040 and 1041 onto the ground outside of the buildings. Based on the disposal activities and previous investigations, VOCs and metals are among the site-related chemical contaminants known to be present or potentially present in environmental media at Site 43. Physical and chemical characteristics of contaminants may affect their mobility, transport, and bioavailability in the environment. Section 5 provides information on the chemical and physical properties which affect mobility, migration, biodegradation, and persistence of the principal chemical contaminants at Site 43.

7.2.3 Potential Sources of Contamination

Sections 1.3 and 1.4 of this report describe Site operational history and previous investigations conducted at Site 43. Between the late 1950s and 1989, approximately 23,000 to 30,000 gallons of spent solvents were used in the Cast Plant (Buildings 1040 and 1041) to remove propellants and oily residues from various metal parts. These solvents were disposed of directly on the ground outside Building 1040 (acetone), at the drainage ditch just south of Schuyler Road and at the utility pole across Gallery Rd from Building 1041 (acetone and toluene). This kind of dumping took place two or three times per week for a period of more than 2 years.

7.2.4 Potential Exposure Pathways

Chemicals may have entered soil, sediment, surface water, and groundwater from historical site activities. Solvents were discharged directly to surface soil by dumping onto the ground outside of Buildings 1040 and 1041. No signs of stressed vegetation or stains have been observed at Site 43; however, historical dumping activities have impacted soil and groundwater in the surficial aquifer. Groundwater seeps have been identified in drainage channels located downgradient of the plume and lead directly to the Potomac River, where ecological receptors may be affected.

The following sections describe the potential exposure pathways.

7.2.4.1 Groundwater

Groundwater flows southwest towards the Potomac River. Exposure to contaminated groundwater discharging as a seep or directly to the Potomac River represents a complete exposure pathway and was evaluated as part of the surface water pathway. Ecological exposure to groundwater does not occur until groundwater discharges as a seep or until it discharges through sediment to surface water. Aquatic receptors can be exposed to contaminants after groundwater from seeps enters the drainage channels at the Site, although the receptors will be limited to invertebrates/insects and amphibians. Also, benthic invertebrates and other aquatic invertebrates can be exposed to contaminants in groundwater as groundwater discharges through sediment to surface water. These pathways were evaluated in the ERA and are discussed in more detail below.

7.2.4.2 Surface Water/Sediment

Surface water and sediment samples were collected from three locations in the northern and southern drainage channels (one location in the northern and two locations in the southern drainage channel), in addition to two surface water samples collected from the culvert and outfall of the southern drainage channel. Only one location was sampled for surface water and sediment within the northern drainage channel because water was not present at the other two proposed sample locations. Two surface water and two sediment samples were collected in the southern drainage channel. In addition, surface water samples were collected at a culvert in the southern drainage channel and the outfall for the southern drainage channel. A seep sample was collected from each of the two drainage channels during two rounds of sampling. Groundwater collected from the four piezometers along the bank of the Potomac River was also evaluated as part of the surface water pathway. Sediment invertebrates and other aquatic organisms can be exposed to chemicals in surface water and sediment within the drainage channels and the Potomac River. Contaminated groundwater may discharge through a seep into surface water or may discharge directly into the Potomac River. Therefore, risks to these receptors from direct exposure to chemicals in surface water and sediment from contaminated surface water, seeps, and groundwater was evaluated in the ERA.

Although birds and mammals may be exposed to contaminants in surface water and sediment via incidental ingestion of surface water, sediment, and ingestion of invertebrates that have accumulated contaminants from surface water or sediment, this is not expected to be a significant exposure pathway because of the limited habitat in channels. Also, VOCs, the primary COCs at the Site, are not bioaccumulative. Therefore, risks to birds and mammals were not evaluated in this ERA.

7.2.5 Assessment Endpoints and Measurement Endpoints

Assessment endpoints are explicit expressions of the environmental value that is to be protected (USEPA, 1997c). Selection of these endpoints is based on habitats present, migration pathways of probable contaminants, and relevant exposure routes for receptors. Measurement endpoints are estimates of measurable biological impacts (e.g., mortality, growth, and reproduction) that are used to evaluate the assessment endpoints. The assessment endpoints and measurement endpoints for Site 43 are presented in Table 7-1.

7.2.5.1 Assessment Endpoints

Based on habitat at Site 43 (which is relatively flat with grasses and trees), surface water drainage pathways flowing west to the Potomac River, and chemicals present at the Site, the assessment endpoints include protection of the following groups of receptors from adverse effects of contaminants on their growth, survival, and reproduction:

- Sediment invertebrates
- Aquatic organisms

The following paragraphs discuss these assessment endpoints.

- *Sediment Invertebrates:* Sediment invertebrates serve as a food source for higher trophic level organisms (i.e., fish, amphibians, birds, mammals).
- *Aquatic Organisms*: Aquatic organisms such as amphibians, insects, and other invertebrates serve as a food source for higher trophic level organisms (i.e., birds and mammals).

As indicated in USEPA guidance (1997c), "it is not practical or possible to directly evaluate risks to all of the individual components of the ecosystem at a site. Instead, assessment endpoints focus the risk assessment on particular components of the ecosystem that could be adversely affected by contaminants from the site." Therefore, this ERA focused on the endpoints that would tend to yield the highest risks, which was expected to account for endpoints associated with lower risks.

7.2.5.2 Measurement Endpoints

The specific measurement endpoints used to evaluate the assessment endpoints are presented in Table 7-1. In general, the measurement endpoints used in the ERA are as follows:

- Sediment screening values - Mortality, growth, and reproduction of sediment invertebrates were evaluated by comparing measured concentrations of chemicals in sediment to screening values designed to be protective of ecological receptors.

- Surface water screening values - Mortality, growth, and reproduction of aquatic organisms were evaluated by comparing measured concentrations of chemicals in surface water to screening values designed to be protective of ecological receptors.

7.2.5.3 Conceptual Site Model

A CSM in problem formulation is a written description and visual representation of predicted relationships between ecological entities and the stressors to which they may be exposed. The CSM consists of two primary components: predicted relationships among stressors, exposure, and assessment endpoint response; and a diagram that illustrates the relationships (USEPA, 1998). The CSM is discussed below.

The primary sources of known or potential contamination at Site 43 were identified based on past operations and disposal practices and the physical characteristics of the Site. The primary source of contamination was disposal of solvents to surface soil. These wastes may have migrated to groundwater and contaminated groundwater may have impacted downgradient surface water/sediment. The primary stressors to ecological receptors are contaminants in sediment, surface water, and groundwater that discharges to surface water. The primary receptors in the potentially impacted media (sediment and surface water) are aquatic organisms and sediment invertebrates. Figure 7-2 represents the ecological CSM for Site 43.

7.3 TIER 1, STEP 2: SCREENING-LEVEL EXPOSURE ESTIMATE AND RISK QUOTIENTS

7.3.1 Ecological Effects Evaluation

The preliminary ecological effects evaluation is an investigation of the relationship between the magnitude of exposure to a chemical, and the nature and magnitude of adverse effects resulting from exposure. In addition to being a toxicological evaluation, it may also include descriptions of apparent effects seen during the site visit (e.g., stressed vegetation). Toxicity thresholds are usually expressed in units of concentration when the medium of concern is in intimate contact with the receptor, such as sediment for sediment invertebrates.

As the first step in the ecological effects evaluation, sediment and surface water ecological screening levels are compiled. Region 3 freshwater sediment screening benchmarks (USEPA, 2006a) are

protective of sediment invertebrates and were used in COPC selection for sediment. Region 3 freshwater surface water screening benchmarks (USEPA, 2006b) are protective of aquatic organisms and were used in the COPC selection for surface water, groundwater seeps, and groundwater from piezometers.

7.3.2 Exposure Characterization

To determine whether a chemical has the potential to impact an ecological receptor, a chemical concentration or dose must first be determined. That concentration/dose is then compared to the ecological effects data presented above. The following paragraphs describe the concentrations/doses used for each set of ecological receptors.

Aquatic organisms and sediment invertebrates are exposed to chemicals in surface water or sediment through direct contact and/or ingestion. Because screening values developed for these receptors are in units of chemical concentration in each medium, chemical concentrations were used in the screening step to select COPCs.

Sediment, surface water, and seep samples from the two drainage channels were identified as collected from either the northern drainage channel or southern drainage channel and were evaluated from each drainage channel separately as two separate exposure points. Groundwater samples from piezometers were evaluated as one exposure point.

7.3.3 Risk Characterization

An Ecological effects quotient (EEQ) approach was used to characterize risk to ecological receptors. This approach characterizes potential effects by comparing ECs with effects data.

The EEQs for sediment invertebrates were calculated as follows:

$$EEQ = \frac{Csd}{SdSL}$$

Where:	EEQ	=	ecological effects quotient (unitless)
	Csd	=	chemical concentration in sediment (µg/kg or mg/kg)
	SdSL	=	sediment screening level (µg/kg or mg/kg)

The EEQs for aquatic organisms were calculated as follows:

$$EEQ = \frac{Csw}{SwSL}$$

Where:	EEQ	=	ecological effects quotient (unitless)
	Csw	=	chemical concentration in surface water (µg/L)
	SwSL	=	surface water screening level (µg/L)

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

7.3.4 Tier 1, Step 2: Selection of Contaminants of Potential Concern

This section presents the results of COPC selection, which was conducted using the following rule:

- A contaminant was retained as a COPC for risks to aquatic organisms or sediment invertebrates if the maximum detected concentration in surface water or sediment exceeded the associated screening level, or a screening level was not available.

Contaminants retained as COPCs were further evaluated as part of Step 3a of the eight-step ERA process. Tables 7-2 through 7-5 provide the results of COPC selection for sediment, surface water, groundwater seeps, and groundwater from piezometers, respectively.

7.3.4.1 Sediment Invertebrates

Table 7-2 presents COPCs selected for sediment invertebrates in the northern and southern drainage channels. One VOC (methylene chloride) was selected as a COPC in sediment because a screening level was not available.

7.3.4.2 Aquatic Organisms

Tables 7-3 to 7-5 present COPCs selected for aquatic organisms exposed to surface water, groundwater seeps, and groundwater from piezometers, respectively.

One VOC (TCE) and two metals (iron and manganese) were selected as COPCs in surface water because they were detected at concentrations that exceeded their screening levels.

One VOC (TCE) was selected as a COPC in groundwater seeps because it was detected at concentrations that exceeded its screening level.

One VOC (TCE) and two total and dissolved metals (iron and manganese) were selected as COPCs in groundwater from piezometers because they were detected at concentrations that exceeded their screening levels.

7.4 TIER 2, STEP 3A – COPC REFINEMENT

Step 3a consists of refining the conservative exposure assumptions/concentrations used to evaluate potential risks to ecological receptors and re-evaluating the analytical data using benchmarks that are more appropriate for the assessment endpoints. The objective of the Step 3a refinement was to better define those chemicals that contribute to potentially unacceptable levels of ecological risk, and to identify and eliminate from further consideration those COPCs that were retained because of the use of very conservative exposure scenarios. The Step 3a evaluation is designed to eliminate chemicals from further evaluation for certain groups of receptors. This is important because if the site proceeds further to a BERA, the studies in the BERA should only focus on the receptors that are at potential risk.

For chemicals evaluated further in Step 3a, the following factors were evaluated, as appropriate, to determine if the risks are great enough to warrant additional evaluations. All factors may not be discussed for all chemical and/or receptor groups.

- Magnitude of criterion exceedance: Although the magnitude of risks may not relate directly to the magnitude of a criterion exceedance, the magnitude of the criterion exceedance may be one item used in a lines-of-evidence approach to determine the need for further site evaluation. The greater the criterion exceedance, the greater the probability and concern that an unacceptable risk exists.
- Contaminant bioavailability: Many contaminants (especially inorganics) are present in the environment in forms that are typically not bioavailable, and limited bioavailability was considered when evaluating exposures of receptors to site contaminants. Contaminants with generally less bioavailability are considered to be less toxic than more bioavailable contaminants, all other factors being equal.
- Habitat: Although exceedances of criteria may occur, potential risks to ecological receptors may be minimal if there is little habitat for those receptors. Therefore, the extent of habitat was used qualitatively when considering additional evaluation. Areas with little habitat were less of a concern than areas with suitable habitat to support the receptors of interest.

A detailed discussion of the Step 3a evaluation is included in the following sections.

7.4.1 Tier 2, Step 3a: Sediment Invertebrates

Methylene chloride was selected as a COPC because a screening level was not available. Methylene chloride was detected in all sediment samples collected from the two drainage channels at concentrations ranging from 103 to 222 µg/kg. However, VOCs are typically not very toxic to invertebrates. Methylene chloride concentrations were less than a sediment quality benchmark of 370 µg/kg (Jones, et al., 1997). In addition, habitat is limited for sediment invertebrates, as only a few inches of water was present in the drainage channels and water is only expected to be present after significant rain events. For these reasons, impacts to sediment invertebrates from methylene chloride are expected to be minimal, and methylene chloride was not retained as a COPC for sediment invertebrates.

7.4.2 Tier 2, Step 3a: Aquatic Organisms

TCE was selected as a COPC because it exceeded its screening level in surface water, seep samples, and groundwater samples from piezometers. Iron and manganese were selected as COPCs because they exceeded their respective screening levels in samples from surface water and groundwater from piezometers; the seep samples were not analyzed for metals.

Northern Drainage Channel

In the northern drainage channel, concentrations of TCE were similar in the surface water sample (30.5 µg/L) collected May 2013 (Table 7-3) and the seep sample S43-SP02 (28.7 µg/L) from the first round of sampling in June 2012 (Table 7-4). The TCE concentration in the seep sample from the second round of sampling (1.86 µg/L) was less than its screening value (21 µg/L). TCE concentrations were only slightly greater than their screening values in surface water and seep samples.

Concentrations of iron (1,670 µg/L) and manganese (256 µg/L) from surface water exceeded their respective screening levels of 300 µg/L and 120 µg/L.

Southern Drainage Channel

In the southern drainage channel, concentrations of TCE exceeded its screening value in one surface water sample (27.2 µg/L) and its duplicate (26.6 µg/L). The TCE concentration was less than its screening value in a second surface water sample (10.2 µg/L) that was further downstream and TCE was not detected in the culvert or outfall samples (Table 7-3). TCE concentrations from the seep in the two

rounds of sampling (354 µg/L and 156 µg/L) were approximately 10 times greater than concentrations in surface water samples.

Concentrations of iron (1,450 to 3,340 µg/L) and manganese (128 to 189 µg/L) from surface water, including the culvert and outfall, exceeded their respective screening levels of 300 µg/L and 120 µg/L. The manganese concentration in the culvert sample (41.2 µg/L) did not exceed its screening level.

Piezometers

TCE was only detected (41.8 µg/L) in one groundwater piezometer sample (S43-PZ03), which is located between the two drainage channels sampled. Aquatic organisms in the Potomac River would only be exposed to TCE in groundwater after mixing with surface water. Because of the large volume of water in the Potomac River, groundwater would be diluted rapidly after discharging to the river. Dilution would also occur in the shallow sediment zone because surface water would enter from above while groundwater is discharging from below. Although the exact dilution factor is not known, when considering a dilution factor of only 10 (which is very conservative), the concentration of TCE (4.18 µg/L) in groundwater is less than the screening level (21 µg/L); therefore, any impacts to aquatic organisms from TCE are expected to be minimal.

Concentrations of total iron (10,700 to 32,100 µg/L) and total manganese (135 to 2,060 µg/L) in the four piezometers exceeded their respective screening levels, except the iron concentration (102 µg/L) in the southernmost piezometer (S43-PZ04). Dissolved metals more closely approximate the bioavailable fraction of metals in the water column than total recoverable metals. Dissolved metals were only analyzed in one groundwater sample (S43-PZ02). Dissolved concentrations of iron (6,670 µg/L) and manganese (563 µg/L) were only slightly lower than total concentrations of iron (10,700 µg/L) and manganese (600 µg/L).

Summary of Risks to Aquatic Organisms

The screening level for TCE is a Canadian Water Quality Guideline (WQG) and was developed by dividing a lowest observed effects concentration (LOEC) for brook trout by a factor of 10 (CCME, 1999). Because fish are not present in the drainage channels, toxicity data based on invertebrates would be more appropriate. The Canadian WQG for TCE indicated that water fleas *(Daphnia magna)* are the most sensitive aquatic invertebrate to TCE, with a 48-hour Effects Concentration 50 (EC50) for immobilization of 7.76 mg/L. If this value was divided by 100 to better approximate a chronic toxicity threshold, the resulting value of 77.6 µg/L would be greater than the maximum detected concentration in any of the

surface water samples from the drainage channels. Therefore, impacts to aquatic organisms from TCE are not expected.

The screening values for iron and manganese are 300 and 120 µg/L, respectively. The 300 µg/L screening value for iron is a Canadian WQG. A more appropriate value for iron would be the USEPA National Recommended Water Quality Criteria (NRWQC) value of 1,000 µg/L (USEPA, 2012c). However, all of the detected concentrations of iron also exceeded this value. Although most of the concentrations of iron and manganese exceed screening levels, habitat is limited for aquatic organisms, as only a few inches of water was present in the drainage channels and water is only expected to be present after significant rain events. Therefore, impacts to aquatic organisms from iron and manganese are expected to be minimal, so metals were eliminated as COPCs for aquatic organisms in surface water and groundwater seeps from the northern and southern drainage channels. Concentrations of iron and manganese were higher in groundwater piezometer samples than they were in seep and surface water samples and are about 20 to 30 times greater than the NRWQC for iron and screening level for manganese. As discussed above, although a dilution factor has not been determined, there will be considerable dilution when groundwater discharges to the Potomac River. Therefore, any impacts to aquatic organisms from iron and manganese in groundwater are expected to be minimal due to dilution that will occur as groundwater mixes with surface water in the Potomac River.

7.5 ECOLOGICAL RISK UNCERTAINTY ANALYSIS

This section discusses some of the uncertainties associated with the Site 43 ERA.

7.5.1 Uncertainty in Exposure Characterization

There is uncertainty associated with chemical data collected at Site 43. Measured levels of chemicals are only estimates of true site chemical concentrations. Also, there is uncertainty in how much dilution would occur after groundwater discharges to the Potomac River. However, it is expected that considerable dilution would occur (over 50x), so risks to aquatic receptors should be minimal.

Risks to fish larvae and eggs in the hyporheic zone was conservatively evaluated by assessing risks from exposure to water collected in drainage channels from the piezometers and seeps. The piezometer water samples were compared to BTAG Freshwater Surface Water Screening Benchmarks (USEPA, 2006), which are chronic non-lethal endpoint studies designed to be protective of sensitive species if available. The values are meant to be protective of sensitive life stages, including fish larvae and eggs.

Piezometer data is expected to be representative of sediment pore water before the overlying surface water from the drainage channels mix with underlying groundwater. Most benthic organisms reside in the top few inches of sediment so they would be exposed to discharging groundwater that has mixed with overlying surface water. This is supported by the July 2008 USEPA ECO Update/Ground Water Forum Issue Paper (USEPA, 2008), which states the following:

> "The groundwater/surface water transition zone represents a region beneath the bottom of a surface-water body where conditions change from a ground-water dominated to surface-water dominated system within the substrate. It is a region that includes both the interface between ground-water and surface-water as well as the broader region in the substrate (and, on occasion, up into the surface-water body) where ground-water and surface-water mix."

Therefore, the water in the transition zone where the benthic organisms will primarily live consists of a mixture of surface water and groundwater. A specific dilution factor has not been determined, but a dilution of 10, which was used in the risk evaluation, is likely conservative.

7.5.2 Uncertainty in Ecological Effects Data

Uncertainty exists in the ecological effects data, such as the screening levels. The screening levels are conservative and may be based on studies where the bioavailability of the chemical is much greater than it is in the environment. Also, toxicity data were not available or were limited for some chemicals, so screening levels were developed using the results of only a few studies.

Although it is acknowledged that amphibians could be present at the site, there is a general lack of toxicity data for amphibians. For TCE, the lowest toxicity value for amphibians found on the USEPA EXOTOX database was an LOEC of 29,000 µg/L. This LOEC is much greater than any of the TCE concentrations found at the site, so impacts to amphibians from TCE are not likely. No data on ECOTOX were found for amphibians toxicity from iron, and only one study was found for manganese, which listed an LC50 of 1,420 µg/L (there were few details on the study). Therefore, risks to amphibians from iron and manganese were not evaluated.

As indicated in Section 4.2, iron concentrations exceeded the background value of 19,900 µg/L in only 12 of the 37 monitoring wells, while manganese concentrations exceeded its background value of 825 µg/L in only 4 monitoring wells. All of the concentrations in the surface water samples were much lower than the background groundwater concentrations. Because the surface water in the drainage channels result from groundwater seeps and periodic storm water runoff, there is considerable uncertainty in whether iron

and manganese in the surface water are related to site activities. For these reasons, none of the chemicals were retained as COPCs for a BERA based on potential risks to amphibians.

7.5.3 Uncertainty in Risk Characterization

Risks are possible if an EEQ is greater than or equal to 1.0 regardless of the magnitude of the EEQ. However, the magnitude of effects to ecological receptors cannot be inferred based on the magnitude of the EEQ.

Finally, there is also uncertainty in how the predicted risks to a species at a site translate into risk to the population in the area as a whole.

7.6 ECOLOGICAL RISK SUMMARY AND CONCLUSIONS

This ERA evaluated sediment, surface water, groundwater seeps, and groundwater from piezometers. Based on the initial screening of chemical data, several chemicals were selected as COPCs in sediment, surface water, seep samples and groundwater because they were detected at concentrations that exceeded conservative screening levels or because they did not have screening levels.

These chemicals were then further evaluated to refine the list of COPCs, and to better characterize risks to ecological receptors. No chemicals were retained as COPCs for risks to sediment invertebrates or aquatic organisms.

8.0 CONCLUSIONS AND RECOMMENDATIONS

This section presents the conclusions and recommendations of the RI conducted at Site 43. The objectives of the multi-phase RI for Site 43 included delineating the extent of VOC, energetic/explosives, and metals contamination in soil and groundwater near Building 1040. The objectives also included the determination of groundwater flow direction in the Site 43 area, verifying and delineating cobalt detections in groundwater near Building 1041, and evaluating potential vapor intrusion at Buildings 720 and 716. A baseline HHRA was conducted to evaluate potential human health risks and a SLERA was conducted to evaluate potential ecological risks posed by the plume discharge on downgradient surface water, sediment, and porewater near the Potomac River.

The following conclusions are based on the results of the RI at Site 43 – Toluene Disposal Area:

CONCLUSIONS

Soil Conclusions

- Soil sampling defined the potential soil source area along the ditch north of Building 1040.
- TCE was the only VOC detected at concentrations above the PSL (EPA RSL of 910 µg/kg)
- Seven metals (aluminum, cadmium, chromium, cobalt, iron and manganese) were detected at concentrations above both the PSLs and NSF-IH background values.
- All surface soil chromium concentrations were above the USEPA carcinogenic RSL for hexavalent chromium (based on Target Cancer Risk [TCR]=1×10-6). However, only one surface soil sample chromium concentration (37.5 mg/kg) was above the NSF Indian Head background value of 33.4 mg/kg. Hexavalent chromium is unstable and extremely water-soluble, so if present in soil it would be from a direct source and it should be elevated in groundwater. However, there is no known historical use of hexavalent chromium at the site, and chromium concentrations in groundwater are not elevated (equal to or within background levels).

Groundwater Conclusions

- Groundwater essentially flows to the south-southwest at Site 43; however, water level data also indicates a potential groundwater divide with shallow groundwater east of Building 1040 flowing in a south-easterly direction.
- Groundwater sampling has adequately defined the horizontal and vertical extent of groundwater contamination at Site 43 to proceed with the FS.
- VOCs and metals in groundwater represent the primary contaminants and medium of concern at Site 43. Specifically TCE, cis-1,2-DCE, vinyl chloride, arsenic, cobalt and iron were identified as COPCs.

- Arsenic was identified as a COPC in groundwater; however, only one monitoring well had concentrations above the USEPA MCL of 10 µg/L.
- 2,6-dinitrotoluene was identified as a COPC in groundwater; however, was only detected in two of the 31 groundwater samples and was not detected in the associated field duplicate sample at one of those sample locations.

Surface Water and Sediment Conclusions

- Only TCE, iron, and manganese exceeded the PSLs in the surface water samples.
- Only arsenic, cobalt, and iron exceeded the PSLs in sediment samples; however, none of these metals were retained as COPCs in the HHRA or SLERA.

HHRA Conclusions

- The HHRA identified that HIs (RME scenario) for maintenance workers, industrial workers, construction workers, child residents, and adult residents exposed to surface soil, subsurface soil, and surface water are less than or equal to unity (1), indicating that adverse non-carcinogenic effects are not anticipated for these receptors under the defined exposure conditions.
- The RME scenario identified HIs greater than 1 for construction workers, child residents, and adult residents exposed to groundwater. The risk driver for construction workers exposed to groundwater is TCE. The main risk drivers for child residents exposed to groundwater are TCE, iron, cis-1,2-DCE, and cobalt. The main risk drivers for adult residents exposed to groundwater are TCE, cis-1,2-DCE, and cobalt.
- The RME scenario cumulative ILCRs for maintenance workers, industrial workers, and construction workers are within USEPA's target risk range. ILCRs for child residents exposed to subsurface soil, adult residents exposed to surface soil, subsurface soil, and surface water, and lifelong residents exposed to subsurface soil and surface water are also within USEPA's target risk range.
- The RME scenario ILCR for child residents exposed to surface soil and groundwater, adult residents exposed to groundwater, and lifelong residents exposed to surface soil and groundwater are greater than USEPA's target risk range. The main risk drivers for child residents are from exposure to chromium (assumed hexavalent, Cr^{+6}) in surface soil, and from exposure to TCE, vinyl chloride, arsenic, and 2,6-dinitrotoluene in groundwater. The main risk drivers for adult residents exposed to groundwater are TCE, vinyl chloride, arsenic, and 2,6-dinitrotoluene. For lifelong residents, the main risk driver for surface soil exposure is chromium, and the main risk drivers for groundwater exposure are TCE, vinyl chloride, arsenic, and 2,6-dinitrotoluene. However, 2,6-dinitrotoluene is not being retained as a risk driver since it was only detected in two

of 31 groundwater samples and was not detected in the associated field duplicate sample at one of those sample locations.

- Chromium speciation was not performed on surface soil samples; therefore, chromium was evaluated conservatively as hexavalent chromium in the HHRA. If chromium had been evaluated as trivalent chromium, then all ILCRs would have been within USEPA's target risk levels.

Soil Gas and Indoor Air Conclusions

- Groundwater sampling identified elevated concentrations of VOCs in groundwater near Building 720 and 716 that posed vapor intrusion concerns.
- Soil gas sampling identified elevated levels of VOCs in soil vapor near Buildings 720 and 716 that posed vapor intrusion concerns.
- Indoor air risks, based on measured indoor air concentrations at Buildings 716 and 720, are within USEPA target risk range for hypothetical future residents and industrial workers.
- Measured indoor air concentrations suggest that there is no significant vapor intrusion pathway into Buildings 716 or 720. TCE was detected in groundwater and soil gas, but was not detected at concentrations in indoor air that would result in unacceptable risk to hypothetical future residents or industrial workers.
- Indoor air concentrations of TCE and vinyl chloride in Building 716 are comparable to ambient air concentrations that were concurrently measured.
- At Building 720, benzene and chloromethane were identified as COPCs in indoor air. These VOCs were not identified as COPCs in groundwater and benzene was not identified as a COPC in soil gas. Indoor air concentrations of these two contaminants were comparable to their corresponding ambient air concentrations.

Ecological Risk Screening Conclusions

- The SLERA did not identify excess risk from COPCs to ecological receptors (sediment invertebrates or aquatic organisms) in the western downgradient portion of Site 43.

RECOMMENDATIONS

The following recommendations are based on the results and conclusions of the RI at Site 43:

- No action is recommended for surface water and sediment at Site 43.
- Based on the evidence supporting chromium in Site 43 soils being in the trivalent form (Cr+3) instead of the hexavalent form (Cr+6), and only one concentration exceeding background, no additional action is required to address chromium in soil at Site 43.

- Arsenic should be evaluated in the FS to determine if it will be retained as a chemical of concern (COC) for groundwater and addressed in future remedial action at Site 43.
- Proceed with the FS at Site 43 to address unacceptable risks associated with COCs in groundwater (TCE, cis-1,2-DCE, vinyl chloride, and cobalt).
- Further evaluate potential vapor intrusion risk in the FS for buildings at Site 43 within 100 feet of TCE and vinyl chloride MCL exceedances and recommend future action regarding vapor intrusion.

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TABLES

TABLE 2-1
SOIL SAMPLE SUMMARY
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

Sample Location	Sample ID	Sample Interval (feet bgs)	Sampe Date	Analytes
S43-SB008	S43SB008-0608	6 - 8	6/4/2011	VOCs[1], Explosives, Perchlorate, TAL Metals, Total Cyanide, TOC, Grain Size, Bulk Density, Effective Porosity
	S43SB008-0607	6 - 7	6/10/2011	VOCs[2]
S43-SB009	S43SB009-0608	6 - 8	6/4/2011	VOCs[1], Explosives, Perchlorate, TAL Metals, Total Cyanide, TOC
	S43SB009-0708	7 - 8	6/10/2011	VOCs[2]
	S43SB009-0708-D	7 - 8	6/10/2011	VOCs[2]
S43-SB010	S43SB010-0709	7 - 9	6/3/2011	VOCs, Explosives, Perchlorate, TAL Metals, Total Cyanide, TOC
S43-SB011	S43SB011-0709	7 - 9	6/4/2011	VOCs[1], Explosives, Perchlorate, TAL Metals, Total Cyanide, TOC
	S43SB011-0709-D	7 - 9	6/4/2011	VOCs[1], Explosives, Perchlorate, TAL Metals, Total Cyanide, TOC
	S43SB011-3335	33 - 35	6/12/2011	Shelby Tube
	S43SB011-0507	5 - 7	6/10/2011	VOCs[2]
	S43SB011Outside1-1315[3]	13 - 15	6/10/2011	Total Oxidant Demand
S43-SB012	S43SB012-0507	5 - 7	6/11/2011	VOCs, Explosives, Perchlorate, TAL Metals, Total Cyanide, TOC
	S43SB012-0507-D	5 - 7	6/11/2011	VOCs, Explosives, Perchlorate, TAL Metals, Total Cyanide, TOC
S43-SB013	S43SB013-0608	6 - 8	6/3/2011	VOCs, Explosives, Perchlorate, TAL Metals, Total Cyanide, TOC
S43-SB014	S43SB014-0709	7 - 9	6/4/2011	VOCs, Explosives, Perchlorate, TAL Metals, Total Cyanide, TOC
S43-SB015	S43SB015-0810	8 - 10	6/3/2011	VOCs, Explosives, Perchlorate, TAL Metals, Total Cyanide, TOC
S43-SB016	S43SB016-0608	6 - 8	6/5/2011	VOCs[1], Explosives, Perchlorate, TAL Metals, Total Cyanide, TOC
	S43SB016-0607	6 - 7	6/12/2011	VOCs[2]
S43-SB017	S43SB017-0608	6 - 8	6/10/2011	VOCs, Explosives, Perchlorate, TAL Metals, Total Cyanide, TOC
	S43SB017-1517	15 - 17	6/10/2011	Grain Size
S43-SB018	S43SB018-0507	5 - 7	6/10/2011	VOCs, Explosives, Perchlorate, TAL Metals, Total Cyanide, TOC
	S43SB018-3234	32 - 34	6/10/2011	Grain Size
S43-SB019	S43SB019-0607	6 - 7	6/11/2011	VOCs
	S43SB019Inside2-1315[4]	13 - 15	6/11/2011	Total Oxidant Demand
S43-SB022	S43SB022-0708	7 - 8	6/11/2011	VOCs
	S43SB022Inside1-1315[4]	13 - 15	6/11/2011	Total Oxidant Demand
S43-SB023	S43SB023-0001	0 - 1	5/13/2012	VOCs
	S43SB023-0001-D	0 - 1	5/13/2012	VOCs
	S43SB023-0607	6 - 7	5/13/2012	VOCs
S43-SB024	S43SB024-0001	0 - 1	5/13/2012	VOCs
	S43SB024-0607	6 - 7	5/13/2012	VOCs
	S43SB024-0607-D	6 - 7	5/13/2012	VOCs
S43-SB025	S43SB025-0001	0 - 1	5/13/2012	VOCs
	S43SB025-0607	6 - 7	5/13/2012	VOCs
S43-SB026	S43SB026-0001	0 - 1	5/13/2012	VOCs
	S43SB026-0607	6 - 7	5/13/2012	VOCs
S43-SB027	S43SB027-0001	0 - 1	5/13/2012	VOCs
	S43SB027-0708	7 - 8	5/13/2012	VOCs
S43-SB028	S43SB028-0001	0 - 1	5/13/2012	VOCs
	S43SB028-0405	4 - 5	5/13/2012	VOCs

Notes:
bgs : below ground surface
D : Duplicate sample
TAL: Target Analyte List
TOC : Total Organic Carbon
VOC : Volatile Organic Compound
[1] VOC sample exceeded holding time due to wrong preservative
[2] VOC sample recollected
[3] Outside designation means Total Oxidant demand sample taken outside source area
[4] Inside designation means Total Oxidant demand sample taken inside source area

TABLE 2-2
GROUNDWATER GRAB SAMPLE SUMMARY
SITE 43 - TOLUENE DISPOSAL AREA
NSF-INDIAN HEAD, MARYLAND

Sample Location	Sample ID	Sample Interval (feet bgs)	Sample Date	Analysis
S43-TW006	S43TW006-2832	28 - 32	6/11/2011	VOCs, Total and Filtered TAL Metals, Total Cyanide, Explosives, Filtered Perchlorate
S43-TW007	S43TW007-2327	23 - 27	6/3/2011	VOCs, Total and Filtered TAL Metals, Total Cyanide, Explosives, Filtered Perchlorate, Anions and Alkalinity, MEE, Sulfide, filtered TOC
	S43TW007-2327-D	23 - 27	6/3/2011	VOCs, Total and Filtered TAL Metals, Total Cyanide, Explosives, Filtered Perchlorate, Anions and Alkalinity, MEE, Sulfide, filtered TOC
S43-TW008	S43TW008-2832	28 - 32	6/5/2011	VOCs, Total and Filtered TAL Metals, Total Cyanide, Explosives, Filtered Perchlorate
S43-TW009	S43TW009-2125	21 - 25	6/3/2011	VOCs, Total and Filtered TAL Metals, Total Cyanide, Explosives, Filtered Perchlorate, Anions and Alkalinity, MEE, Sulfide, filtered TOC
S43-TW010	S43TW010-2933	29 - 33	No sample	No sample[1]
S43-TW011	S43TW011-3034	30 - 34	6/10/2011	VOCs, Total and Filtered TAL Metals, Total Cyanide, Explosives, Filtered Perchlorate
S43-TW012	S43TW012-2630	26 - 30	6/11/2011	VOCs, Total and Filtered TAL Metals, Total Cyanide, Explosives, Filtered Perchlorate
S43-TW013	S43TW013-2933	29 - 33	4/20/2012	VOCs
S43-TW014	S43TW014-1317	13 - 17	4/20/2012	VOCs
	S43TW014-2933	29 - 33	4/20/2012	VOCs
S43-TW015	S43TW015-1721	17 - 21	4/22/2012	VOCs
	S43TW015-2933	29 - 33	4/22/2012	VOCs
S43-TW016	S43TW016-1721	17 - 21	4/22/2012	VOCs
	S43TW016-1721-D	17 - 21	4/22/2012	VOCs
	S43TW016-2933	29 - 33	4/22/2012	VOCs
S43-TW017	S43TW017-1923	19 - 23	4/22/2012	VOCs
	S43TW017-2933	29 - 33	4/22/2012	VOCs
S43-TW018	S43TW018-1923	19 - 23	5/5/2012	VOCs
	S43TW018-3034	30 - 34	5/5/2012	VOCs
S43-TW019	S43TW019-2024	20 - 24	5/4/2012	VOCs
	S43TW019-2832	28 - 32	4/21/2012	VOCs
S43-TW020	S43TW020-1923	19 - 23	4/21/2012	VOCs
	S43TW020-2933	29 - 33	4/21/2012	VOCs
	S43TW020-2933-D	29 - 33	4/21/2012	VOCs
S43-TW021	S43TW021-1923	19 - 23	4/21/2012	VOCs
	S43TW021-2630	26 - 30	4/21/2012	VOCs
S43-TW022	S43TW022-1014	10 - 14	5/4/2012	VOCs
	S43TW022-2226	22 - 26	4/27/2012	VOCs
	S43TW022-3337	33 - 37	5/4/2012	VOCs
S43-TW023	S43TW023-1014	10 - 14	4/27/2012	VOCs
	S43TW023-2226	22 - 26	4/27/2012	VOCs
	S43TW023-3236	32 - 36	4/27/2012	VOCs
S43-TW024	S43TW024-2327	23 - 27	5/4/2012	VOCs
	S43TW024-3236	32 - 36	5/4/2012	VOCs
S43-TW025	S43TW025-1115	11 - 15	5/3/2012	VOCs
	S43TW025-2933	29 - 33	5/5/2012	VOCs
S43-TW026	S43TW026-1014	10 - 14	5/5/2012	VOCs
	S43TW026-3236	32 - 36	5/5/2012	VOCs
S43-TW027	S43TW027-1418	14 - 18	No sample	No sample[1]
	S43TW027-2933	29 - 33	5/4/2012	VOCs
S43-TW028	S43TW028-1721	17 - 21	5/4/2012	VOCs
	S43TW028-2933	29 - 33	5/4/2012	VOCs
	S43TW028-2933-D	29 - 33	5/4/2012	VOCs
S43-TW029	S43TW029-2226	22 - 26	5/6/2012	VOCs
	S43TW029-3236	32 - 36	5/11/2012	VOCs
S43-TW030	S43TW030-1317	13 - 17	5/6/2012	VOCs
	S43TW030-1317-D	13 - 17	5/6/2012	VOCs
	S43TW030-2226	22 - 26	5/6/2012	VOCs
	S43TW030-3236	32 - 36	5/6/2012	VOCs
S43-TW031	S43TW031-1014	10 - 14	5/6/2012	VOCs
	S43TW031-2226	22 - 26	5/6/2012	VOCs
	S43TW031-3236	32 - 36	5/6/2012	VOCs
S43-TW032	S43TW032-2226	22 - 26	5/6/2012	VOCs
	S43TW032-2226-D	22 - 26	5/6/2012	VOCs
	S43TW032-3236	32 - 36	5/6/2012	VOCs
S43-TW033	S43TW033-2226	22 - 26	5/11/2012	VOCs
	S43TW033-3236	32 - 36	5/11/2012	VOCs
S43-TW034	S43TW034-2226	22 - 26	5/11/2012	VOCs
	S43TW034-3236	32 - 36	5/11/2012	VOCs
	S43TW034-3236-D	32 - 36	5/11/2012	VOCs
S43-TW035	S43TW035-2226	22 - 26	5/11/2012	VOCs
	S43TW035-3236	32 - 36	5/11/2012	VOCs
S43-TW036	S43TW036-2024	20 - 24	6/1/2012	VOCs
	S43TW036-3034	30 - 34	6/1/2012	VOCs
S43-TW037	S43TW037-2024	20 - 24	6/1/2012	VOCs
	S43TW037-2024-D	20 - 24	6/1/2012	VOCs
	S43TW037-3135	31 - 35	6/1/2012	VOCs
S43-TW038	S43TW038-1822	18 - 22	6/2/2012	VOCs
	S43TW038-2832	28 - 32	6/2/2012	VOCs
S43-TW039	S43TW039-0812	8 - 12	6/12/2012	VOCs
S43-TW040	S43TW040-2226	22 - 26	6/19/2012	VOCs
	S43TW040-3236	32 - 36	6/18/2012	VOCs
S43-TW041	S43TW041-1822	18 - 22	6/18/2012	VOCs
	S43TW041-1822-D	18 - 22	6/18/2012	VOCs
	S43TW041-3337	33 - 37	6/18/2012	VOCs
S43-TW042	S43TW042-1822	18 - 22	6/18/2012	VOCs
	S43TW042-3337	33 - 37	6/18/2012	VOCs
S43-TW043	S43TW043-1519	15 - 19	6/19/2012	VOCs
S43-TW044	S43TW044-1317	13 - 17	6/19/2012	VOCs
	S43TW044-3943-	39 - 43	No sample	No sample[1]

TABLE 2-2
GROUNDWATER GRAB SAMPLE SUMMARY
SITE 43 - TOLUENE DISPOSAL AREA
NSF-INDIAN HEAD, MARYLAND

S43-TW045	S43TW045-2024	20 - 24	6/19/2012	VOCs
	S43TW045-3337	33 - 37	No sample	No sample[1]
	S43TW045-3741	37 - 41	6/21/2012	VOCs
S43-TW046	S43TW046-0408	4 - 8	No sample	No sample[1]
	S43TW046-4044	40 - 44	No sample	No sample[1]
S43-TW047	S43TW047-1014	10 - 14	6/21/2012	VOCs
S43-TW048	S43TW048-1519	15 - 19	No sample	No sample[1]
	S43TW048-4044	40 - 44	6/20/2012	VOCs
S43-TW049	S43TW049-1721	17 - 21	6/19/2012	VOCs
	S43TW049-1721-D	17 - 21	6/19/2012	VOCs
	S43TW049-3337	33 - 37	No sample	No sample[1]
S43-TW050	S43TW050-1822	18 - 22	6/20/2012	VOCs
	S43TW050-3236	32 - 36	No sample	No sample[1]
S43-TW051	S43TW051-1721	17 - 21	6/21/2012	VOCs
S43-TW052	S43TW052-1014	10 - 14	6/21/2012	VOCs
	S43TW052-3842	38 - 42	No sample	No sample[1]
S43-TW053	S43TW053-1317	13 - 17	6/22/2012	VOCs
	S43TW053-2428	24 - 28	6/22/2012	VOCs
	S43TW053-2428-D	24 - 28	6/22/2012	VOCs
S43-TW054	S43TW054-1721	17 - 21	6/22/2012	VOCs
S43-TW055	S43TW055-1822	18 - 22	6/22/2012	VOCs
S43-TW056	S43TW056-1620	16 - 20	6/22/2012	VOCs
S43-TW057	S43TW057-1923	19 - 23	7/12/2012	VOCs
	S43TW057-2933	29 - 33	7/13/2012	VOCs
S43-TWSA01 (S43-MW001)	S43TWSA01-3034	30 - 34	5/13/2012	VOCs
S43-TWSA02 (S43-MW006)	S43TWSA02-1418	14 - 18	5/11/2012	VOCs
	S43TWSA02-3034	30 - 34	5/11/2012	VOCs
S43-TWSA03 (S43-MW004)	S43TWSA03-1014	10 - 14	No sample	No sample[1]

Notes:
bgs : below ground surface
D : Duplicate sample
MEE: Methane, Ethane, Ethene
TAL: Target Analyte List
TOC : Total Organic Carbon
VOCs : Volatile Organic Compounds
[1] Sample interval did not produce water

TABLE 2-3
MONITORING WELL CONSTRUCTION DETAILS
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

Monitoring Well	Installation Date	Total Depth (feet below TOC)	Screened Interval Depth (feet bgs)	Reference Elevation TOC (feet MSL)	Ground Surface Elevation (feet MSL)
S43-MW001	7/15/2005	18.75	9 - 19	33.90	34.14
S43-MW002	7/14/2005	21.40	12 - 22	34.60	34.97
S43-MW003	6/4/2011	36.72	24 - 34	37.43	33.97
S43-MW004	6/5/2011	35.5*	23 - 33	36.44	34.15
S43-MW005	6/4/2011	30.50	21 - 31	34.33	34.78
S43-MW006	6/5/2011	27.0*	17 - 27	33.76	33.96
S43-MW007	5/20/2012	35.5*	23 - 33	36.80	34.55
S43-MW008	5/19/2012	35.5*	23 - 33	37.88	35.28
S43-MW009S	5/19/2012	19.41	6 - 16	35.23	32.18
S43-MW009D	5/19/2012	35.5*	28 - 33	35.01	32.21
S43-MW010	5/18/2012	37.5*	30 - 35	35.86	33.12
S43-MW011	5/20/2012	39.10	26 - 36	38.55	35.48
S43-MW012	6/2/2012	30.38	27.5 - 32.5	34.99	35.21
S43-MW013	5/12/2012	23.36	11 - 21	38.97	36.59
S43-MW014	5/12/2012	20.73	8 - 18	36.53	33.70
S43-MW015	5/12/2012	20.65	11 - 21	34.85	35.10
S43-MW016	5/12/2012	23.96	11 - 21	37.79	34.93
S43-MW017S	7/13/2012	30.5*	18 - 28	38.43	35.16
S43-MW017D	7/12/2012	39.21	31 - 36	38.08	35.36
S43-MW018	7/10/2012	19.03	7 - 17	38.59	35.35
S43-MW019S	7/9/2012	26.73	14 - 24	37.90	34.96
S43-MW019D	7/10/2012	38.28	30 - 35	37.57	34.92
S43-MW020	7/11/2012	23.5*	6 - 21	38.50	35.00
S43-MW021	7/16/2012	37.5*	15 - 25	39.37	36.15
S43-MW022	7/11/2012	22.30	10 - 20	37.29	34.18
S43-MW023	7/9/2012	24.26	11 - 21	37.95	35.13
S43-MW024	7/10/2012	19.52	2 - 17	37.79	35.05
S43-MW025	7/11/2012	20.21	7 - 17	21.03	18.05
S43-MW026	7/13/2012	26.43	13 - 23	37.98	35.01
S43-MW027	4/30/2013	25.03	12 - 22	38.42	34.82
S43-MW028	4/30/2013	19.5*	7 - 17	35.75	32.53
S43-MW029	4/28/2013	21.31	9 - 19	35.05	31.46
S43-MW030	5/2/2013	41.49	34 - 39	38.12	34.99
S43-PZ01	5/1/2013	17.83	5 - 15	9.59	6.66
S43-PZ02	5/1/2013	16.72	5 - 15	9.03	5.70
S43-PZ03	5/1/2013	17.30	5 - 15	7.10	4.09
S43-PZ04	5/1/2013	17.5*	5 - 15	16.23	12.89

Notes:
bgs : below ground surface
MW : Monitoring Well
MSL : Mean Sea Level
TOC : Top of Casing
* : Estimated total depth

TABLE 2-4
MONITORING WELL SAMPLE SUMMARY
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

Sample Location	Sample ID	Sample Interval (feet bgs)	Sample Date	Analysis
S43-MW001	S43MW00103	9-19	6/17/2011	VOCs, Total and Dissolved TAL Metals, Total Cyanide, Explosives, Dissolved Perchlorate, Anions and Alkalinity, MEE, Sulfide, filtered TOC
	S43MW00104	9 - 19	7/22/2012	VOCs, Total and Dissolved TAL Metals, Explosives
	S43MW00104-D	9 - 19	7/22/2012	VOCs, Total and Dissolved TAL Metals, Explosives
	S43MW00105	9 - 19	5/8/2013	VOCs, Total and Dissolved TAL Metals
	S43MW00105-D	9 - 19	5/8/2013	VOCs, Total and Dissolved TAL Metals
S43-MW002	S43MW00203	12-22	6/17/2011	TCE, Total and Dissolved Cobalt, Total Cyanide, Anions and Alkalinity, MEE, Sulfide, filtered TOC
	S43MW00204	12 - 22	7/22/2012	TCE, Total and Dissolved Cobalt
	S43MW00204-D	12 - 22	7/22/2012	TCE, Total and Dissolved Cobalt
	S43MW00205	12 - 22	5/19/2013	VOCs, Total TAL Metals
S43-MW003	S43MW00301	24-34	6/17/2011	VOCs, Total and Dissolved TAL Metals, Total Cyanide, Explosives, Dissolved Perchlorate
	S43MW00302	24 - 34	7/22/2012	VOCs, Total and Dissolved TAL Metals, Explosives
	S43MW00303	24 - 34	5/9/2013	VOCs, Total TAL Metals
S43-MW004	S43MW00401	23-33	6/17/2011	VOCs, Total and Dissolved TAL Metals, Total Cyanide, Explosives, Dissolved Perchlorate, Anions and Alkalinity, MEE, Sulfide, filtered TOC
	S43MW00401-D	23-33	6/17/2011	VOCs, Total and Dissolved TAL Metals, Total Cyanide, Explosives, Dissolved Perchlorate, Anions and Alkalinity, MEE, Sulfide, filtered TOC
	S43MW00402	23 - 33	7/22/2012	VOCs, Total and Dissolved TAL Metals, Explosives
	S43MW00403	23 - 33	5/13/2013	VOCs, Total TAL Metals
S43-MW005	S43MW00501	21-31	6/17/2011	VOCs, Total and Dissolved TAL Metals, Total Cyanide, Explosives, Dissolved Perchlorate
	S43MW00502	21 - 31	7/22/2012	VOCs, Total and Dissolved TAL Metals, Explosives
	S43MW00503	21 - 31	5/9/2013	VOCs, Total and Dissolved TAL Metals
S43-MW006	S43MW00601	17-27	6/17/2011	VOCs, Total and Dissolved TAL Metals, Total Cyanide, Explosives, Dissolved Perchlorate, Anions and Alkalinity, MEE, Sulfide, filtered TOC
	S43MW00602	17 - 27	7/21/2012	VOCs, Total and Dissolved TAL Metals, Explosives
	S43MW00603	17 - 27	5/9/2013	VOCs, Total and Dissolved TAL Metals
S43-MW007	S43MW00701	23 - 33	7/22/2012	VOCs, Total and Dissolved TAL Metals, Explosives
	S43MW00702	23 - 33	5/13/2013	VOCs, Total TAL Metals
S43-MW008	S43MW00801	23 - 33	7/21/2012	VOCs, Total and Dissolved TAL Metals, Explosives
	S43MW00802	23 - 33	5/9/2013	VOCs, Total TAL Metals
S43-MW009S	S43MW009S01	6 - 16	7/22/2012	VOCs, Total and Dissolved TAL Metals, Explosives
	S43MW009S02	6 - 16	5/13/2013	VOCs, Total TAL Metals
	S43MW009S02-D	6 - 16	5/13/2013	VOCs, Total TAL Metals
S43-MW009D	S43MW009D01	28 - 33	7/22/2012	VOCs, Total and Dissolved TAL Metals, Explosives
	S43MW009D02	28 - 33	5/13/2013	VOCs, Total and Dissolved TAL Metals
S43-MW010	S43MW01001	30 - 35	7/22/2012	VOCs, Total and Dissolved TAL Metals, Explosives
	S43MW01002	30 - 35	5/9/2013	VOCs, Total and Dissolved TAL Metals
S43-MW011	S43MW01101	26 - 36	7/21/2012	VOCs, Total and Dissolved TAL Metals, Explosives
	S43MW01102	26 - 36	5/9/2013	VOCs, Total TAL Metals
S43-MW012	S43MW01201	27.5 - 32.5	7/22/2012	VOCs, Total and Dissolved TAL Metals, Explosives
	S43MW01202	27.5 - 32.5	5/14/2013	VOCs, Total TAL Metals
S43-MW013	S43MW01301	11 - 21	7/22/2012	TCE, Total and Dissolved Cobalt
	S43MW01302	11 - 21	5/19/2013	VOCs, Total TAL Metals
S43-MW014	S43MW01401	8 - 18	7/22/2012	TCE, Total and Dissolved Cobalt
	S43MW01402	8 - 18	5/19/2013	VOCs, Total TAL Metals
S43-MW015	S43MW01501	11 - 21	7/22/2012	TCE, Total and Dissolved Cobalt
	S43MW01502	11 - 21	5/19/2013	VOCs, Total TAL Metals

TABLE 2-4
MONITORING WELL SAMPLE SUMMARY
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

Sample Location	Sample ID	Sample Interval (feet bgs)	Sample Date	Analysis
S43-MW016	S43MW01601	11 - 21	7/22/2012	TCE, Total and Dissolved Cobalt
	S43MW01602	11 - 21	5/19/2013	VOCs, Total TAL Metals
S43-MW017S	S43MW017S01	18 - 28	7/21/2012	VOCs, Total and Dissolved TAL Metals, Explosives
	S43MW017S02	18 - 28	5/9/2013	VOCs, Total TAL Metals
S43-MW017D	S43MW017D01	31 - 36	7/21/2012	VOCs, Total and Dissolved TAL Metals, Explosives
	S43MW017D02	31 - 36	5/9/2013	VOCs, Total TAL Metals
	S43MW017D02-D	31 - 36	5/9/2013	VOCs, Total TAL Metals
S43-MW018	S43MW01801	7 - 17	7/21/2012	VOCs, Total and Dissolved TAL Metals, Explosives
	S43MW01802	7 - 17	5/8/2013	VOCs, Total TAL Metals
S43-MW019S	S43MW019S01	14 - 24	7/21/2012	VOCs, Total and Dissolved TAL Metals, Explosives
	S43MW019S01-D	14 - 24	7/21/2012	VOCs, Total and Dissolved TAL Metals, Explosives
	S43MW019S02	14 - 24	5/8/2013	VOCs, Total TAL Metals
S43-MW019D	S43MW019D01	30 - 35	7/21/2012	VOCs, Total and Dissolved TAL Metals, Explosives
	S43MW019D02	30 - 35	5/8/2013	VOCs, Total TAL Metals
S43-MW020	S43MW02001	6 - 21	7/19/2012	VOCs, Total and Dissolved TAL Metals, Explosives
	S43MW02002	6 - 21	5/9/2013	VOCs, Total and Dissolved TAL Metals
S43-MW021	S43MW02101	15 - 25	7/21/2012	VOCs, Total and Dissolved TAL Metals, Explosives
	S43MW02102	15 - 25	5/8/2013	VOCs, Total TAL Metals
S43-MW022	S43MW02201	10 - 20	7/19/2012	VOCs, Total and Dissolved TAL Metals, Explosives
	S43MW02202	10 - 20	5/9/2013	VOCs, Total TAL Metals
S43-MW023	S43MW02301	11 - 21	7/20/2012	VOCs, Total and Dissolved TAL Metals, Explosives
	S43MW02302	11 - 21	5/9/2013	VOCs, Total TAL Metals
S43-MW024	S43MW02401	2 - 17	7/20/2012	VOCs, Total and Dissolved TAL Metals, Explosives
	S43MW02402	2 - 17	5/8/2013	VOCs, Total TAL Metals
S43-MW025	S43MW02501	7 - 17	7/20/2012	VOCs, Total and Dissolved TAL Metals, Explosives
	S43MW02502	7 - 17	5/8/2013	VOCs, Total TAL Metals
S43-MW026	S43MW02601	13 - 23	7/18/2012	VOCs, Total and Dissolved TAL Metals, Explosives
	S43MW02602	13 - 23	5/9/2013	VOCs, Total TAL Metals
S43-MW027	S43MW02701	12 - 22	5/13/2013	VOCs, Total TAL Metals
S43-MW028	S43MW02801	7 - 17	5/13/2013	VOCs, Total TAL Metals
S43-MW029	S43MW02901	9 - 19	5/13/2013	VOCs, Total TAL Metals
S43-MW030	S43MW03001	34 - 39	5/13/2013	VOCs, Total TAL Metals
	S43MW03001-D	34 - 39	5/13/2013	VOCs, Total TAL Metals
S43-PZ01	S43PZ01	5 - 15	5/14/2013	VOCs, Total TAL Metals
S43-PZ02	S43PZ02	5 - 15	5/14/2013	VOCs, Total and Dissolved TAL Metals
S43-PZ03	S43PZ03	5 - 15	5/14/2013	VOCs, Total TAL Metals
S43-PZ04	S43PZ04	5 - 15	5/14/2013	VOCs, Total TAL Metals

Notes:
bgs : below ground surface
D : Duplicate
MEE : Methane, Ethane, Ethene
TAL: Target Analyte List
TCE : Trichloroethene
TOC : Total Organic Carbon
VOC : Volatile Organic Compound

TABLE 2-5
SOIL GAS AND INDOOR AIR SAMPLE SUMMARY
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

Sample Location	Sample ID	Sample Interval (feet bgs)	Sample Date	Collection Method	Comments
Building 720					
Outdoor Air Samples					
S43-ODA01	S43ODA01	-	6/11/2011	24 hour Summa	Collected upgradient of Building 720 on stop sign at the intersection of Gallery Road and Schuyler Road
S43-ODA02	S43ODA02	-	4/20/2012	24 hour Summa	Collected upgradient of Building 720 near S43-MW03
Soil Gas Samples					
S43-SG01	S43SG0106	6	6/11/2011	30 minute Summa	Sample collected in 1.5 hours and is located in a grass area 3 feet west of Building 1040
S43-SG02	S43SG0206	6	No sample	30 minute Summa	No sample obtained, several attempts were made but could not get cannister to pull soil gas
	S43SG0205-D	6	No sample	30 minute Summa	No sample obtained, several attempts were made but could not get cannister to pull soil gas
S43-SG03	S43SG0305	6	6/11/2011	30 minute Summa	Sample collected in 1 hour and is located in an asphalt[1] area 3 feet north of Building 720
S43-SG04	S43SG0406	6	6/11/2011	30 minute Summa	Sample collected in 1.5 hours and is located in an asphalt[1] area 3 feet north of Building 720
Indoor Air Samples					
S43-IND01	S43IND01	-	4/20/2012	24 hour Summa	Collected along northern wall in northernmost bay of Building 720
	S43IND01-D	-	4/20/2012	24 hour Summa	Collected along northern wall in the middle of the northernmost bay of Building 720
S43-IND02	S43IND02	-	4/20/2012	24 hour Summa	Collected along southern wall in the middle of the northermost bay of Buidling 720, below the stairs
Building 716					
Outdoor Air Samples					
S43-716-ODA01	S43-716-ODA01	-	7/25/2013	24 hour Summa	Sample collected approximately 75 feet NE off north corner of Building 716
Soil Gas Samples					
S43-SG05	S43SG05-0708	7-8	5/6/2013	30 minute Summa	Sample collected in 1.5 hours and is located in grass on the NE side of Building 716
	S43SG05-0708-D	7-8	5/6/2013	30 minute Summa	Sample collected in 1.5 hours and is located in grass on the NE side of Building 716
S43-SG06	S43SG06-0708	7-8	5/6/2013	30 minute Summa	Sample collected in 0.75 hour and is located in the asphalt on the SE side of Building 716
S43-SG07	S43SG07-1011	10-11	5/6/2013	30 minute Summa	Sample collected in 0.75 hour and is located in grass on the SW side of Building 716
S43-SG08	S43SG08-0708	7-8	5/6/2013	30 minute Summa	Sample collected in 1 hour and is located in grass on the NW side of Building 716
Indoor Air Samples					
S43-716-IND01	S43-716-IND01	-	7/25/2013	24 hour Summa	Collected in southern half of Building 716 (air conditioned) in middle of room on table
S43-716-IND02	S43-716-IND02	-	7/25/2013	24 hour Summa	Collected in northern half of Buidling 716 (not air conditioned) along NE wall on a shelf 4 feet off ground
	S43-716-IND02-D	-	7/25/2013	24 hour Summa	Collected in northern half of Buidling 716 (not air conditioned) along NE wall on a shelf 4 feet off ground

Notes:

bgs : below ground surface

D : Duplicate

[1] Aspahlt approximately 3-5 inches thick with approximately 2 inches of gravel beneath

TABLE 2-6
SEEP, SURFACE WATER, AND SEDIMENT SAMPLE SUMMARY
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

Sample Location	Sample ID	Sample Date	Analysis
Seep Samples			
S43-SP01	S43-SP01-01	6/20/2012	VOCs
	S43-SP01-02	5/10/2013	VOCs, TAL Metals
S43-SP02	S43-SP02-01	6/20/2012	VOCs
	S43-SP02-02	5/10/2013	VOCs, TAL Metals
Surface Water Samples			
S43-SW01	S43SW01	5/10/2013	VOCs, TAL Metals
	S43SW01-D	5/10/2013	VOCs, TAL Metals
S43-SW02	S43SW02	5/10/2013	VOCs, TAL Metals
S43-SW04	S43SW04	5/10/2013	VOCs, TAL Metals
S43-CL01	S43CL01	5/10/2013	VOCs, TAL Metals
S43-OF01	S43OF01	5/10/2013	VOCs, TAL Metals
Sediment Samples			
S43-SD01	S43SD01	5/10/2013	VOCs, TAL Metals
	S43SD01-D	5/10/2013	VOCs, TAL Metals
S43-SD02	S43SD02	5/10/2013	VOCs, TAL Metals
S43-SD04	S43SD04	5/10/2013	VOCs, TAL Metals

Notes:
D : Duplicate
TAL: Target Analyte List
VOC : Volatile Organic Compound

TABLE 3-1
GROUNDWATER ELEVATION SUMMARY
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

Monitoring Well	Total Depth (feet below TOC)	Screened Interval Depth (feet bgs)	July 2012 Water Level (feet below TOC)	May 2013 Water Level (feet below TOC)	October 2013 Water Level (feet below TOC)	Survey TOC (feet MSL)	Ground Surface Elevation (feet MSL)	July 2012 Water Level (feet MSL)	May 2013 Water Level (feet MSL)	October 2013 Water Level (feet MSL)
S43-MW001	18.75	9 - 19	8.46	3.65	8.59	33.90	34.14	25.44	30.25	25.31
S43-MW002	21.40	12 - 22	11.68	11.24	11.81	34.60	34.97	22.92	23.36	22.79
S43-MW003	36.72	24 - 34	16.76	15.01	16.81	37.43	33.97	20.67	22.42	20.62
S43-MW004	35.00	23 - 33	11.20	16.57	11.30	36.44	34.15	25.24	19.87	25.14
S43-MW005	30.50	21 - 31	9.05	4.57	9.23	34.33	34.78	25.28	29.76	25.10
S43-MW006	27.00	17 - 27	8.52	3.98	8.57	33.76	33.96	25.24	29.78	25.19
S43-MW007	--	23 - 33	11.37	6.58	11.49	36.8	34.55	25.43	30.22	25.31
S43-MW008	--	23 - 33	12.56	7.68	12.62	37.88	35.28	25.32	30.20	25.26
S43-MW009S	19.41	6 - 16	10.28	7.14	9.77	35.23	32.18	24.95	28.09	25.46
S43-MW009D	--	28 - 33	9.86	5.29	9.98	35.01	32.21	25.15	29.72	25.03
S43-MW010	--	30 - 35	11.68	9.00	12.23	35.86	33.12	24.18	26.86	23.63
S43-MW011	39.10	26 - 36	13.92	9.77	14.03	38.55	35.48	24.63	28.78	24.52
S43-MW012	30.38	27.5 - 32.5	14.90	13.34	14.74	34.99	35.21	20.09	21.65	20.25
S43-MW013	23.36	11 - 21	16.18	15.75	16.25	38.97	36.59	22.79	23.22	22.72
S43-MW014	20.73	8 - 18	13.56	13.19	13.73	36.53	33.7	22.97	23.34	22.80
S43-MW015	20.65	11 - 21	11.89	11.39	11.93	34.85	35.1	22.96	23.46	22.92
S43-MW016	23.96	11 - 21	14.92	14.52	14.97	37.79	34.93	22.87	23.27	22.82
S43-MW017S	--	18 - 28	15.18	13.73	15.39	38.43	35.16	23.25	24.70	23.04
S43-MW017D	39.21	31 - 36	19.42	17.62	19.20	38.08	35.36	18.66	20.46	18.88
S43-MW018	19.03	7 - 17	13.21	10.30	12.64	38.59	35.35	25.38	28.29	25.95
S43-MW019S	26.73	14 - 24	15.26	14.60	15.37	37.9	34.96	22.64	23.30	22.53
S43-MW019D	38.28	30 - 35	22.54	22.05	22.69	37.57	34.92	15.03	15.52	14.88
S43-MW020	--	6 - 21	15.93	15.48	16.05	38.5	35	22.57	23.02	22.45
S43-MW021	--	15 - 25	15.76	15.25	15.89	39.37	36.15	23.61	24.12	23.48
S43-MW022	22.30	10 - 20	14.70	14.34	14.84	37.29	34.18	22.59	22.95	22.45
S43-MW023	24.26	11 - 21	16.63	16.40	16.59	37.95	35.13	21.32	21.55	21.36
S43-MW024	19.52	2 - 17	9.94	9.81	10.57	37.79	35.05	27.85	27.98	27.22
S43-MW025	20.21	7 - 17	11.68	9.13	10.57	21.03	18.05	9.35	11.90	10.46
S43-MW026	26.43	13 - 23	16.06	15.56	16.16	37.98	35.01	21.92	22.42	21.82
S43-MW027	25.03	12 - 22	--	7.76	12.86	38.42	34.82	--	30.66	25.56
S43-MW028	20.00	7 - 17	--	11.02	12.00	35.75	32.53	--	24.73	23.75
S43-MW029	21.31	9 - 19	--	10.07	11.53	35.05	31.46	--	24.98	23.52
S43-MW030	41.49	34 - 39	--	26.81	27.02	38.12	34.99	--	11.31	11.10
S43-PZ01	17.83	5 - 15	--	7.69	8.18	9.59	6.66	--	1.90	1.41
S43-PZ02	16.72	5 - 15	--	7.13	7.28	9.03	5.7	--	1.90	1.75
S43-PZ03	17.30	5 - 15	--	5.37	5.62	7.1	4.09	--	1.73	1.48
S43-PZ04	--	5 - 15	--	13.31	14.33	16.23	12.89	--	2.92	1.90

Notes:
bgs : below ground surface
MSL : Mean sea level
TOC : top of casing

TABLE 4-1
SOIL ANALYTICAL DETECTIONS
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

LOCATION	PSL [1]	PSL REFERENCE	NSF-IH Background Surface Soil[2]	NSF-IH Background Subsurface Soil[2]	S43-SB001		S43-SB002		S43SB003				S43-SB004		S43SB005	
SAMPLE ID					S43SS0010001	S43SB0010101	S43SS0020001	S43SB0020101	S43SS0030001	S43SS0030001-D	S43SB0030101	S43SB0030101-D	S43SS0040001	S43SB0040101	S43SS0050001	S43SB0050101
SAMPLE DATE					7/14/2005	7/14/2005	7/14/2005	7/14/2005	7/14/2005	7/14/2005	7/14/2005	7/14/2005	7/14/2005	7/14/2005	7/14/2005	7/14/2005
VOLATILE ORGANIC COMPOUNDS (µg/kg)																
2-BUTANONE	2,800,000	EPA RSL	--	--	15 U	10 U	20 U	12 U	8 J	13 U	9 J	6 J	14 U	7 J	10 U	8 J
2-HEXANONE	21,000	EPA RSL	--	--	15 U	10 U	20 U	12 U	13 U	13 U	14 U	13 U	14 U	14 U	10 U	12 U
4-METHYL-2-PENTANONE	530,000	EPA RSL	--	--	15 U	10 U	20 U	12 U	13 U	13 U	14 U	13 U	14 U	14 U	10 U	12 U
ACETONE	6,100,000	EPA RSL	--	--	15 U	10 U	20 U	12 U	31 J	48 J	12 J	13 J	12 J	10 J	25 J	17 J
CARBON DISULFIDE	82,000	EPA RSL	--	--	15 U	10 U	20 U	12 U	13 U	13 U	14 U	13 U	14 U	14 U	10 U	12 U
CIS-1,2-DICHLOROETHENE	16,000	EPA RSL	--	--	15 U	10 U	20 U	12 U	13 U	13 U	14 U	13 U	14 U	14 U	10 U	12 U
METHYLENE CHLORIDE	56,000	EPA RSL	--	--	8 B	8 B	210 J	5 B	130 J	6 B	150 J	130 J	130 J	140 J	6 B	120 J
TETRACHLOROETHENE	1,200	MDE	--	--	15 U	10 U	20 U	12 U	13 U	13 U	14 U	13 U	14 U	14 U	10 U	12 U
TOLUENE	500,000	EPA RSL	--	--	15 U	10 U	20 U	12 U	13 U	13 U	14 U	13 U	14 U	14 U	10 U	12 U
TRICHLOROETHENE	910	EPA RSL	--	--	15 U	8 J	20 U	12 U	13 U	13 U	14 U	13 U	14 U	14 U	10 U	12 U
VINYL CHLORIDE	60	EPA RSL	--	--	15 U	10 U	20 U	12 U	13 U	13 U	14 U	13 U	14 U	14 U	10 U	12 U
EXPLOSIVES (mg/kg)																
1,3,5-TRINITROBENZENE	220	EPA RSL	--	--	0.25 U	0.25 U	0.25 U	0.25 U	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	0.61	EPA RSL	--	--	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
3-NITROTOLUENE	0.61	EPA RSL	--	--	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.043 J	0.25 U
4-NITROTOLUENE	30	EPA RSL	--	--	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
NITROCELLULOSE	18,000,000	EPA RSL	--	--	8 J	1.5 B	9 J	1.4 B	1.2 B	1.3 B	1.1 B	1.2 B	1.4 B	1.5 B	1.4 B	1.5 B
NITROGUANIDINE	610	EPA RSL	--	--	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
METALS (mg/kg)																
ALUMINUM	7,700	EPA RSL	19,700	21,400	4,410 J	3,490 J	7,230 J	3,380 J	**17,000 J**	**18,300 J**	**16,200 J**	**16,800 J**	**18,400 J**	**16,200 J**	7,190 J	**18,300 J**
ARSENIC	0.61	EPA RSL	14.9	28.7	**4.3**	**3.6**	**5.3 K**	**2.7**	**5.7 K**	**3.9**	**11.3 K**	**13.5 K**	**3.8**	**8.5**	**5.2 K**	**2.6**
BARIUM	1,500	EPA RSL	80.4	66.5	25.9 J	20.4	64.0 J	29.5	165 J	457 J	93.4	92.4	112 J	106	37.8 J	133
BERYLLIUM	16	EPA RSL	1.1	1.5	0.27	0.26	0.40	1.6	1.2	0.95	1.2	1.2	0.63	1.1	0.37	0.88
CADMIUM	3.9	MDE	2.5	0.61	0.95	0.16	0.82 K	0.40	0.35 K	0.13	0.41 K	0.4 K	0.22	0.16	0.2 K	0.058
CALCIUM	--	NA	2,060	1,270	1,610	176	1,170	1,280	279	256	143	194	350	116	1,140	296
CHROMIUM	0.29	EPA RSL	33.4	59.1	**19.9 J**	**18.2 J**	**37.5 J**	**17.3 J**	**20.2 J**	**17.1 J**	**18.5 J**	**22.1 J**	**20.2 J**	**16.7 J**	**27.5 J**	**17.1 J**
COBALT	2.3	EPA RSL	22.3	14.7	**7.0**	**3.5**	**19.3**	**4.6**	**1.7 L**	**2.4**	**3**	**3**	**3.2**	**4.9**	**5.7**	**3.8**
COPPER	310	EPA RSL	20.3	47.6	22.8 J	9.7	25.7 J	21.9	20.2 J	14 J	16.8	17.7	13.9 J	14.8	13 J	12
IRON	5,500	EPA RSL	38,500	35,200	**13,500**	**14,100**	**23,400**	**18,700**	**34,600**	**16,800**	**41,200**	**41,500**	**16,500**	**19,200**	**19,700**	**8,550**
LEAD	400	EPA RSL	62.5	38.6	91.0	6.1	42.3	7.7	22.9	19.7	15.6	16.8	15.8	17.0	9.5	18.5
MAGNESIUM	--	NA	1,620	2,940	3,860	196	765	777	469	535	586	637	675	607	369	629
MANGANESE	160	MDE	1,390	155	**228 J**	110 J	**813 J**	**227 J**	9.9 J	9.9 J	10.9 J	12.3 J	15.9 J	10.2 J	156 J	29.9 J
MERCURY	0.78	MDE	0.16	0.14	0.05 U	0.045 U	0.05 U	0.048 U	0.062 K	0.063 U	0.056 U	0.06 U	0.34	0.065 U	0.051 U	0.056 U
NICKEL	150	EPA RSL	15.4	15.9	38.8	7.0	12.6	5.5	5.1 L	7.4	7.5 L	7.9 L	7.1	9.7	6.6	8.2
POTASSIUM	--	NA	1,470	3,440	299	311	441	380	366 L	466	420 L	504 L	530	408	351	357
SELENIUM	39	EPA RSL	1.2	3.8	0.56 UR	0.49 UR	0.54 UR	0.58 UR	0.62 UR	0.72 UR	0.6 UR	0.67 UR	0.56 UR	0.71 UR	0.52 UR	0.65 UR
SILVER	39	EPA RSL	0.84	1.1	0.46 B	0.31 B	0.55 B	0.14 U	1.7 B	2 B	1.5 B	1.6 B	2.0 B	1.8 B	0.6 B	2 B
SODIUM	--	NA	120	461	281	288	465	265	99.9 K	111	128 K	129 K	102	263	173	344
THALLIUM	0.078	EPA RSL	2.3	4.1	0.38 U	0.33 U	0.36 U	0.39 U	0.41 U	**0.88 B**	0.4 U	0.45 U	0.38 U	0.48 U	0.34 U	0.43 U
VANADIUM	7.8	MDE	53.3	102	**39.4**	**16.2**	**36.0**	**25.3**	**26.3**	**24.2**	**49.2**	**55.8**	**31.0**	**38.7**	**37.3**	**18.3**
ZINC	2,300	EPA RSL	37.5	49.7	70.8 K	23.1 K	58.4 K	13.1 K	14.5 K	16.2 K	16.7 K	18.7 K	19.4 K	22.6 K	13.2 K	20.5 K
MISCELLANEOUS PARAMETERS																
CYANIDE (mg/kg)	2.2	EPA RSL	--	--	0.095 U	1.4	0.089 U	0.097 U	0.12 U	0.12 U	0.13 U	0.12 U	0.12 U	0.12 U	0.1 U	0.11 U
TOTAL ORGANIC CARBON (mg/kg)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PERCHLORATE (µg/kg)	5,500	EPA RSL	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

PSL : Project Screening Level
DUP : Duplicate sample
µg/kg : micrograms per kilogram
mg/kg : milligram per kilogram
NA : Not Applicable

J : Estimated value
B : Compound detected in blank sample
K : Biased high
L : Biased Low
R : The chemical was rejected.
U : The chemical was not detected.

-- : The chemical was not analyzed or no value was available.

Bold and shaded (except metals) values indicate an exceedance of PSLs

For Metals: Bolded values indicate an exceedance of PSLs

For Metals: Shaded indicate exceedances of NSF-IH Background subsurface soil

EPA RSL : U.S. Environmental Protection Agency (EPA) (May 2013) Regional Screening Level (RSL) forsoil under residential scenario. RSLs based on non-carcinogenic effects have been divided by 10 to account for exposure to multiple constituents.

MDE : Maryland Department of Environment Cleanup Standards for residential soil. Standards based on non-carcinogenic effects have been divided by 10 to account for exposure to multiple constituents.

[1] Selected PSL is the lowest (most conservative) of the applicable screening criteria

[2] Values taken from Tetra Tech, 2002. *Background Soil Investigation Report for Indian Head and Stump Neck Annex, Indian Head Division, Naval Surface Warfare Cener, Indian Head, Maryland*.

TABLE 4-1
SOIL ANALYTICAL DETECTIONS
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

LOCATION	PSL [1]	PSL REFERENCE	NSF-IH Background Surface Soil[2]	NSF-IH Background Subsurface Soil[2]	S43SB006		S43-SB008		S43-SB009			S43-SB010	S43-SB011			S43-SB012	
SAMPLE ID					S43SS0060001	S43SB0060101	S43SB008-0608	S43SB008-0607	S43SB009-0608	S43SB009-0708	S43SB009-0708-DUP	S43SB010-0709	S43SB011-0709	S43SB011-0709-DUP	S43SB011-0507	S43SB012-0507	S43SB012-0507-DUP
SAMPLE DATE					7/14/2005	7/14/2005	6/4/2011	6/10/2011	6/4/2011	6/10/2011	6/10/2011	6/3/2011	6/4/2011	6/4/2011	6/10/2011	6/11/2011	6/11/2011
VOLATILE ORGANIC COMPOUNDS (µg/kg)																	
2-BUTANONE	2,800,000	EPA RSL	--	--	7 U	10 U	--	5 U	--	4.91 U	5.07 U	5.62 U	--	--	208 U	5.04 U	5.04 U
2-HEXANONE	21,000	EPA RSL	--	--	7 U	10 U	--	2.5 U	--	2.45 U	2.53 U	2.81 U	--	--	104 U	2.52 U	2.52 U
4-METHYL-2-PENTANONE	530,000	EPA RSL	--	--	7 U	10 U	--	2.5 U	--	2.45 U	2.53 U	2.81 U	--	--	104 U	2.52 U	2.52 U
ACETONE	6,100,000	EPA RSL	--	--	16 J	19 J	--	20 J	--	14.5 J	13.3 J	11.2 UR	--	--	416 U	12.1 B	12 J
CARBON DISULFIDE	82,000	EPA RSL	--	--	0.8 J	10 U	--	2.5 U	--	2.45 U	2.53 U	2.81 U	--	--	104 U	2.52 U	2.52 U
CIS-1,2-DICHLOROETHENE	16,000	EPA RSL	--	--	7 U	10 U	--	2.5 U	--	2.45 U	2.53 U	2.81 U	--	--	104 U	2.52 U	2.52 U
METHYLENE CHLORIDE	56,000	EPA RSL	--	--	9 B	8 B	--	5 U	--	4.91 U	5.07 U	9.47 B	--	--	208 U	5.04 U	5.04 U
TETRACHLOROETHENE	1,200	MDE	--	--	7 U	10 U	--	2.5 U	--	2.45 U	2.53 U	1.65 J	--	--	104 U	2.52 U	2.52 U
TOLUENE	500,000	EPA RSL	--	--	0.8 J	10 U	--	2.5 U	--	2.45 U	2.53 U	2.81 U	--	--	104 U	2.52 U	2.52 U
TRICHLOROETHENE	910	EPA RSL	--	--	7 U	10 U	--	2.5 U	--	2.45 U	2.53 U	2.81 U	--	--	470	2.52 U	2.52 U
VINYL CHLORIDE	60	EPA RSL	--	--	7 U	10 U	--	2.5 U	--	2.45 U	2.53 U	2.81 U	--	--	104 U	2.52 U	2.52 U
EXPLOSIVES (mg/kg)																	
1,3,5-TRINITROBENZENE	220	EPA RSL	--	--	0.25 U	0.25 U	0.0392 U	--	0.0385 U	--	--	0.0396 U	0.0396 U	0.0367 U	--	0.0367 U	0.0396 U
1,3-DINITROBENZENE	0.61	EPA RSL	--	--	0.25 U	0.25 U	0.0392 U	--	0.0375 J	--	--	0.0396 U	0.0396 U	0.0367 U	--	0.0367 U	0.0396 U
3-NITROTOLUENE	0.61	EPA RSL	--	--	0.25 U	0.25 U	0.0392 U	--	0.0385 U	--	--	0.0396 U	0.0396 U	0.0367 U	--	0.0367 U	0.0396 U
4-NITROTOLUENE	30	EPA RSL	--	--	0.25 U	0.25 U	0.0392 U	--	0.0385 U	--	--	0.0396 U	0.064 J	0.0367 U	--	0.0367 U	0.0396 U
NITROCELLULOSE	18,000,000	EPA RSL	--	--	1 B	1.5 B	--	--	--	--	--	--	--	--	--	--	--
NITROGUANIDINE	610	EPA RSL	--	--	0.25 U	0.25 U	0.37 UJ	--	0.455 UJ	--	--	0.345 U	0.455 UJ	0.37 UJ	--	0.476 UJ	0.455 UJ
METALS (mg/kg)																	
ALUMINUM	7,700	EPA RSL	19,700	21,400	3,370 J	**18,500 J**	5,890	--	**8,690**	--	--	5,970	**8,040**	7,100	--	**10,500**	**8,440**
ARSENIC	0.61	EPA RSL	14.9	28.7	**4.6**	**3**	**1.53 J**	--	**3.01 J**	--	--	**0.925 J**	**2.25 J**	**5.24 J**	--	**2.91**	**2.92**
BARIUM	1,500	EPA RSL	80.4	66.5	15.1 J	134	28.2 J	--	51.1 J	--	--	30.8	39.6 J	16.7 J	--	221	165
BERYLLIUM	16	EPA RSL	1.1	1.5	0.19	0.91	0.361	--	0.777	--	--	0.455 J	0.557	0.613	--	0.713	0.666
CADMIUM	3.9	MDE	2.5	0.61	0.16 K	0.1	0.117 U	--	0.118 U	--	--	0.239 U	0.119 U	0.115 U	--	0.284 U	0.292 U
CALCIUM	--	NA	2,060	1,270	20,000	131	--	--	--	--	--	--	--	--	--	--	--
CHROMIUM	0.29	EPA RSL	33.4	59.1	**23.5 J**	**17 J**	**8.03 K**	--	**15.8 K**	--	--	**10**	**13.3 K**	**14.5 K**	--	**16.2**	**13.4**
COBALT	2.3	EPA RSL	22.3	14.7	**4.1**	**2.8**	**3.36**	--	**5.28**	--	--	**2.54**	**6.12**	**5.13**	--	**6.16**	**5.32**
COPPER	310	EPA RSL	20.3	47.6	17.1 J	11.6	4.8	--	14	--	--	10	8.13	11.6	--	12.1	10.2
IRON	5,500	EPA RSL	38,500	35,200	**12,100**	**13,400**	**9,430**	--	**14,500**	--	--	**8,670**	**9,380**	**15,500**	--	**9,620**	**9,590**
LEAD	400	EPA RSL	62.5	38.6	5.5	17.2	5.34	--	11.6	--	--	5.99	9.23	9.19	--	10.7	9.36
MAGNESIUM	--	NA	1,620	2,940	11,500	579	--	--	--	--	--	--	--	--	--	--	--
MANGANESE	160	MDE	1,390	155	102 J	43.4 J	23.3 K	--	16.9 K	--	--	11.5	28.6 K	30 K	--	30.9 J	18.1 J
MERCURY	0.78	MDE	0.16	0.14	0.043 U	0.049 U	0.0128 J	--	0.0347 U	--	--	0.0418 U	0.0292 U	0.0383 U	--	0.0376 U	0.036 U
NICKEL	150	EPA RSL	15.4	15.9	7.7	7.4	6.02	--	10.3	--	--	5.92	10.4	9.5	--	11.2	9.88
POTASSIUM	--	NA	1,470	3,440	366	412	--	--	--	--	--	--	--	--	--	--	--
SELENIUM	39	EPA RSL	1.2	3.8	0.54 UR	0.64 UR	0.293 UL	--	0.343 J	--	--	0.597 U	0.223 J	0.258 J	--	0.569 UL	0.585 UL
SILVER	39	EPA RSL	0.84	1.1	0.13 U	2 B	0.117 U	--	0.118 U	--	--	0.239 U	0.119 U	0.115 U	--	0.569 UL	0.585 UL
SODIUM	--	NA	120	461	133	260	--	--	--	--	--	--	--	--	--	--	--
THALLIUM	0.078	EPA RSL	2.3	4.1	0.36 U	**0.61 B**	0.235 U	--	0.472 U	--	--	0.478 U	0.474 U	0.461 U	--	0.455 U	0.468 U
VANADIUM	7.8	MDE	53.3	102	**42**	**22.2**	**11.3 J**	--	**27.1 J**	--	--	**12.7**	**16.4 J**	**29.9 J**	--	**18.3**	**18**
ZINC	2,300	EPA RSL	37.5	49.7	9.7 K	15.2 K	18.8 K	--	35.7 K	--	--	16.9	27.8 K	31.4 K	--	35.2	33.8
MISCELLANEOUS PARAMETERS																	
CYANIDE (mg/kg)	2.2	EPA RSL	--	--	0.096 U	0.21	0.292 U	--	0.266 U	--	--	0.266 U	0.285 U	0.291 U	--	0.883 U	0.873 U
TOTAL ORGANIC CARBON (mg/kg)	--	--	--	--	--	--	1,180 J	--	1,660	--	--	702 J	1,210 J	900 J	--	1,260 J	1,690
PERCHLORATE (µg/kg)	5,500	EPA RSL	--	--	--	--	3.86 J	--	2.38 UJ	--	--	2.45 U	2.42 UJ	4.84 J	--	2.36 UJ	2.33 U

Notes:

PSL : Project Screening Level
DUP : Duplicate sample
µg/kg : micrograms per kilogram
mg/kg : milligram per kilogram
NA : Not Applicable

J : Estimated value
B : Compound detected in blank sample
K : Biased high
L : Biased Low
R : The chemical was rejected.
U : The chemical was not detected.

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Bold and shaded (except metals) values indicate an exceedance of PSLs

For Metals: Bolded values indicate an exceedance of PSLs

For Metals: Shaded indicate exceedances of NSF-IH Background subsurface soil

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SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

LOCATION	PSL [1]	PSL REFERENCE	NSF-IH Background Surface Soil[2]	NSF-IH Background Subsurface Soil[2]	S43-SB013	S43-SB014	S43-SB015	S43-SB016		S43-SB017	S43-SB018	S43-SB019	S43-SB022	S43-SB023		
SAMPLE ID					S43SB013-0608	S43SB014-0709	S43SB015-0810	S43SB016-0608	S43SB016-0607	S43SB017-0608	S43SB018-0507	S43SB019-0607	S43SB022-0708	S43SB023-0001	S43SB023-0001-DUP	S43SB023-0607
SAMPLE DATE					6/3/2011	6/4/2011	6/3/2011	6/5/2011	6/12/2011	6/10/2011	6/10/2011	6/11/2011	6/11/2011	5/13/2012	5/13/2012	5/13/2012
VOLATILE ORGANIC COMPOUNDS (µg/kg)																
2-BUTANONE	2,800,000	EPA RSL	--	--	4.6 U	--	564 J	--	4.73 U	239 U	236 U	4.52 U	837	5.28 U	4.93 U	5020 U
2-HEXANONE	21,000	EPA RSL	--	--	2.3 U	--	16	--	2.37 U	120 U	118 U	2.26 U	132 U	2.64 U	2.47 U	2,510 U
4-METHYL-2-PENTANONE	530,000	EPA RSL	--	--	2.3 U	--	5190 J	--	2.37 U	120 U	118 U	2.26 U	19,100 J	2.64 U	2.47 U	2,510 U
ACETONE	6,100,000	EPA RSL	--	--	9.2 UR	--	157000 J	--	18.3 J	478 U	472 U	23.6 J	4,660,000	26.1 B	19.1 B	195,000 J
CARBON DISULFIDE	82,000	EPA RSL	--	--	2.3 U	--	2.44 U	--	2.37 U	120 U	118 U	2.26 U	132 U	2.64 U	2.47 U	2,510 U
CIS-1,2-DICHLOROETHENE	16,000	EPA RSL	--	--	2.3 U	--	2.44 U	--	2.37 U	397	118 U	2.26 U	585	2.64 U	2.47 U	2,510 U
METHYLENE CHLORIDE	56,000	EPA RSL	--	--	6.81 J	--	8.6 J	--	4.73 U	239 U	236 U	4.52 U	265 U	5.28 U	4.93 U	3,590 J
TETRACHLOROETHENE	1,200	MDE	--	--	2.3 U	--	2.44 U	--	2.37 U	120 U	118 U	2.26 U	132 U	2.64 U	2.47 U	2,510 U
TOLUENE	500,000	EPA RSL	--	--	1.29 J	--	2.44 U	--	2.37 U	120 U	118 U	2.26 U	132 U	2.64 U	2.47 U	2,510 U
TRICHLOROETHENE	910	EPA RSL	--	--	2.3 U	--	2.44 U	--	2.37 U	**3,940**	776	2.26 U	132 U	2.64 U	2.47 U	2,510 U
VINYL CHLORIDE	60	EPA RSL	--	--	2.3 U	--	2.44 U	--	2.37 U	120 U	118 U	14.3	132 U	2.64 U	2.47 U	2,510 U
EXPLOSIVES (mg/kg)																
1,3,5-TRINITROBENZENE	220	EPA RSL	--	--	0.0367 U	0.0377 U	0.0381 U	0.0392 U	--	0.0377 U	0.0381 U	--	--	0.0392 U	0.0385 U	0.0385 U
1,3-DINITROBENZENE	0.61	EPA RSL	--	--	0.0367 U	0.0377 U	0.0381 U	0.032 J	--	0.0377 U	0.0381 U	--	--	0.0392 U	0.0385 U	0.0385 U
3-NITROTOLUENE	0.61	EPA RSL	--	--	0.0367 U	0.0377 U	0.0381 U	0.0392 U	--	0.0377 U	0.0381 U	--	--	0.0392 U	0.0385 U	0.0385 U
4-NITROTOLUENE	30	EPA RSL	--	--	0.0367 U	0.0234 J	0.0381 U	0.0239 J	--	0.0377 U	0.0381 U	--	--	0.0392 U	0.0385 U	0.0385 U
NITROCELLULOSE	18,000,000	EPA RSL	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NITROGUANIDINE	610	EPA RSL	--	--	0.435 U	0.385 UJ	0.417 U	0.37 UJ	--	0.476 UJ	0.455 UJ	--	--	0.182 U	0.2 U	0.19 U
METALS (mg/kg)																
ALUMINUM	7,700	EPA RSL	19,700	21,400	2,180	**12,300**	**10,600**	**9,680**	--	7,220	7,260	--	--	**20,200**	**20,000**	**11,200**
ARSENIC	0.61	EPA RSL	14.9	28.7	**0.834 J**	**2.48 J**	**2.14 L**	**1.19 J**	--	**1.28**	**0.895**	--	--	**2.69 L**	**4.28 L**	**1.88 L**
BARIUM	1,500	EPA RSL	80.4	66.5	19	115 J	148	55.4 J	--	33.2	25.6	--	--	76 L	80.2 L	408 K
BERYLLIUM	16	EPA RSL	1.1	1.5	0.295 J	0.855	0.844	0.675	--	0.545	0.605	--	--	0.815	0.859	0.704
CADMIUM	3.9	MDE	2.5	0.61	0.232 U	0.112 U	0.233 U	0.113 U	--	0.298 U	0.288 U	--	--	0.459 J	2.13 J	0.118 U
CALCIUM	--	NA	2,060	1,270	--	--	--	--	--	--	--	--	--	--	--	--
CHROMIUM	0.29	EPA RSL	33.4	59.1	**18.5**	**15.7 K**	**13.1**	**14.2 K**	--	**12.7**	**11.9**	--	--	**21.3 K**	**24.4 K**	**16.4 K**
COBALT	2.3	EPA RSL	22.3	14.7	**1.47**	**5.45**	**4.17**	**5.29**	--	**5.04**	**4.71**	--	--	**3.64**	**4.38**	**6.28**
COPPER	310	EPA RSL	20.3	47.6	7.38	15.3	12.9	10.4	--	6.77	9.81	--	--	21.1	32.7	15.1
IRON	5,500	EPA RSL	38,500	35,200	4,010	**10,600**	**8,630**	**8,290**	--	**9,110**	**10,500**	--	--	**25,900 J**	**32,100 J**	**12,300 J**
LEAD	400	EPA RSL	62.5	38.6	5.02	13.3	11.4	9.87	--	8.21	8.1	--	--	14.8 J	28.2 J	9.2
MAGNESIUM	--	NA	1,620	2,940	--	--	--	--	--	--	--	--	--	--	--	--
MANGANESE	160	MDE	1,390	155	23	17 K	10.3	9.75 K	--	16.5 J	15.4 J	--	--	26.8 K	36.6 K	17.8 K
MERCURY	0.78	MDE	0.16	0.14	0.0368 U	0.0133 J	0.0364 U	0.0388 U	--	0.0351 U	0.0365 U	--	--	0.0259 J	0.0207 J	0.03 U
NICKEL	150	EPA RSL	15.4	15.9	5.26	11.8	10.1	9.09	--	8.38	8.97	--	--	9.2	9.72	14.5
POTASSIUM	--	NA	1,470	3,440	--	--	--	--	--	--	--	--	--	--	--	--
SELENIUM	39	EPA RSL	1.2	3.8	0.58 U	0.28 UL	0.583 U	0.284 UL	--	0.596 UL	0.575 UL	--	--	0.54 J	0.565 J	0.295 UL
SILVER	39	EPA RSL	0.84	1.1	0.232 U	0.112 U	0.233 U	0.113 U	--	0.596 UL	0.575 UL	--	--	0.133 U	0.086 J	0.118 U
SODIUM	--	NA	120	461	--	--	--	--	--	--	--	--	--	--	--	--
THALLIUM	0.078	EPA RSL	2.3	4.1	0.464 U	0.392 U	0.466 U	0.454 U	--	0.477 U	0.46 U	--	--	0.266 UL	0.257 UL	0.295 UL
VANADIUM	7.8	MDE	53.3	102	7.53	**20.3 J**	**20.1**	**12.6 J**	--	**17.8**	**16.7**	--	--	**32**	**33.8**	**25.4**
ZINC	2,300	EPA RSL	37.5	49.7	9.98	46.6 K	26.3	36.2 K	--	23.1	22.7	--	--	47.1 J	110 J	23.5 J
MISCELLANEOUS PARAMETERS																
CYANIDE (mg/kg)	2.2	EPA RSL	--	--	0.268 U	0.294 U	0.272 U	0.265 U	--	0.877 U	0.884 U	--	--	--	--	--
TOTAL ORGANIC CARBON (mg/kg)	--	--	--	--	1,100 J	1,030 J	828 J	1,020 J	--	588 J	1,130 J	--	--	--	--	--
PERCHLORATE (µg/kg)	5,500	EPA RSL	--	--	2.38 U	1.08 J	2.35 U	2.35 UJ	--	2.34 UJ	2.36 UJ	--	--	--	--	--

Notes:

PSL : Project Screening Level
DUP : Duplicate sample
µg/kg : micrograms per kilogram
mg/kg : milligram per kilogram
NA : Not Applicable

J : Estimated value
B : Compound detected in blank sample
K : Biased high
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For Metals: Bolded values indicate an exceedance of PSLs

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NSF INDIAN HEAD, MARYLAND

LOCATION	PSL [1]	PSL REFERENCE	NSF-IH Background Surface Soil[2]	NSF-IH Background Subsurface Soil[2]	S43-SB024			S43-SB025		S43-SB026		S43-SB027		S43-SB028	
SAMPLE ID					S43SB024-0001	S43SB024-0607	S43SB024-0607-DUP	S43SB025-0001	S43SB025-0607	S43SB026-0001	S43SB026-0506	S43SB027-0001	S43SB027-0708	S43SB028-0001	S43SB028-0405
SAMPLE DATE					5/13/2012	5/13/2012	5/13/2012	5/13/2012	5/13/2012	5/13/2012	5/13/2012	5/13/2012	5/13/2012	5/13/2012	5/13/2012
VOLATILE ORGANIC COMPOUNDS (µg/kg)															
2-BUTANONE	2,800,000	EPA RSL	--	--	4.59 U	256 U	257 U	4.34 U	250 U	6.03 U	233 U	229 U	278 U	486 U	5.12 U
2-HEXANONE	21,000	EPA RSL	--	--	2.3 U	128 U	128 U	2.17 U	125 U	3.02 U	117 U	114 U	139 U	243 U	2.56 U
4-METHYL-2-PENTANONE	530,000	EPA RSL	--	--	2.3 U	128 U	128 U	2.17 U	125 U	3.02 U	117 U	114 U	139 U	243 U	2.56 U
ACETONE	6,100,000	EPA RSL	--	--	20.4 B	512 U	513 U	8.95 B	500 U	14.8 B	467 U	457 U	556 U	972 U	10.2 U
CARBON DISULFIDE	82,000	EPA RSL	--	--	2.3 U	128 U	128 U	2.17 U	125 U	3.02 U	117 U	114 U	139 U	243 U	2.56 U
CIS-1,2-DICHLOROETHENE	16,000	EPA RSL	--	--	14.4	442	397	2.17 U	100 J	23.7	117 U	175 J	447	243 U	2.56 U
METHYLENE CHLORIDE	56,000	EPA RSL	--	--	4.59 U	256 U	257 U	4.34 U	250 U	6.03 U	233 U	229 U	278 U	486 U	5.12 U
TETRACHLOROETHENE	1,200	MDE	--	--	2.3 U	128 U	128 U	2.17 U	125 U	3.02 U	117 U	114 U	139 U	243 U	2.56 U
TOLUENE	500,000	EPA RSL	--	--	2.3 U	128 U	128 U	2.17 U	125 U	3.02 U	117 U	114 U	139 U	243 U	2.56 UJ
TRICHLOROETHENE	910	EPA RSL	--	--	2.3 U	**2,080**	**1,700**	1.91 J	**2,380**	69.4	**1,150**	**2,720**	**4,790**	243 U	2.56 U
VINYL CHLORIDE	60	EPA RSL	--	--	2.3 U	128 U	128 U	2.17 U	125 U	2.18 J	117 U	114 U	139 U	243 U	2.56 U
EXPLOSIVES (mg/kg)															
1,3,5-TRINITROBENZENE	220	EPA RSL	--	--	0.0385 U	0.0385 U	0.04 U	0.0396 U	0.0392 U	0.04 U	0.0396 U	0.0385 U	0.0388 U	0.032 J	0.0388 U
1,3-DINITROBENZENE	0.61	EPA RSL	--	--	0.0385 U	0.0385 U	0.04 U	0.0396 U	0.0392 U	0.04 U	0.0396 U	0.0385 U	0.0277 J	0.0388 U	0.0388 U
3-NITROTOLUENE	0.61	EPA RSL	--	--	0.0385 U	0.0385 U	0.04 U	0.0396 U	0.0392 U	0.04 U	0.0396 U	0.0385 U	0.0388 U	0.0388 U	0.0388 U
4-NITROTOLUENE	30	EPA RSL	--	--	0.0385 U	0.0385 U	0.04 U	0.0396 U	0.0392 U	0.04 U	0.0396 U	0.0385 U	0.0388 U	0.0388 U	0.0388 U
NITROCELLULOSE	18,000,000	EPA RSL	--	--	--	--	--	--	--	--	--	--	--	--	--
NITROGUANIDINE	610	EPA RSL	--	--	0.211 U	0.19 U	0.182 U	0.182 U	0.19 U	0.19 U	0.211 U	0.2 U	0.19 U	0.429 J	0.174 U
METALS (mg/kg)															
ALUMINUM	7,700	EPA RSL	19,700	21,400	**17,400**	**8,860**	**8,640**	**15,700**	**8,390**	**16,000**	**9,620**	**13,100**	7,170	**17,600**	**10,400**
ARSENIC	0.61	EPA RSL	14.9	28.7	**1.95 L**	**1.41 L**	**2.08 L**	**2.27 L**	**1.45 L**	**1.6 L**	**2.34 L**	**2.68 L**	**1.15 L**	**12.3**	**2.53 L**
BARIUM	1,500	EPA RSL	80.4	66.5	60.9 L	33.5 L	31.6 L	56.1 L	53.7 L	70.3 L	177 L	233 L	14.9 L	132 L	43.5 L
BERYLLIUM	16	EPA RSL	1.1	1.5	0.691	0.557	0.552	0.572	0.507	0.524	0.462	0.534	0.435	0.883	0.742
CADMIUM	3.9	MDE	2.5	0.61	0.471	0.122 U	0.121 U	0.072 J	0.119 U	0.0996 J	0.124 U	0.0774 J	0.121 U	**12.2**	0.0771 J
CALCIUM	--	NA	2,060	1,270	--	--	--	--	--	--	--	--	--	--	--
CHROMIUM	0.29	EPA RSL	33.4	59.1	**19.1 K**	**14.3 K**	**13.4 K**	**18.3 K**	**13.3 K**	**19.5 K**	**14.3 K**	**17.1 K**	**10.7 K**	**30.3 K**	**18.5 K**
COBALT	2.3	EPA RSL	22.3	14.7	**3.34**	**4.58**	**3.81**	**2.94**	**3.69**	**3.76**	**4.38**	**4.74**	**3.73**	**11.7**	**4.38**
COPPER	310	EPA RSL	20.3	47.6	16.6	10.8	10.2	14.9	11.3	12.3	11.9	10.6	10.4	57.4	14.4
IRON	5,500	EPA RSL	38,500	35,200	**18,500 J**	**13,700 J**	**12,200 J**	**15,400 J**	**10,400 J**	**12,700 J**	**14,400 J**	**12,500 J**	**14,600 J**	**23,900 J**	**17,300 J**
LEAD	400	EPA RSL	62.5	38.6	12.3	7.8	7.85	11	7.79	10.4	8.96	9.69	6.63	74	10.9
MAGNESIUM	--	NA	1,620	2,940	--	--	--	--	--	--	--	--	--	--	--
MANGANESE	160	MDE	1,390	155	14.7 K	17.3 K	19.6 K	17.2 K	20.4 K	28.2 K	18.3 K	22.2 K	11.5 K	**391 K**	106 K
MERCURY	0.78	MDE	0.16	0.14	0.034 U	0.029 U	0.037 U	0.035 U	0.032 U	0.033 U	0.035 U	0.033 U	0.030 U	0.12	0.0221 J
NICKEL	150	EPA RSL	15.4	15.9	7.66	8.23	7.63	7.1	8.06	8.25	8.22	9.14	6.12	24.3	7.26
POTASSIUM	--	NA	1,470	3,440	--	--	--	--	--	--	--	--	--	--	--
SELENIUM	39	EPA RSL	1.2	3.8	0.331 J	0.253 J	0.353 J	0.396 J	0.227 J	0.31 J	0.358 J	0.256 J	0.279 J	0.801 J	0.327 J
SILVER	39	EPA RSL	0.84	1.1	0.0673 J	0.122 U	0.121 U	0.0848 J	0.119 U	0.121 U	0.124 U	0.129 U	0.121 U	0.262 J	0.133 U
SODIUM	--	NA	120	461	--	--	--	--	--	--	--	--	--	--	--
THALLIUM	0.078	EPA RSL	2.3	4.1	0.369 UL	0.304 UL	0.303 UL	0.31 UL	0.298 UL	0.242 UL	0.247 UL	0.258 UL	0.303 UL	**0.664 J**	0.266 UL
VANADIUM	7.8	MDE	53.3	102	**29.5**	**17**	**19.8**	**32.7**	**22.4**	**32.4**	**20.2**	**34.6**	**13.3**	**44.6**	**34**
ZINC	2,300	EPA RSL	37.5	49.7	33.5 J	24.4 J	21.4 J	19.4 J	20.8 J	19.7 J	21.2 J	23.8 J	16.5 J	402 J	31 J
MISCELLANEOUS PARAMETERS															
CYANIDE (mg/kg)	2.2	EPA RSL	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL ORGANIC CARBON (mg/kg)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PERCHLORATE (µg/kg)	5,500	EPA RSL	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

PSL : Project Screening Level
DUP : Duplicate sample
µg/kg : micrograms per kilogram
mg/kg : milligram per kilogram
NA : Not Applicable

J : Estimated value
B : Compound detected in blank sample
K : Biased high
L : Biased Low
R : The chemical was rejected.
U : The chemical was not detected.

-- : The chemical was not analyzed or no value was available.

Bold and shaded (except metals) values indicate an exceedance of PSLs

For Metals: Bolded values indicate an exceedance of PSLs

For Metals: Shaded indicate exceedances of NSF-IH Background subsurface soil

EPA RSL : U.S. Environmental Protection Agency (EPA) (May 2013) Regional Screening Level (RSL) forsoil under residential scenario. RSLs based on non-carcinogenic effects have been divided by 10 to account for exposure to multiple constituents.

MDE : Maryland Department of Environment Cleanup Standards for residential soil. Standards based on non-carcinogenic effects have been divided by 10 to account for exposure to multiple constituents.

[1] Selected PSL is the lowest (most conservative) of the applicable screening criteria

[2] Values taken from Tetra Tech, 2002. *Background Soil Investigation Report for Indian Head and Stump Neck Annex, Indian Head Division, Naval Surface Warfare Cener, Indian Head, Maryland*.

TABLE 4-2
GROUNDWATER GRAB SAMPLE ANALYTICAL DETECTIONS
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

LOCATION	PSL [1]	PSL	S43NW1	S43W2	S43N4	S43N3	S43W4	S43-TW006	S43-TW007		S43-TW008	S43-TW009	S43-TW011	S43-TW012	S43-TW013	S43-TW014	
SAMPLE ID		Reference	S43TW0010102	S43TW0020102	S43TW0030102	S43TW0040102	S43TW0050102	S43TW006-2832	S43TW007-2327	S43TW007-2327-DUP	S43TW008-2832	S43TW009-2125	S43TW011-3034	S43TW012-2630	S43TW013-2933	S43TW014-1317	S43TW014-2933
VOLATILE ORGANIC COMPOUNDS (µg/L)																	
1,1,1-TRICHLOROETHANE	200	MDE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.50 U	5 U	5 U	0.50 U	2.5 U	0.50 U	0.50 U	0.5 U	0.5 U	0.5 U
1,1-DICHLOROETHANE	2.4	EPA RSL	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.50 U	5 U	5 U	0.50 U	2.5 U	0.50 U	0.50 U	0.5 U	0.5 U	0.5 U
1,1-DICHLOROETHENE	7	MDE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.50 U	4.5 J	4.75 J	0.364 J	2.5 U	0.50 U	0.50 U	0.5 U	0.5 U	0.5 U
1,2-DICHLOROETHANE	0.15	EPA RSL	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.50 U	5 U	5 U	0.50 U	2.5 U	0.50 U	0.50 U	0.5 U	0.5 U	0.5 U
2-BUTANONE	490	EPA RSL	5 U	5 U	4.2 J	5 U	5 U	5 U	50 U	50 U	5 U	25 U	5 U	5 U	5 U	5 U	5 U
ACETONE	550	MDE	5 U	5 U	17.0	5 U	5 U	5 U	50 U	50 U	10.6 J	55.6 J	5 U	5 U	4.26 B	5 U	5 U
BROMOFORM	7.9	EPA RSL	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.50 U	5 U	5 U	0.50 U	2.5 U	0.50 U	0.50 U	0.5 U	0.5 U	0.5 U
CARBON DISULFIDE	72	EPA RSL	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.50 U	5 U	5 U	0.50 U	2.5 U	0.50 U	0.50 U	0.5 U	0.5 U	0.4 J
CHLOROFORM	0.19	EPA RSL	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.50 U	5 U	5 U	0.50 U	2.5 U	0.50 U	0.50 U	0.5 U	0.5 U	0.5 U
CHLOROMETHANE	19	EPA RSL	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.50 U	5 U	5 U	0.50 U	2.5 U	0.50 U	0.50 U	0.5 U	0.5 U	0.5 U
CIS-1,2-DICHLOROETHENE	2.8	EPA RSL	0.36 J	0.5 U	0.5 U	0.5 U	0.5 U	**4.49**	**56.5**	**61.3**	**21.8**	2.61 J	0.50 U	0.50 U	1.71	0.5 U	**3.35**
METHYLENE CHLORIDE	5	MDE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	**7.7 J**	**9.74 J**	0.748 J	4.84 J	1 U	1 U	1 U	1 U	1 U
TETRACHLOROETHENE	5	MDE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.50 U	5 U	5 U	0.50 U	2.5 U	0.50 U	0.50 U	0.5 U	0.5 U	0.5 U
TRANS-1,2-DICHLOROETHENE	8.6	EPA RSL	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.50 U	5 U	5 U	0.50 U	2.5 U	0.50 U	0.50 U	0.61 J	0.5 U	0.5 U
TRICHLOROETHENE	0.44	EPA RSL	**3.2**	0.5 U	0.5 U	0.5 U	0.5 U	**53.9**	**923**	**1010**	**41.9**	**563**	**1.68**	0.50 U	**20.3**	0.5 U	**79.9**
VINYL CHLORIDE	0.015	EPA RSL	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	**0.724 J**	**26.2**	**25.8**	**16.2**	2.5 U	0.50 U	0.50 U	0.5 U	0.5 U	**0.74 J**

Notes:
PSL : Project Screening Level
DUP : Duplicate sample
µg/L : micrograms per liter
J : Estimated value
B : Compound detected in blank sample
K : Biased High
L : Biased Low
D : Diluted value
U : The chemical was not detected.
-- : The chemical was not analyzed or no value was available.
Bold and shaded values indicate an exceedance of PSLs
[1] Selected PSL is the lowest (most conservative) of the applicable screening criteria
EPA RSL: U.S. Environmental Protection Agency (EPA) (May 2012) Regional Screening Level (RSL) for tap water. RSLs based on non-carcinogenic effects have been divided by 10 to account for exposure to multiple constituents.
MDE: Maryland Department of Environment (2008) Cleanup Standards for Type I and II Aquifers. Standards based on non-carcinogenic effects have been divided by 10 to account for exposure to multiple constituents.

TABLE 4-2
GROUNDWATER GRAB SAMPLE ANALYTICAL DETECTIONS
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

LOCATION	PSL [1]	PSL	S43-TW015		S43-TW016			S43-TW017		S43-TW018		S43-TW019		S43-TW020		
SAMPLE ID		Reference	S43TW015-1721	S43TW015-2933	S43TW016-1721	S43TW016-1721-DUP	S43TW016-2933	S43TW017-1923	S43TW017-2933	S43TW018-1923	S43TW018-3034	S43TW019-2024	S43TW019-2832	S43TW020-1923	S43TW020-2933	S43TW020-2933-DUP
VOLATILE ORGANIC COMPOUNDS (µg/L)																
1,1,1-TRICHLOROETHANE	200	MDE	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	2.5 U	2.5 U
1,1-DICHLOROETHANE	2.4	EPA RSL	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	2.5 U	2.5 U
1,1-DICHLOROETHENE	7	MDE	0.56 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1.34 J	2.5 U	2.5 U
1,2-DICHLOROETHANE	0.15	EPA RSL	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	2.5 U	2.5 U
2-BUTANONE	490	EPA RSL	10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	25 U	25 U
ACETONE	550	MDE	10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5.74 B	25 U	25 U
BROMOFORM	7.9	EPA RSL	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	2.5 U	2.5 U
CARBON DISULFIDE	72	EPA RSL	1 U	0.63 J	0.5 U	0.5 U	0.65 J	0.5 U	0.5 U	0.5 U	0.5 U	0.29 J	0.5 U	1 U	2.5 U	2.5 U
CHLOROFORM	0.19	EPA RSL	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	2.5 U	2.5 U
CHLOROMETHANE	19	EPA RSL	1 U	0.5 U	0.37 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.43 J	0.5 U	0.5 U	1 U	2.5 U	2.5 U
CIS-1,2-DICHLOROETHENE	2.8	EPA RSL	**25.7**	1.17	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	**81.8**	**50.2**	**47**
METHYLENE CHLORIDE	5	MDE	2 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1.28 J	5 U	5 U
TETRACHLOROETHENE	5	MDE	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	2.5 U	2.5 U
TRANS-1,2-DICHLOROETHENE	8.6	EPA RSL	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.56 J	2.5 U	2.5 U
TRICHLOROETHENE	0.44	EPA RSL	**158**	**0.64 J**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	**298**	**298**	**287**
VINYL CHLORIDE	0.015	EPA RSL	**1.4 J**	**0.58 J**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	**13.1**	**12.3**	**11.5**

Notes:
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[1] Selected PSL is the lowest (most conservative) of the applicable screening criteria

EPA RSL: U.S. Environmental Protection Agency (EPA) (May 2012) Regional Screening Level (RSL) for tap water. RSLs based on non-carcinogenic effects have been divided by 10 to account for exposure to multiple constituents.

MDE: Maryland Department of Environment (2008) Cleanup Standards for Type I and II Aquifers. Standards based on non-carcinogenic effects have been divided by 10 to account for exposure to multiple constituents.

TABLE 4-2
GROUNDWATER GRAB SAMPLE ANALYTICAL DETECTIONS
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

LOCATION	PSL [1]	PSL	S43-TW021		S43-TW022			S43-TW023			S43-TW024		S43-TW025		S43-TW026		S43-TW027
SAMPLE ID		Reference	S43TW021-1923	S43TW021-2630	S43TW022-1014	S43TW022-2226	S43TW022-3337	S43TW023-1014	S43TW023-2226	S43TW023-3236	S43TW024-2327	S43TW024-3236	S43TW025-1115	S43TW025-2933	S43TW026-1014	S43TW026-3236	S43TW027-2933
VOLATILE ORGANIC COMPOUNDS (µg/L)																	
1,1,1-TRICHLOROETHANE	200	MDE	0.5 U	0.5 U	0.5 U	25 U	1 U	0.5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1-DICHLOROETHANE	2.4	EPA RSL	0.5 U	0.5 U	0.5 U	25 U	1 U	0.5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1-DICHLOROETHENE	7	MDE	0.5 U	0.5 U	0.5 U	25 U	1.7 J	0.5 U	5.5 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-DICHLOROETHANE	0.15	EPA RSL	0.5 U	0.5 U	0.5 U	25 U	1 U	0.5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2-BUTANONE	490	EPA RSL	5 U	5 U	5 U	250 U	10 U	5 U	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
ACETONE	550	MDE	5 U	5 U	5 U	250 U	10 U	4.94 J	50 U	3.3 J	3.97 B	12.5 B	2.5 B	11.6 B	3.31 B	19.8 B	2.93 B
BROMOFORM	7.9	EPA RSL	0.5 U	0.5 U	0.5 U	25 U	1 U	0.5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CARBON DISULFIDE	72	EPA RSL	0.5 U	0.5 U	0.5 U	25 U	0.88 J	0.59 J	5 U	0.44 J	0.31 J	0.39 J	0.5 U	0.77 J	0.25 J	0.5 U	0.5 U
CHLOROFORM	0.19	EPA RSL	0.5 U	0.5 U	**0.37 J**	25 U	1 U	0.5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CHLOROMETHANE	19	EPA RSL	0.5 U	0.5 U	0.5 U	25 U	1 U	0.5 U	5 U	0.5 U	0.5 U	0.5 J	0.5 U	0.65 J	0.5 U	0.5 U	0.5 U
CIS-1,2-DICHLOROETHENE	2.8	EPA RSL	0.69 J	0.5 U	0.64 J	**288**	**170**	0.37 J	**197**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
METHYLENE CHLORIDE	5	MDE	1 U	1 U	1 U	50 U	2 U	1 U	10 U	0.57 J	1 U	0.55 B	1 U	1 U	1 U	0.54 B	0.59 B
TETRACHLOROETHENE	5	MDE	0.5 U	0.5 U	0.5 U	25 U	1 U	0.5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
TRANS-1,2-DICHLOROETHENE	8.6	EPA RSL	0.5 U	0.5 U	0.5 U	25 U	0.88 J	0.5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
TRICHLOROETHENE	0.44	EPA RSL	**1.04**	0.35 J	**1.64**	**4440**	**384**	**1.21**	**833**	**1.61**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
VINYL CHLORIDE	0.015	EPA RSL	0.5 U	0.5 U	0.5 U	**54**	**47.2**	0.5 U	**29.7**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U

Notes:
PSL : Project Screening Level
DUP : Duplicate sample
µg/L : micrograms per liter
J : Estimated value
B : Compound detected in blank sample
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L : Biased Low
D : Diluted value
U : The chemical was not detected.
-- : The chemical was not analyzed or no value was available.
Bold and shaded values indicate an exceedance of PSLs

[1] Selected PSL is the lowest (most conservative) of the applicable screening criteria

EPA RSL: U.S. Environmental Protection Agency (EPA) (May 2012) Regional Screening Level (RSL) for tap water. RSLs based on non-carcinogenic effects have been divided by 10 to account for exposure to multiple constituents.

MDE: Maryland Department of Environment (2008) Cleanup Standards for Type I and II Aquifers. Standards based on non-carcinogenic effects have been divided by 10 to account for exposure to multiple constituents.

TABLE 4-2
GROUNDWATER GRAB SAMPLE ANALYTICAL DETECTIONS
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

LOCATION	PSL [1]	PSL	S43-TW028			S43-TW029		S43-TW030				S43-TW031			S43-TW032		
SAMPLE ID		Reference	S43TW028-1721	S43TW0028-2933	S43TW028-2933-DUP	S43TW029-2226	S43TW029-3236	S43TW030-1317	S43TW030-1317-DUP	S43TW030-2226	S43TW030-3236	S43TW031-1014	S43TW031-2226	S43TW031-3236	S43TW032-2226	S43TW032-2226-DUP	S43TW032-3236
VOLATILE ORGANIC COMPOUNDS (µg/L)																	
1,1,1-TRICHLOROETHANE	200	MDE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1-DICHLOROETHANE	2.4	EPA RSL	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1-DICHLOROETHENE	7	MDE	0.43 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.29 J	0.52 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-DICHLOROETHANE	0.15	EPA RSL	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2-BUTANONE	490	EPA RSL	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
ACETONE	550	MDE	5 U	5 U	5 U	11.4 B	7.81 J	5 U	5 U	4.09 B	5 U	5 U	5 U	12.5 B	5 U	5 U	5 U
BROMOFORM	7.9	EPA RSL	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CARBON DISULFIDE	72	EPA RSL	0.26 J	0.38 J	0.5 U	0.5 U	0.72 J	0.5 U	0.26 J	0.5 U	0.32 J	0.5 U	0.5 U	0.47 J	0.5 U	0.5 U	0.5 U
CHLOROFORM	0.19	EPA RSL	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CHLOROMETHANE	19	EPA RSL	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1.24 J	0.5 U	0.36 J	0.5 U	0.5 U	0.5 U	0.75 J	0.86 J	1.04 J
CIS-1,2-DICHLOROETHENE	2.8	EPA RSL	**120**	0.5 U	0.5 U	0.32 J	**10.5**	0.5 U	0.5 U	**25.9**	**66.8**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
METHYLENE CHLORIDE	5	MDE	1 U	1 U	1 U	0.55 B	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.55 B	1 U	1 U	1 U
TETRACHLOROETHENE	5	MDE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
TRANS-1,2-DICHLOROETHENE	8.6	EPA RSL	0.82 J	0.5 U	0.5 U	0.5 U	0.67 J	0.5 U	0.5 U	0.5 U	0.57 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
TRICHLOROETHENE	0.44	EPA RSL	**2.52**	0.5 U	0.5 U	**1.36**	**23.7**	0.5 U	0.5 U	**68.5**	**93.7**	0.5 U	**0.63 J**	0.5 U	0.5 U	0.5 U	0.5 U
VINYL CHLORIDE	0.015	EPA RSL	**3.46**	0.5 U	0.5 U	0.5 U	**0.49 J**	0.5 U	0.5 U	**2.25**	**54.5**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U

Notes:
PSL : Project Screening Level
DUP : Duplicate sample
µg/L : micrograms per liter
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B : Compound detected in blank sample
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EPA RSL: U.S. Environmental Protection Agency (EPA) (May 2012) Regional Screening Level (RSL) for tap water. RSLs based on non-carcinogenic effects have been divided by 10 to account for exposure to multiple constituents.

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TABLE 4-2
GROUNDWATER GRAB SAMPLE ANALYTICAL DETECTIONS
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

LOCATION	PSL [1]	PSL	S43-TW033		S43-TW034			S43-TW035		S43-TW036		S43-TW037			S43-TW038		S43-TW039
SAMPLE ID		Reference	S43TW033-2226	S43TW033-3236	S43TW034-2226	S43TW034-3236	S43TW034-3236-DUP	S43TW035-2226	S43TW035-3236	S43TW036-2024	S43TW036-3034	S43TW037-2024	S43TW037-2024-DUP	S43TW037-3135	S43TW038-1822	S43TW038-2832	S43TW039-0812
VOLATILE ORGANIC COMPOUNDS (µg/L)																	
1,1,1-TRICHLOROETHANE	200	MDE	5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1-DICHLOROETHANE	2.4	EPA RSL	5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1-DICHLOROETHENE	7	MDE	5.8 J	0.5 U	0.5 U	0.25 J	0.28 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-DICHLOROETHANE	0.15	EPA RSL	5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2-BUTANONE	490	EPA RSL	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	3.38 B
ACETONE	550	MDE	50 U	5 U	5 U	5 U	5 U	5 U	2.95 J	5 U	5 U	5 U	5 U	5 U	5 U	5 U	26.4 B
BROMOFORM	7.9	EPA RSL	5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CARBON DISULFIDE	72	EPA RSL	5 U	0.75 J	0.5 U	0.5 U	0.5 U	0.5 U	0.42 J	0.5 U	0.83 J	0.28 J	0.5 U	0.95 J	0.5 U	0.5 U	0.88 J
CHLOROFORM	0.19	EPA RSL	5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CHLOROMETHANE	19	EPA RSL	5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.46 J	0.92 J
CIS-1,2-DICHLOROETHENE	2.8	EPA RSL	**164**	**5.8**	1.8	**23.9**	**25**	0.3 J	**3.35**	0.5 U	**4.38**	**4.18**	**4.2**	**23.3**	**3.06**	2.45	**8.64**
METHYLENE CHLORIDE	5	MDE	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
TETRACHLOROETHENE	5	MDE	5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
TRANS-1,2-DICHLOROETHENE	8.6	EPA RSL	5 U	0.29 J	0.5 U	0.5 U	0.29 J	0.5 U	0.26 J	0.5 U	0.51 J	0.5 U	0.5 U	0.8 J	0.5 U	0.46 J	0.5 U
TRICHLOROETHENE	0.44	EPA RSL	**1270**	**5.81**	**8.98**	**80.6**	**78.7**	**1.48**	**0.52 J**	**0.51 J**	**0.31 J**	**24.6**	**24.3**	**29**	**0.94 J**	**4.63**	**17.9**
VINYL CHLORIDE	0.015	EPA RSL	**39.1**	**4.02**	0.5 U	**8.01 J**	**11 J**	0.5 U	**0.39 J**	0.5 U	0.5 U	**0.5 J**	**0.47 J**	**20.6 J**	**0.73 J**	0.5 U	**0.36 J**

Notes:
PSL : Project Screening Level
DUP : Duplicate sample
µg/L : micrograms per liter
J : Estimated value
B : Compound detected in blank sample
K : Biased High
L : Biased Low
D : Diluted value
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Bold and shaded values indicate an exceedance of PSLs

[1] Selected PSL is the lowest (most conservative) of the applicable screening criteria

EPA RSL: U.S. Environmental Protection Agency (EPA) (May 2012) Regional Screening Level (RSL) for tap water. RSLs based on non-carcinogenic effects have been divided by 10 to account for exposure to multiple constituents.

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TABLE 4-2
GROUNDWATER GRAB SAMPLE ANALYTICAL DETECTIONS
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

LOCATION	PSL [1]	PSL	S43-TW040	S43-TW040	S43-TW041			S43-TW042		S43-TW043	S43-TW044	S43-TW045	S43-TW047	S43-TW048	S43-TW049		S43-TW050
SAMPLE ID		Reference	S43TW040-3236	S43TW040-2226	S43TW041-1822	S43TW041-1822-DUP	S43TW041-3337	S43TW042-1822	S43TW042-3337	S43TW043-1519	S43TW044-1317	S43TW045-2024	S43TW047-1014	S43TW048-4044	S43TW049-1721	S43TW049-1721-DUP	S43TW050-1822
VOLATILE ORGANIC COMPOUNDS (µg/L)																	
1,1,1-TRICHLOROETHANE	200	MDE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.96 J	2.54	1.95 J	0.88 J	0.5 U	2.01	1.93	0.5 U
1,1-DICHLOROETHANE	2.4	EPA RSL	0.50 U	0.5 U	0.74 J	0.72 J	0.50 U	0.50 U	0.50 U	**8.89**	**3.37**	1.55 J	**5.84**	0.5 U	**23.3**	**23**	0.5 U
1,1-DICHLOROETHENE	7	MDE	0.50 U	0.5 U	0.25 J	0.28 J	0.50 U	0.76 J	0.50 U	3.27	4.97	2.5 U	3.47	0.5 U	5.74	5.66	0.5 U
1,2-DICHLOROETHANE	0.15	EPA RSL	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.5 U	2.5 U	0.5 U	0.5 U	**0.62 J**	**0.62 J**	0.5 U
2-BUTANONE	490	EPA RSL	5 U	5 U	5 U	5 U	3.49 J	5 U	5 U	5 U	5 U	25 U	5 U	5 U	5 U	5 U	5 U
ACETONE	550	MDE	8.63 J	5 U	5 U	5 U	23.8	14.3	19.8	5 U	5 U	25 U	31.4 B	4.45 J	5 U	5 U	5 U
BROMOFORM	7.9	EPA RSL	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.5 U	2.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CARBON DISULFIDE	72	EPA RSL	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.5 U	3 J	0.69 J	0.5 U	0.5 U	0.5 U	0.5 U
CHLOROFORM	0.19	EPA RSL	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.13 J	0.50 U	0.15 J	**0.25 J**	2.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CHLOROMETHANE	19	EPA RSL	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.5 U	2.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CIS-1,2-DICHLOROETHENE	2.8	EPA RSL	0.50 U	1.57	**13.4**	**13.6**	0.50 U	**30.7**	**10.7**	0.5 U	0.87 J	2.5 U	1.32	0.5 U	0.5 U	0.5 U	0.5 U
METHYLENE CHLORIDE	5	MDE	1 U	1 U	1 U	1 U	1.55 J	1.33 J	1.4 J	1 U	1 U	5 U	0.63 J	1 U	1 U	1 U	1 U
TETRACHLOROETHENE	5	MDE	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.5 U	2.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
TRANS-1,2-DICHLOROETHENE	8.6	EPA RSL	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.64 J	0.42 J	0.5 U	0.5 U	2.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
TRICHLOROETHENE	0.44	EPA RSL	0.50 U	**102**	**22.2**	**22.5**	0.50 U	**137**	**8.75**	**1.11**	**8.14**	**731 J**	**1.58**	0.5 U	**1.53**	**1.43**	0.5 U
VINYL CHLORIDE	0.015	EPA RSL	0.50 U	0.5 U	**2.88**	**2.81**	0.50 U	**2.37**	**6.25**	0.5 U	0.5 U	2.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U

Notes:
PSL : Project Screening Level
DUP : Duplicate sample
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TABLE 4-2
GROUNDWATER GRAB SAMPLE ANALYTICAL DETECTIONS
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

LOCATION	PSL [1]	PSL	S43-TW051	S43-TW052	S43-TW053			S43-TW054	S43-TW055	S43-TW056	S43-TW057		S43-TWSA01	S43-TWSA02	
SAMPLE ID		Reference	S43TW051-1721	S43TW052-1014	S43TW053-1317	S43TW053-2428	S43TW053-2428-DUP	S43TW054-1721	S43TW055-1822	S43TW056-1620	S43TW057-1923	S43TW057-2933	S43TWSA01-3034	S43TWSA02-1418	S43TWSA02-3034
VOLATILE ORGANIC COMPOUNDS (µg/L)															
1,1,1-TRICHLOROETHANE	200	MDE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	5 U	2.5 U	0.5 U	0.5 U	5 U
1,1-DICHLOROETHANE	2.4	EPA RSL	0.5 U	0.5 U	0.55 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	5 U	2.5 U	0.5 U	0.5 U	5 U
1,1-DICHLOROETHENE	7	MDE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	5 U	2.5 U	0.5 U	0.5 U	5 U
1,2-DICHLOROETHANE	0.15	EPA RSL	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	5 U	2.5 U	0.5 U	0.5 U	5 U
2-BUTANONE	490	EPA RSL	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	50 U	25 U	5 U	5 U	50 U
ACETONE	550	MDE	5 U	19.7 B	12.2 B	5 U	5 U	5 U	5 U	5 U	50 U	25 U	5 U	5 U	50 U
BROMOFORM	7.9	EPA RSL	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	5 U	2.5 U	0.5 U	0.5 U	5 U
CARBON DISULFIDE	72	EPA RSL	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	5 U	2.5 U	0.5 U	0.5 U	5 U
CHLOROFORM	0.19	EPA RSL	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	5 U	2.5 U	0.5 U	0.5 U	5 U
CHLOROMETHANE	19	EPA RSL	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	5 U	2.5 U	0.5 U	0.5 U	5 U
CIS-1,2-DICHLOROETHENE	2.8	EPA RSL	0.5 U	0.5 U	**12.4**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	**87.7**	**205**	0.46 J	**4.8**	**62.6**
METHYLENE CHLORIDE	5	MDE	1 U	0.53 J	1 U	1 U	1 U	1 U	1 U	1 U	5.1 B	5 U	1 U	1 U	10 U
TETRACHLOROETHENE	5	MDE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	5 U	2.5 U	0.5 U	0.5 U	5 U
TRANS-1,2-DICHLOROETHENE	8.6	EPA RSL	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	5 U	3.75 J	0.5 U	0.5 U	5 U
TRICHLOROETHENE	0.44	EPA RSL	0.5 U	0.5 U	**1**	0.5 U	0.5 U	**1.79**	0.5 U	0.5 U	**766**	**259**	**15.4**	**135**	**1730**
VINYL CHLORIDE	0.015	EPA RSL	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	5 U	**47.9**	0.5 U	0.5 U	**4.1 J**

Notes:
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TABLE 4-3
MONITORING WELL
VOLATILE ORGANIC COMPOUNDS ANALYTICAL DETECTIONS
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

LOCATION	PSL	PSL REFERENCE	S43-MW001									S43-MW002					
SAMPLE ID			S43MW00101	S43MW00101-D	S43MW00102	S43MW00102-D	S43MW00103	S43MW0104	S43MW0104-D	S43MW00105	S43MW00105-D	S43MW002010	S43MW002010	S43MW00203	S43MW0204	S43MW0204-D	S43MW00205
SAMPLE DATE			20050725	20050725	20071111	20071111	20110617	20120722	20120722	20130508	20130508	20050727	20071111	20110617	20120722	20120722	20130519
VOLATILES (µg/L)																	
1,1,1-TRICHLOROETHANE	200	MDE	500 U	500 U	800 U	800 U	--	50 U	50 U	--	--	0.51	1.3	--	--	--	--
1,1-DICHLOROETHANE	2.4	EPA RSL	500 U	500 U	800 U	800 U	25 U	50 U	50 U	50 U	50 U	**2.7**	**15**	--	--	--	**5.06**
1,1-DICHLOROETHENE	7	MDE	500 U	500 U	800 U	800 U	25 U	50 U	50 U	50 U	50 U	1.1	3.9	--	--	--	0.52 J
1,2-DICHLOROETHANE	0.15	EPA RSL	500 U	500 U	800 U	800 U	25 U	50 U	50 U	50 U	50 U	0.5 U	0.5 U	--	--	--	0.5 U
2-BUTANONE	490	EPA RSL	5000 U	5000 U	8000 U	8000 U	250 U	500 U	500 U	--	--	5 U	5 U	--	--	--	--
ACETONE	550	MDE	5000 U	5000 U	8000 U	8000 U	250 U	500 U	500 U	--	--	5 U	5 U	--	--	--	--
BROMOFORM	7.9	EPA RSL	500 U	500 U	800 U	**960**	25 U	50 U	50 U	50 U	50 U	0.5 U	0.5 U	--	--	--	0.5 U
CARBON DISULFIDE	72	EPA RSL	500 U	500 U	800 U	800 U	25 U	50 U	50 U	--	--	0.5 U	0.5 U	--	--	--	--
CHLOROFORM	0.19	EPA RSL	500 U	500 U	800 U	800 U	**8.32 J**	50 U	50 U	50 U	50 U	0.5 U	0.5 U	--	--	--	0.5 U
CHLOROMETHANE	19	EPA RSL	500 U	500 U	800 U	800 U	25 U	50 U	50 U	--	--	0.5 U	0.5 U	--	--	--	--
CIS-1,2-DICHLOROETHENE	2.8	EPA RSL	**580**	**480 J**	800 U	800 U	**284**	**400**	**355**	**148**	**151**	0.5 U	0.5 U	--	--	--	0.5 U
METHYLENE CHLORIDE	5	MDE	500 U	730 B	800 U	800 U	50 U	100 U	100 U	100 U	100 U	0.5 U	0.5 U	--	--	--	1 U
TETRACHLOROETHENE	5	MDE	500 U	500 U	800 U	800 U	25 U	50 U	50 U	--	--	0.5 U	0.5 U	--	--	--	--
TRANS-1,2-DICHLOROETHENE	8.6	EPA RSL	500 U	500 U	800 U	800 U	25 U	50 U	50 U	50 U	50 U	0.5 U	0.5 U	--	--	--	0.5 U
TRICHLOROETHENE	0.44	EPA RSL	**53000 J**	**55000 J**	**36000**	**36000**	**10900**	**17500**	**16200**	**8330**	**9060**	**1.3 J**	**3.2**	0.398 J	0.5 U	0.5 U	0.26 J
VINYL CHLORIDE	0.015	EPA RSL	500 U	500 U	800 U	800 U	25 U	50 U	50 U	50 U	50 U	0.5 U	0.5 U	--	--	--	0.5 U
MISCELLANEOUS																	
pH (S.U.)			5.30	--	5.40	--	5.59	5.05	--	5.57	--	4.57	4.39	4.39	4.24	--	4.68
Specific Conductivity (mS/cm)			0.226	--	0.220	--	0.288	0.277	--	0.145	--	0.368	0.400	0.326	0.277	--	0.292
Temperature (°C)			18.99	--	18.10	--	17.00	19.74	--	14.42	--	21.00	19.60	18.50	21.45	--	16.24
Turbidity (NTU)			2.40	--	0.00	--	52	7.30	--	18.20	--	0.10	0.00	0.40	26.2	--	1.88
Dissolved Oxygen (mg/L)			0.00	--	1.60	--	1.25	0.75	--	0.88	--	0.30	0.00	2.12	0.00	--	0.68
Salinity (%)			--	--	0.1	--	0.0	0.1	--	0.0	--	--	0.1	0.0	0.1	--	0.1
ORP (mV)			106	--	--	--	110	75	--	155	--	352	--	350	320	--	296

Notes:
PSL : Project Screening Level
DUP : Duplicate sample
µg/L : micrograms per liter
mg/L : milligram per liter
S.U. : Standard Units
°C : degrees celsius
NTU : Nephelometric Turbidity Units
% : Percentage
mV : millivolts
J : Estimated value
B : Compound detected in blank sample
U : The chemical was not detected.
Blank cells or -- : The chemical was not analyzed or no value was available.
Bold and Shaded cells indicate an exceedance of PSLs

[1] Selected PSL is the lowest (most conservative) of the applicable screening criteria
EPA RSL : U.S. Environmental Protection Agency (EPA) (May 2013) Regional Screening Level (RSL) for tap water. RSLs based on non-carcinogenic effects have been divided by 10 to account for exposure to multiple constituents.
MDE : Maryland Department of Environment (2008) Cleanup Standards for Type I and II Aquifers. Standards based on non-carcinogenic effects have been divided by 10 to account for exposure to multiple constituents.

TABLE 4-3
MONITORING WELL
VOLATILE ORGANIC COMPOUNDS ANALYTICAL DETECTIONS
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

LOCATION	PSL	PSL REFERENCE	S43-MW003			S43-MW004				S43-MW005			S43-MW006			S43-MW007	
SAMPLE ID			S43MW00301	S43MW0302	S43MW00303	S43MW00401	S43MW00401-D	S43MW0402	S43MW00403	S43MW00501	S43MW0502	S43MW00503	S43MW00601	S43MW0602	S43MW00603	S43MW0701	S43MW00702
SAMPLE DATE			20110617	20120722	20130509	20110617	20110617	20120722	20130513	20110617	20120722	20130509	20110617	20120721	20130509	20120722	20130513
VOLATILES (µg/L)																	
1,1,1-TRICHLOROETHANE	200	MDE	0.5 U	0.5 U	--	2.5 U	2.5 U	2.5 U	--	0.5 U	0.5 U	--	5 U	12.5 U	--	0.5 U	--
1,1-DICHLOROETHANE	2.4	EPA RSL	0.5 U	0.5 U	0.5 U	2.5 U	2.5 U	2.5 U	5 U	0.5 U	0.5 U	0.5 U	5 U	12.5 U	25 U	0.5 U	0.5 U
1,1-DICHLOROETHENE	7	MDE	0.5 U	0.5 U	0.5 U	2.56 J	2.43 J	2.95 J	5 U	0.5 U	0.5 U	0.5 U	5 U	12.5 U	25 U	0.5 U	0.5 U
1,2-DICHLOROETHANE	0.15	EPA RSL	0.5 U	0.5 U	0.5 U	2.5 U	2.5 U	2.5 U	5 U	0.5 U	0.5 U	0.5 U	5 U	12.5 U	25 U	0.5 U	0.5 U
2-BUTANONE	490	EPA RSL	5 U	5 U	--	25 U	25 U	25 U	--	5 U	5 U	--	50 U	125 U	--	5 U	--
ACETONE	550	MDE	5 U	5 U	--	25 U	25 U	25 U	--	5 U	5 U	--	50 U	125 U	--	5 U	--
BROMOFORM	7.9	EPA RSL	0.5 U	0.5 U	0.5 U	2.5 U	2.5 U	2.5 U	5 U	0.5 U	0.5 U	0.5 U	5 U	12.5 U	25 U	0.5 U	0.5 U
CARBON DISULFIDE	72	EPA RSL	0.5 U	0.5 U	--	2.5 U	2.5 U	2.25 J	--	0.5 U	0.5 U	--	5 U	12.5 U	--	0.5 U	--
CHLOROFORM	0.19	EPA RSL	0.5 U	0.5 U	0.5 U	2.5 U	2.5 U	2.5 U	5 U	0.5 U	0.5 U	0.5 U	5 U	12.5 U	25 U	0.5 U	0.5 U
CHLOROMETHANE	19	EPA RSL	6.35	0.5 U	--	5.05	2.5 U	2.5 U	--	3.41	0.5 U	--	5 U	12.5 U	--	0.5 U	--
CIS-1,2-DICHLOROETHENE	2.8	EPA RSL	0.896 J	0.77 J	1.28	**152**	**156**	**203**	**164**	0.5 U	0.5 U	0.5 U	**41.6**	**153 J**	**110**	0.5 U	0.5 U
METHYLENE CHLORIDE	5	MDE	1 U	1 U	0.72 J	5 U	5 U	5 U	**5.3 J**	1 U	0.53 J	1 U	10 U	25 U	50 U	1 U	0.58 J
TETRACHLOROETHENE	5	MDE	0.5 U	0.5 U	--	2.5 U	2.5 U	2.5 U	--	0.5 U	0.5 U		5 U	12.5 U	--	0.5 U	--
TRANS-1,2-DICHLOROETHENE	8.6	EPA RSL	0.5 U	0.5 U	0.5 U	2.5 U	2.5 U	1.4 J	5 U	0.5 U	0.5 U	0.5 U	5 U	12.5 U	25 U	0.5 U	0.5 U
TRICHLOROETHENE	0.44	EPA RSL	**1.74**	**0.66 J**	**1**	**699**	**682**	**644 J**	**903**	0.5 U	0.5 U	**1.45**	**1130**	**4420**	**3230**	0.31 J	0.5 U
VINYL CHLORIDE	0.015	EPA RSL	**1.16**	**1.23**	**2.85**	**15.7**	**14.1**	**37.9 J**	**15.2**	0.5 U	0.5 U	0.5 U	5 U	**7.5 J**	25 U	0.5 U	0.5 U
MISCELLANEOUS																	
pH (S.U.)			5.84	5.75	5.82	4.53	--	4.87	5.48	5.30	4.44	4.69	5.80	5.71	5.79	4.86	4.71
Specific Conductivity (mS/cm)			0.278	0.404	0.435	0.211	--	0.129	0.188	0.116	0.173	0.169	0.290	0.539	0.474	0.264	0.209
Temperature (°C)			17.65	21.08	19.84	15.86	--	21.36	16.10	17.00	18.22	16.82	16.75	18.24	16.96	16.81	13.51
Turbidity (NTU)			4.02	3.48	3.70	0.50	--	24.6	1.27	67	2.00	80.95	610	91.1	42.0	1.63	0.36
Dissolved Oxygen (mg/L)			0.99	0.00	0.48	1.28	--	0.00	0.48	1.07	0.00	0.45	0.96	0.97	0.00	0.87	0.00
Salinity (%)			0.0	0.2	--	0.0	--	0.1	--	0.0	0.1	--	0.0	0.2	0.2	0.1	0.1
ORP (mV)			-28	-57	-5	115	--	38	99	64	133	198	13	-25	-33	108	190

Notes:
PSL : Project Screening Level
DUP : Duplicate sample
µg/L : micrograms per liter
mg/L : milligram per liter
S.U. : Standard Units
°C : degrees celsius
NTU : Nephelometric Turbidity Units
% : Percentage
mV : millivolts
J : Estimated value
B : Compound detected in blank sample
U : The chemical was not detected.
Blank cells or -- : The chemical was not analyzed or no value was a
Bold and Shaded cells indicate an exceedance of PSLs

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MONITORING WELL
VOLATILE ORGANIC COMPOUNDS ANALYTICAL DETECTIONS
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

LOCATION	PSL	PSL REFERENCE	S43-MW008		S43-MW009D		S43-MW009S			S43-MW010		S43-MW011		S43-MW012		S43-MW013	
SAMPLE ID			S43MW0801	S43MW00802	S43MW09D01	S43MW009D02	S43MW09S01	S43MW009S02	S43MW009S02-	S43MW1001	S43MW01002	S43MW1101	S43MW01102	S43MW1201	S43MW01202	S43MW1301	S43MW01302
SAMPLE DATE			20120721	20130509	20120722	20130513	20120722	20130513	20130513	20120722	20130509	20120721	20130509	20120722	20130514	20120722	20130519
VOLATILES (µg/L)																	
1,1,1-TRICHLOROETHANE	200	MDE	0.5 U	--	0.5 U	--	1 U	--	--	0.5 U	--	0.5 U	--	0.5 U	--	--	--
1,1-DICHLOROETHANE	2.4	EPA RSL	0.5 U	0.5 U	0.5 U	0.5 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	--	**20.5**
1,1-DICHLOROETHENE	7	MDE	0.5 U	0.5 U	0.5 U	0.5 U	4.36	3.08	3.34	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	--	3.36
1,2-DICHLOROETHANE	0.15	EPA RSL	0.5 U	0.5 U	0.5 U	0.5 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	--	**0.36 J**
2-BUTANONE	490	EPA RSL	5 U	--	5 U	--	10 U	--	--	5 U	--	5 U	--	5 U	--	--	--
ACETONE	550	MDE	5 U	--	5 U	--	10 U	--	--	5 U	--	5 U	--	5 U	--	--	--
BROMOFORM	7.9	EPA RSL	0.5 U	0.5 U	0.5 U	0.5 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	--	0.5 U
CARBON DISULFIDE	72	EPA RSL	0.5 U	--	0.5 U	--	2.36	--	--	2.65	--	0.5 U	--	0.55 J	--	--	--
CHLOROFORM	0.19	EPA RSL	0.5 U	0.5 U	0.5 U	0.5 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	--	0.5 U
CHLOROMETHANE	19	EPA RSL	0.5 U	--	0.5 U	--	1 U	--	--	0.5 U	--	0.5 U	--	0.5 U	--	--	--
CIS-1,2-DICHLOROETHENE	2.8	EPA RSL	0.5 U	0.5 U	0.5 U	0.5 U	**26.4**	**17.2**	**16.5**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	--	0.5 U
METHYLENE CHLORIDE	5	MDE	1 U	1 U	0.51 J	1 U	2 U	1 U	1 U	1 U	0.54 J	1 U	1 U	1 U	1 U	--	1 U
TETRACHLOROETHENE	5	MDE	0.5 U	--	0.5 U	--	1 U	--	--	0.5 U	--	0.5 U	--	0.5 U	--	--	--
TRANS-1,2-DICHLOROETHENE	8.6	EPA RSL	0.5 U	0.5 U	0.5 U	0.5 U	0.58 J	0.42 J	0.34 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	--	0.5 U
TRICHLOROETHENE	0.44	EPA RSL	0.5 U	0.5 U	0.5 U	0.41 J	**100**	**63.2**	**61.2**	0.5 U	**1.06**	0.5 U	0.5 U	**1.77**	**1.37**	**1.18**	**0.78 J**
VINYL CHLORIDE	0.015	EPA RSL	0.5 U	0.5 U	0.5 U	0.5 U	**2.7 J**	**1.15**	**1.18**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	--	0.5 U
MISCELLANEOUS																	
pH (S.U.)			4.82	4.45	6.09	6.51	4.28	4.97	--	6.02	6.04	5.33	5.19	5.90	6.14	4.35	4.55
Specific Conductivity (mS/cm)			0.055	0.063	0.415	0.314	0.474	0.325	--	0.421	0.321	0.215	0.175	0.183	0.169	0.201	0.242
Temperature (°C)			19.01	16.02	17.45	16.73	19.08	13.45	--	19.09	17.03	15.92	14.04	20.95	20.27	19.26	15.65
Turbidity (NTU)			5.30	0.46	11.12	5.16	2.75	1.59	--	12.40	39.6	0.53	1.59	8.85	4.09	23.8	0.9
Dissolved Oxygen (mg/L)			0.00	0.00	0.63	0.55	3.60	1.23	--	0.71	0.00	5.77	0.00	0.00	0.45	0.00	0.61
Salinity (%)			--	0.0	0.2	--	0.2	--	--	0.2	0.1	0.1	0.0	0.1	--	0.1	0.1
ORP (mV)			23	207	-87	-106	233	1	--	-87	-69	36	51	-87	-51	224	299

Notes:
PSL : Project Screening Level
DUP : Duplicate sample
µg/L : micrograms per liter
mg/L : milligram per liter
S.U. : Standard Units
°C : degrees celsius
NTU : Nephelometric Turbidity Units
% : Percentage
mV : millivolts
J : Estimated value
B : Compound detected in blank sample
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VOLATILE ORGANIC COMPOUNDS ANALYTICAL DETECTIONS
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

LOCATION	PSL	PSL REFERENCE	S43-MW014		S43-MW015		S43-MW016		S43-MW017D			S43-MW017S		S43-MW018		S43-MW019D	
SAMPLE ID			S43MW1401	S43MW01402	S43MW1501	S43MW01502	S43MW1601	S43MW01602	S43MW17D01	S43MW017D02	S43MW017D02-D	S43MW17S01	S43MW017S02	S43MW1801	S43MW01802	S43MW19D01	S43MW019D02
SAMPLE DATE			20120722	20130519	20120722	20130519	20120722	20130519	20120721	20130509	20130509	20120721	20130509	20120721	20130508	20120721	20130508
VOLATILES (µg/L)																	
1,1,1-TRICHLOROETHANE	200	MDE	--	--	--	--	--	--	10 U	--	--	10 U	--	0.5 U	--	1 U	--
1,1-DICHLOROETHANE	2.4	EPA RSL	--	**6.98**	--	**5.14**	--	0.34 J	10 U	12.5 U	10 U	10 U	12.5 U	0.5 U	0.5 U	1 U	0.5 U
1,1-DICHLOROETHENE	7	MDE	--	0.68 J	--	0.51 J	--	0.5 U	6.2 J	12.5 U	5.6 J	6.6 J	12.5 U	0.5 U	0.5 U	1 U	0.52 J
1,2-DICHLOROETHANE	0.15	EPA RSL	--	0.5 U	--	0.5 U	--	0.5 U	10 U	12.5 U	10 U	10 U	12.5 U	0.5 U	0.5 U	1 U	0.5 U
2-BUTANONE	490	EPA RSL	--	--	--	--	--	--	100 U	--	--	100 U	--	5 U	--	10 U	--
ACETONE	550	MDE	--	--	--	--	--	--	100 U	--	--	100 U	--	5 U	--	10 U	--
BROMOFORM	7.9	EPA RSL	--	0.5 U	--	0.5 U	--	0.5 U	10 U	12.5 U	10 U	10 U	12.5 U	0.5 U	0.5 U	1 U	0.5 U
CARBON DISULFIDE	72	EPA RSL	--	--	--	--	--	--	10 U	--	--	10 U	--	0.5 U	--	1 U	--
CHLOROFORM	0.19	EPA RSL	--	0.5 U	--	0.5 U	--	0.14 J	10 U	12.5 U	10 U	10 U	12.5 U	0.5 U	0.5 U	1 U	0.5 U
CHLOROMETHANE	19	EPA RSL	--	--	--	--	--	--	10 U	--	--	10 U	--	0.5 U	--	1 U	--
CIS-1,2-DICHLOROETHENE	2.8	EPA RSL	--	0.5 U	--	0.5 U	--	0.5 U	**255**	**214**	**217**	**212**	**176**	1.59	1.02	**30.5**	**32**
METHYLENE CHLORIDE	5	MDE	--	1 U	--	1 U	--	1 U	20 U	25 U	20 U	20 U	25 U	1 U	1 U	2 U	1 U
TETRACHLOROETHENE	5	MDE	--	--	--	--	--	--	10 U	--	--	10 U	--	0.5 U	--	1 U	--
TRANS-1,2-DICHLOROETHENE	8.6	EPA RSL	--	0.5 U	--	0.5 U	--	0.5 U	10 U	12.5 U	10 U	10 U	12.5 U	0.5 U	0.5 U	1 U	0.53 J
TRICHLOROETHENE	0.44	EPA RSL	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	**2660**	**1100**	**1290**	**2740**	**1280**	**2.78**	**2.36**	**72.8**	**92.3**
VINYL CHLORIDE	0.015	EPA RSL	--	0.5 U	--	0.5 U	--	0.5 U	**65.6**	**22.8 J**	**56 J**	**45.2**	**18.5 J**	0.5 U	0.5 U	**9.12**	**6.96**
MISCELLANEOUS																	
pH (S.U.)			4.44	4.55	5.70	6.13	4.02	4.42	5.53	5.76	--	5.50	5.34	5.22	4.97	5.33	5.57
Specific Conductivity (mS/cm)			0.148	0.156	0.322	0.505	0.277	0.361	0.402	0.295	--	0.394	0.302	0.361	0.270	0.233	0.245
Temperature (°C)			18.89	18.16	21.55	15.43	20.91	15.93	16.15	16.28	--	15.71	14.99	18.84	15.77	18.80	16.39
Turbidity (NTU)			36.5	2.90	3.90	0.00	40.4	1.36	1.92	6.76	--	2.27	5.80	1.00	2.03	4.80	4.47
Dissolved Oxygen (mg/L)			0.00	0.00	0.00	0.00	0.00	0.59	2.19	0.00	--	0.01	0.00	0.99	7.77	0.00	0.69
Salinity (%)			0.1	0.1	0.2	0.2	0.1	0.2	0.2	0.1	--	0.2	0.1	0.2	--	0.1	--
ORP (mV)			147	234	56	50	339	348	-2	-2	--	8	28	203	307	-46	13

Notes:
PSL : Project Screening Level
DUP : Duplicate sample
µg/L : micrograms per liter
mg/L : milligram per liter
S.U. : Standard Units
°C : degrees celsius
NTU : Nephelometric Turbidity Units
% : Percentage
mV : millivolts
J : Estimated value
B : Compound detected in blank sample
U : The chemical was not detected.
Blank cells or -- : The chemical was not analyzed or no value was a
Bold and Shaded cells indicate an exceedance of PSLs

[1] Selected PSL is the lowest (most conservative) of the applicable screening criteria
EPA RSL : U.S. Environmental Protection Agency (EPA) (May 2013) Regional Screening Level (RSL) for tap water. RSLs based on non-carcinogenic effects have been divided by 10 to account for exposure to multiple constituents.
MDE : Maryland Department of Environment (2008) Cleanup Standards for Type I and II Aquifers. Standards based on non-carcinogenic effects have been divided by 10 to account for exposure to multiple constituents.

TABLE 4-3
MONITORING WELL
VOLATILE ORGANIC COMPOUNDS ANALYTICAL DETECTIONS
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

LOCATION	PSL	PSL REFERENCE	S43-MW019S			S43-MW020		S43-MW021		S43-MW022		S43-MW023		S43-MW024		S43-MW025	
SAMPLE ID			S43MW19S01	S43MW19S01-D	S43MW019S02	S43MW2001	S43MW02002	S43MW2101	S43MW02102	S43MW2201	S43MW02202	S43MW2301	S43MW02302	S43MW2401	S43MW02402	S43MW2501	S43MW02502
SAMPLE DATE			20120721	20120721	20130508	20120719	20130509	20120721	20130508	20120719	20130509	20120720	20130509	20120720	20130508	20120720	20130508
VOLATILES (µg/L)																	
1,1,1-TRICHLOROETHANE	200	MDE	12.5 U	12.5 U	--	11.1	--	0.5 U	--	0.37 J	--	0.5 U	--	3.67	--	0.5 U	--
1,1-DICHLOROETHANE	2.4	EPA RSL	**9.75 J**	**10.2 J**	12.5 U	5 U	5 U	0.5 U	0.5 U	**3.49**	0.58 J	0.4 J	**13.2**	**39.6**	**41.9**	0.76 J	1.46
1,1-DICHLOROETHENE	7	MDE	**57**	**70**	**16 J**	5 U	5 U	0.5 U	0.5 U	2.04	0.57 J	0.5 U	2.68	**8.6**	**7.6**	0.8 J	0.8 J
1,2-DICHLOROETHANE	0.15	EPA RSL	12.5 U	12.5 U	12.5 U	5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2-BUTANONE	490	EPA RSL	125 U	125 U	--	50 U	--	5 U	--	5 U	--	5 U	--	4.04 J	--	5 U	--
ACETONE	550	MDE	125 U	125 U	--	50 U	--	5 U	--	5 U	--	5 U	--	7.56 J	--	5 U	--
BROMOFORM	7.9	EPA RSL	12.5 U	12.5 U	12.5 U	5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CARBON DISULFIDE	72	EPA RSL	12.5 U	12.5 U	--	5 U	--	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U	--
CHLOROFORM	0.19	EPA RSL	12.5 U	12.5 U	12.5 U	5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CHLOROMETHANE	19	EPA RSL	12.5 U	12.5 U	--	5 U	--	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U	--
CIS-1,2-DICHLOROETHENE	2.8	EPA RSL	**158**	**166**	**56.2**	2.5 J	**5 J**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1	0.95 J
METHYLENE CHLORIDE	5	MDE	25 U	25 U	25 U	10 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
TETRACHLOROETHENE	5	MDE	12.5 U	12.5 U	--	--	--	--	--	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U	--
TRANS-1,2-DICHLOROETHENE	8.6	EPA RSL	12.5 U	12.5 U	12.5 U	5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
TRICHLOROETHENE	0.44	EPA RSL	**3620**	**4090**	**1690**	**1390**	**1800**	**0.83 J**	**4.63**	**0.54 J**	0.5 U	**1.59**	**2.27**	0.5 U	0.5 U	**9.22**	**2.15**
VINYL CHLORIDE	0.015	EPA RSL	12.5 U	12.5 U	12.5 U	5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
MISCELLANEOUS																	
pH (S.U.)			4.28	--	4.53	4.51	5.05	5.55	5.16	4.30	4.71	4.83	4.98	5.61	5.00	5.46	4.44
Specific Conductivity (mS/cm)			0.268	--	0.266	0.247	0.178	0.165	0.153	0.366	0.255	0.164	0.208	0.260	0.107	0.218	0.581
Temperature (°C)			18.95	--	16.16	17.40	18.40	18.99	15.29	16.50	13.64	18.89	16.15	23.72	16.35	17.66	12.49
Turbidity (NTU)			0.70	--	0.50	8.47	53.23	7.30	3.44	1.45	2.82	0.61	0.59	5.41	2.03	0.84	2.70
Dissolved Oxygen (mg/L)			0.00	--	0.54	3.19	1.97	0.23	1.05	2.33	1.99	4.44	0.63	1.50	0.33	6.63	0.00
Salinity (%)			0.1	--	--	0.0	--	0.1	--	0.2	--	0.1	--	0.1	0.1	0.1	0.1
ORP (mV)			157	--	276	185	254	71	205	153	345	159	205	160	289	107	348

Notes:
PSL : Project Screening Level
DUP : Duplicate sample
µg/L : micrograms per liter
mg/L : milligram per liter
S.U. : Standard Units
°C : degrees celsius
NTU : Nephelometric Turbidity Units
% : Percentage
mV : millivolts
J : Estimated value
B : Compound detected in blank sample
U : The chemical was not detected.
Blank cells or -- : The chemical was not analyzed or no value was a
Bold and Shaded cells indicate an exceedance of PSLs

[1] Selected PSL is the lowest (most conservative) of the applicable screening criteria
EPA RSL : U.S. Environmental Protection Agency (EPA) (May 2013) Regional Screening Level (RSL) for tap water. RSLs based on non-carcinogenic effects have been divided by 10 to account for exposure to multiple constituents.
MDE : Maryland Department of Environment (2008) Cleanup Standards for Type I and II Aquifers. Standards based on non-carcinogenic effects have been divided by 10 to account for exposure to multiple constituents.

TABLE 4-3
MONITORING WELL
VOLATILE ORGANIC COMPOUNDS ANALYTICAL DETECTIONS
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

LOCATION	PSL	PSL REFERENCE	S43-MW026		S43-MW027	S43-MW028	S43-MW029	S43-MW030		S43-PZ001	S43-PZ002	S43-PZ003	S43-PZ004
SAMPLE ID			S43MW2601	S43MW02602	S43MW02701	S43MW02801	S43MW02901	S43MW03001	S43MW030013-D	S43PZ001	S43PZ002	S43PZ003	S43PZ004
SAMPLE DATE			20120718	20130509	20130513	20130513	20130513	20130513	20130513	20130514	20130514	20130514	20130514
VOLATILES (µg/L)													
1,1,1-TRICHLOROETHANE	200	MDE	0.5 U	--	--	--	--	--	--	--	--	--	--
1,1-DICHLOROETHANE	2.4	EPA RSL	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	1 U	0.5 U	0.5 U	0.59 J	0.47 J
1,1-DICHLOROETHENE	7	MDE	0.5 U	0.5 U	0.5 U	0.34 J	0.5 U	0.72 J	0.78 J	0.5 U	0.5 U	1.34	0.5 U
1,2-DICHLOROETHANE	0.15	EPA RSL	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U
2-BUTANONE	490	EPA RSL	5 U	--	--	--	--	--	--	--	--	--	--
ACETONE	550	MDE	5 U	--	--	--	--	--	--	--	--	--	--
BROMOFORM	7.9	EPA RSL	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U
CARBON DISULFIDE	72	EPA RSL	0.5 U	--	--	--	--	--	--	--	--	--	--
CHLOROFORM	0.19	EPA RSL	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U
CHLOROMETHANE	19	EPA RSL	0.5 U	--	--	--	--	--	--	--	--	--	--
CIS-1,2-DICHLOROETHENE	2.8	EPA RSL	0.5 U	0.5 U	0.5 U	1.88	0.5 U	**77.3**	**76.6**	0.5 U	2.53	**9.9**	0.5 U
METHYLENE CHLORIDE	5	MDE	1 U	1 U	1 U	1 U	1 U	1.64 J	1.8 J	1 U	0.5 J	1 U	1 U
TETRACHLOROETHENE	5	MDE	--	--	--	--	--	--	--	--	--	--	--
TRANS-1,2-DICHLOROETHENE	8.6	EPA RSL	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	7.86	7.8	0.5 U	0.5 U	0.69 J	0.5 U
TRICHLOROETHENE	0.44	EPA RSL	**0.51 J**	**1.24**	0.5 U	**2.14**	0.5 U	**102**	**101**	0.5 U	0.5 U	**41.8**	0.5 U
VINYL CHLORIDE	0.015	EPA RSL	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	**17.6**	**17.2**	0.5 U	**0.91 J**	**0.81 J**	0.5 U
MISCELLANEOUS													
pH (S.U.)			3.77	4.49	5.93	5.58	4.64	6.12	6.12	6.37	5.94	5.78	5.02
Specific Conductivity (mS/cm)			0.056	0.079	0.183	0.286	0.069	0.224	0.224	0.535	0.459	0.205	0.249
Temperature (°C)			24.57	18.32	13.54	13.68	14.25	18.29	18.29	12.41	15.00	18.60	18.91
Turbidity (NTU)			3.12	0.48	15.00	2.71	1.60	3.39	3.39	8.72	33.8	5.40	5.23
Dissolved Oxygen (mg/L)			2.99	0.43	0.00	0.00	0.00	0.62	0.62	0.00	4.93	0.51	2.29
Salinity (%)			0.0	--	0.1	0.1	0.0	--	--	0.3	0.2	--	--
ORP (mV)			298	376	5	131	194	-39	-39	-88	48	-7	263

Notes:
PSL : Project Screening Level
DUP : Duplicate sample
µg/L : micrograms per liter
mg/L : milligram per liter
S.U. : Standard Units
°C : degrees celsius
NTU : Nephelometric Turbidity Units
% : Percentage
mV : millivolts
J : Estimated value
B : Compound detected in blank sample
U : The chemical was not detected.
Blank cells or -- : The chemical was not analyzed or no value was a
Bold and Shaded cells indicate an exceedance of PSLs

[1] Selected PSL is the lowest (most conservative) of the applicable screening criteria
EPA RSL : U.S. Environmental Protection Agency (EPA) (May 2013) Regional Screening Level (RSL) for tap water. RSLs based on non-carcinogenic effects have been divided by 10 to account for exposure to multiple constituents.
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TABLE 4-4
MONITORING WELL
METALS AND EXPLOSIVES ANALYTICAL DATA
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

LOCATION	PSL[1]	PSL REFERENCE	NSF-IH Background Groundwater	S43MW001									S43MW002					
SAMPLE ID				S43MW00101	S43MW00101-D	S43MW00102	S43MW00102-D	S43MW00103	S43MW0104	S43MW0104-D	S43MW00105	S43MW00105-D	S43MW00201	S43MW00202	S43MW00203	S43MW0204	S43MW0204-D	S43MW00205
SAMPLE DATE				20050725	20050725	20071111	20071111	20110617	20120722	20120722	20130508	20130508	20050727	20071111	20110617	20120722	20120722	20130519
EXPLOSIVES (µg/L)																		
1,3-DINITROBENZENE	0.15	EPA RSL	--	0.1 U	0.1 U	--	--	0.15 J	0.152 U	0.168 U	--	--	0.1 U	--	--	--	--	--
2,6-DINITROTOLUENE	0.042	MDE	--	0.1 U	0.1 U	--	--	0.15 U	**0.185 J**	0.168 U	--	--	0.1 U	--	--	--	--	--
2-AMINO-4,6-DINITROTOLUENE	3	EPA RSL	--	0.1 U	0.1 U	--	--	0.274 J	0.152 U	0.168 U	--	--	0.1 U	--	--	--	--	--
2-NITROTOLUENE	0.27	EPA RSL	--	0.5 U	0.5 U	--	--	0.236 J	0.152 U	0.168 U	--	--	0.5 U	--	--	--	--	--
3-NITROTOLUENE	0.13	EPA RSL	--	0.5 U	0.5 U	--	--	**0.723 J**	**0.511 J**	**0.609 J**	--	--	0.5 U	--	--	--	--	--
4-AMINO-2,6-DINITROTOLUENE	3	EPA RSL	--	0.1 U	0.1 U	--	--	0.15 U	0.152 U	0.168 U	--	--	0.1 U	--	--	--	--	--
4-NITROTOLUENE	3.7	EPA RSL	--	0.5 U	0.5 U	--	--	0.15 U	0.394 J	0.173 J	--	--	0.5 U	--	--	--	--	--
HMX	78	EPA RSL	--	0.1 U	0.1 U	--	--	0.15 U	0.152 U	0.168 U	--	--	3.4	--	--	--	--	--
NITROBENZENE	0.12	EPA RSL	--	0.1 U	0.1 U	--	--	0.15 U	0.152 U	0.168 U	--	--	0.1 U	--	--	--	--	--
NITROGLYCERIN	0.15	EPA RSL	--	0.65 U	0.65 U	--	--	**25.2 J**	0.381 U	0.421 U	--	--	0.65 U	--	--	--	--	--
RDX	0.61	EPA RSL	--	0.17	0.22	--	--	0.15 U	0.215 B	0.225 B	--	--	0.11	--	--	--	--	--
TETRYL	6.1	EPA RSL	--	0.1 U	0.1 U	--	--	0.15 U	0.152 U	0.168 U	--	--	0.1 U	--	--	--	--	--
MISCELLANEOUS PARAMETERS (µg/L)																		
PERCHLORATE	1.1	EPA RSL	--	--	--	--	--	0.251 J	--	--	--	--	--	--	--	--	--	--
METALS (µg/L)																		
ALUMINUM	1,600	EPA RSL	9,620	134 B	153	--	--	1,550	156	143	--	--	215	--	--	--	--	--
ARSENIC	0.045	EPA RSL	--	2 UL	2 UL	--	--	**2.65**	**1.18 J**	**1.15 J**	1.5 UL	1.5 UL	2 UL	--	--	--	--	1.5 UL
BARIUM	290	EPA RSL	139	203	197	--	--	30.8	27.1	27	--	--	**354**	--	--	--	--	--
BERYLLIUM	4	MDE	NA	0.69	0.66	--	--	0.385 J	0.321 J	0.306 J	--	--	**4.6**	--	--	--	--	--
CADMIUM	0.69	EPA RSL	2.8	0.30	0.26	--	--	0.558 J	0.5 U	0.383 J	--	--	0.61	--	--	--	--	--
CHROMIUM	0.031 [2]	EPA RSL	16.4	**0.71**	**0.59**	--	--	**11.6**	**0.927 J**	**0.841 J**	--	--	0.50 U	--	--	--	--	--
COBALT	0.47	EPA RSL	15.6	**35.2**	**34.2**	--	--	**9.03**	**13.3**	**13.2**	**3.42**	**3.46**	**96.4**	--	**70.4**	**33.6**	**34.3**	**42.8**
COPPER	62	EPA RSL	22.4	9.3 B	5.9 B	--	--	14.3	1.2 J	1.33 J	--	--	8.2 B	--	--	--	--	--
IRON	300	MDE	19,900	**4230**	**4030**	--	--	**2420 K**	**5360 K**	**5150 K**	**966**	**981**	37.3 B	--	--	--	--	16.4 J
LEAD	15	MDE	NA	2.8 K	2.2 K	--	--	4.57	0.785	1.08	--	--	0.90 U	--	--	--	--	--
MANGANESE	32	EPA RSL	824	**306**	**296**	--	--	**101**	**106**	**106**	**33.3**	**33.3**	**270**	--	--	--	--	**239**
NICKEL	30	EPA RSL	16.6	**40.6 J**	**39.5 J**	--	--	11.7	13.4	13.5	--	--	**78.3 J**	--	--	--	--	--
THALLIUM	2	MDE	NA	**3.7 B**	**2.7 B**	--	--	1 UL	1 U	1 U	--	--	2.0 U	--	--	--	--	--
VANADIUM	3.7	MDE	20.9	0.49	0.72	--	--	**14.2**	2.29 J	2.23 J	--	--	0.40 U	--	--	--	--	--
ZINC	470	EPA RSL	45.2	51.9 J	49.9 J	--	--	102	38.6	38.9	--	--	134 J	--	--	--	--	--
DISSOLVED METALS (µg/L)																		
ALUMINUM	1,600	EPA RSL	9,620	--	--	--	--	195	51.6	49.4 J	--	--	--	--	--	--	--	--
ARSENIC	0.045	EPA RSL	--	--	--	--	--	**2.13 J**	**1.23 J**	**0.807 J**	--	--	--	--	--	--	--	--
BARIUM	290	EPA RSL	139	--	--	--	--	25.3	27.8	26.3	--	--	--	--	--	--	--	--
BERYLLIUM	4	MDE	NA	--	--	--	--	0.50 U	0.305 J	0.276 J	--	--	--	--	--	--	--	--
CADMIUM	0.69	EPA RSL	2.8	--	--	--	--	0.427 J	0.5 U	0.5 U	--	--	--	--	--	--	--	--
CHROMIUM	0.031 [2]	EPA RSL	16.4	--	--	--	--	**6.58**	**0.581 J**	1 U	--	--	--	--	--	--	--	--
COBALT	0.47	EPA RSL	15.6	--	--	--	--	**8.28**	**13.7**	**13.1**	--	--	--	--	**73.5**	**33.8**	**33.7**	--
COPPER	62	EPA RSL	22.4	--	--	--	--	8.94	2 U	1.04 J	--	--	--	--	--	--	--	--
IRON	300	MDE	19,900	--	--	--	--	**768 K**	**5370 K**	**4820 K**	--	--	--	--	--	--	--	--
LEAD	15	MDE	NA	--	--	--	--	0.444 J	0.75 U	0.75 U	--	--	--	--	--	--	--	--
MANGANESE	32	EPA RSL	824	--	--	--	--	**90**	**109 L**	**103 L**	--	--	--	--	--	--	--	--
NICKEL	30	EPA RSL	16.6	--	--	--	--	10.2	13.8	13.2	--	--	--	--	--	--	--	--
THALLIUM	2	MDE	NA	--	--	--	--	1 UL	1 U	1 U	--	--	--	--	--	--	--	--
VANADIUM	3.7	MDE	20.9	--	--	--	--	**9.48**	1.6 J	1.55 J	--	--	--	--	--	--	--	--
ZINC	470	EPA RSL	45.2	--	--	--	--	60.6	38.8	38.2	--	--	--	--	--	--	--	--

Notes:
PSL : Project Screening Level
D : Duplicate sample
µg/L : micrograms per liter
B : Compound detected in blank sample
J : Estimated value
K : Biased high
L : Biased low
U : The chemical was not detected.
Blank cells or -- : The chemical was not analyzed or no value was available.

Bold and Shaded cells indicate an exceedance of PSLs
For metals, values that are shaded indicate exceedances of NSF-IH Background groundwater

[1] Selected PSL is the lowest (most conservative) of the applicable screening criteria
[2] PSL used is for hexavalent chromium

EPA RSL : U.S. Environmental Protection Agency (EPA) (May 2013) Regional Screening Level (RSL) for tap water. RSLs based on non-carcinogenic effects have been divided by 10 to account for exposure to multiple constituents.
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TABLE 4-4
MONITORING WELL
METALS AND EXPLOSIVES ANALYTICAL DATA
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

LOCATION	PSL[1]	PSL REFERENCE	NSF-IH Background Groundwater	S43MW003			S43MW004				S43MW005			S43MW006			S43MW007	
SAMPLE ID				S43MW00301	S43MW0302	S43MW00303	S43MW00401	S43MW00401-D	S43MW0402	S43MW00403	S43MW00501	S43MW0502	S43MW00503	S43MW00601	S43MW0602	S43MW00603	S43MW0701	S43MW00702
SAMPLE DATE				20110617	20120722	20130509	20110617	20110617	20120722	20130513	20110617	20120722	20130509	20110617	20120721	20130509	20120722	20130513
EXPLOSIVES (µg/L)																		
1,3-DINITROBENZENE	0.15	EPA RSL	--	0.15 U	0.168 U	--	0.15 U	0.16 U	0.155 U	--	0.131 J	0.168 U	--	**0.244 J**	0.158 U	--	0.155 U	--
2,6-DINITROTOLUENE	0.042	MDE	--	0.15 U	0.168 U	--	0.15 U	0.16 U	0.155 U	--	0.157 U	0.168 U	--	0.168 U	0.158 U	--	0.155 U	--
2-AMINO-4,6-DINITROTOLUENE	3	EPA RSL	--	0.15 U	0.168 U	--	0.15 U	0.16 U	0.155 U	--	0.157 U	0.168 U	--	0.168 U	0.158 U	--	0.155 U	--
2-NITROTOLUENE	0.27	EPA RSL	--	0.15 U	0.168 U	--	0.15 U	0.16 U	0.155 U	--	0.157 U	0.168 U	--	0.168 U	0.158 U	--	0.155 U	--
3-NITROTOLUENE	0.13	EPA RSL	--	0.15 U	0.168 U	--	**2.91**	**3.57 J**	**0.28 J**	--	0.157 U	**0.439 J**	--	0.168 U	**0.871**	--	**0.227 J**	--
4-AMINO-2,6-DINITROTOLUENE	3	EPA RSL	--	0.15 U	0.168 U	--	0.15 U	0.16 U	0.155 U	--	0.0929 J	0.168 U	--	0.128 J	0.158 U	--	0.155 U	--
4-NITROTOLUENE	3.7	EPA RSL	--	0.15 U	0.291 J	--	0.15 U	0.16 U	0.148 J	--	0.157 U	0.168 U	--	0.195 J	0.142 J	--	0.0861 J	--
HMX	78	EPA RSL	--	0.15 U	0.168 U	--	0.125 J	0.125 J	0.155 U	--	0.157 U	0.168 U	--	0.904	0.158 U	--	0.155 U	--
NITROBENZENE	0.12	EPA RSL	--	0.15 U	0.168 U	--	0.15 U	0.16 U	0.155 U	--	0.157 U	0.168 U	--	0.168 U	0.158 U	--	0.155 U	--
NITROGLYCERIN	0.15	EPA RSL	--	**0.262 J**	0.421 U	--	0.374 U	0.4 U	0.388 U	--	0.392 U	0.421 U	--	**32.3 J**	0.396 U	--	0.388 U	--
RDX	0.61	EPA RSL	--	0.15 U	0.168 U	--	0.212 J	0.415 J	0.546 B	--	0.0886 J	0.305 B	--	**1.7 J**	0.398 B	--	0.217 B	--
TETRYL	6.1	EPA RSL	--	0.15 U	0.168 U	--	0.15 U	0.16 U	0.155 U	--	0.157 U	0.168 U	--	0.168 U	0.158 U	--	0.155 U	--
MISCELLANEOUS PARAMETERS (µg/L)																		
PERCHLORATE	1.1	EPA RSL	--	0.2 U	--	--	0.244 J	0.2 U	--	--	0.2 U	--	--	0.2 U	--	--	--	--
METALS (µg/L)																		
ALUMINUM	1,600	EPA RSL	9,620	22.5 J	14.8 J	--	18.2 J	14.1 J	16.5 J	--	1,090	129	--	**4,050**	1,190	--	16.2 J	--
ARSENIC	0.045	EPA RSL	--	**16.9**	**12.2**	**12**	**1.72 J**	**1.7 J**	**1.31 J**	**1.02 J**	**1.58 J**	**2.11 J**	**5.75**	**2.76**	**6.47**	**3.44**	1.5 U	1.5 UL
BARIUM	290	EPA RSL	139	132	91.8	--	96.6	90.9	69.5	--	106	88.4	--	138	167	--	109	--
BERYLLIUM	4	MDE	NA	0.50 U	0.5 U	--	0.50 U	0.50 U	0.355 J	--	0.386 J	0.911 J	--	0.536 J	0.311 J	--	1.11 J	--
CADMIUM	0.69	EPA RSL	2.8	0.50 U	0.5 U	--	0.50 U	0.50 U	0.5 U	--	0.50 U	0.5 U	--	0.50 U	0.5 U	--	0.5 U	--
CHROMIUM	0.031 [2]	EPA RSL	16.4	1 U	1 U	--	1 U	1 U	1 U	--	**2.76**	1 U	--	**9.79**	**3.13**	--	1 U	--
COBALT	0.47	EPA RSL	15.6	**4.25**	**6.96**	**7.5**	**24.7**	**23.4**	**24.3**	**34.8**	**31.1**	**50.3**	**64.9**	**40.7**	**26.4**	**29.3**	**60**	**72.3**
COPPER	62	EPA RSL	22.4	2 U	2 U	--	2 U	2 U	2 U	--	2.92	1.09 J	--	9.93	2.87	--	1.02 J	--
IRON	300	MDE	19,900	**42600 K**	**42200 K**	**39800**	**16600 K**	**16200 K**	**12400 K**	**11200**	**10400**	**8510 K**	**7510**	**35800 K**	**54900 K**	**41300**	**11600**	**4190**
LEAD	15	MDE	NA	0.75 UL	0.75 U	--	0.75 UL	0.75 UL	0.75 UL	--	1.41 L	0.75 UL	--	3.73	0.69 J	--	0.75 U	--
MANGANESE	32	EPA RSL	824	**602**	**763**	**805**	**409**	**383**	**352**	**384**	**345**	**298**	**275**	**611**	**713**	**793**	**423**	**324**
NICKEL	30	EPA RSL	16.6	0.875 J	2.05 J	--	14.3	14	14.3	--	25.5	**45.5**	--	28.8	15.1	--	**46.5**	--
THALLIUM	2	MDE	NA	1 UL	1 U	--	1 UL	1 UL	1 U	--	1 UL	1 U	--	1 UL	1 U	--	1 U	--
VANADIUM	3.7	MDE	20.9	2.5 U	2.19 J	--	2.5 U	2.5 U	1.33 J	--	**4.61**	1.69 J	--	**15.7**	**6.68**	--	1.59 J	--
ZINC	470	EPA RSL	45.2	11.6	4.1 J	--	14.8	13.2	15.8	--	38.3	57.9	--	33.2	16.4	--	53.2	--
DISSOLVED METALS (µg/L)																		
ALUMINUM	1,600	EPA RSL	9,620	16.2 J	25 U	--	25 U	25 U	25 U	--	26.5 J	15.6 J	--	17 J	21 J	--	18.5 J	--
ARSENIC	0.045	EPA RSL	--	**15.2**	**12.3**	--	**1.67 J**	**1.53 J**	**1.65 J**	--	**1.22 J**	**1.65 J**	1.5 U	**2.09 J**	**3.61**	**3.24**	1.5 U	--
BARIUM	290	EPA RSL	139	129	94.8	--	91.9	94.1	68.5	--	110	86.6	--	126	163	--	112	--
BERYLLIUM	4	MDE	NA	0.50 U	0.5 U	--	0.50 U	0.50 U	0.344 J	--	0.50 U	0.838 J	--	0.50 U	0.5 U	--	1.15 J	--
CADMIUM	0.69	EPA RSL	2.8	0.50 U	0.5 U	--	0.50 U	0.50 U	0.5 U	--	0.50 U	0.5 U	--	0.50 U	0.5 U	--	0.262 J	--
CHROMIUM	0.031 [2]	EPA RSL	16.4	1 U	1 U	--	1 U	1 U	1 U	--	1 U	1 U	--	1 U	1 U	--	1 U	--
COBALT	0.47	EPA RSL	15.6	**4.21**	**7.1**	--	**23.9**	**24.5**	**23.5**	--	**33.5**	**48.9**	**60.1**	**35.4**	**25.9**	**26.3**	**61.2**	--
COPPER	62	EPA RSL	22.4	2 U	2 U	--	2 U	2 U	2 U	--	2 U	2 U	--	2 U	2 U	--	2 U	--
IRON	300	MDE	19,900	**38600**	**43800 K**	--	**15900 K**	**16400 K**	**12500**	--	**10900**	**8400 K**	**5070**	**34800 K**	**44500 K**	**39300**	**11800**	--
LEAD	15	MDE	NA	0.75 UL	0.75 U	--	0.75 UL	0.75 UL	0.75 U	--	0.75 UL	1.5 UL	--	1.5 UL	1.5 U	--	0.75 U	--
MANGANESE	32	EPA RSL	824	**572**	**795 L**	--	**394**	**396**	**335 L**	--	**383**	**294**	**273**	**616**	**753**	**765**	**430 L**	--
NICKEL	30	EPA RSL	16.6	1.5 U	2.13 J	--	14.4	14.5	14.4	--	27.7	**44.3**	--	24.9	14.4	--	**47**	--
THALLIUM	2	MDE	NA	1 UL	1 U	--	1 UL	1 UL	1 U	--	1 UL	1 U	--	1 UL	1 U	--	1 U	--
VANADIUM	3.7	MDE	20.9	2.5 U	2.23 J	--	2.5 U	2.5 U	2.5 U	--	2.5 U	2.5 U	--	2.5 U	2.24 J	--	1.67 J	--
ZINC	470	EPA RSL	45.2	11.5	5.06	--	14.1	13.9	15.3	--	36	56.3	--	13.9	10.7	--	56.3	--

Notes:
PSL : Project Screening Level
D : Duplicate sample
µg/L : micrograms per liter
B : Compound detected in blank sample
J : Estimated value
K : Biased high
L : Biased low
U : The chemical was not detected.
Blank cells or -- : The chemical was not analyzed or no value was available.

Bold and Shaded cells indicate an exceedance of PSLs
For metals, values that are shaded indicate exceedances of NSF-IH Background groundwater

[1] Selected PSL is the lowest (most conservative) of the applicable screening criteria
[2] PSL used is for hexavalent chromium

EPA RSL : U.S. Environmental Protection Agency (EPA) (May 2013) Regional Screening Level (RSL) for tap water. RSLs based on non-carcinogenic effects have been divided by 10 to account for exposure to multiple constituents.
MDE : Maryland Department of Environment (2008) Cleanup Standards for Type I and II Aquifers. Standards based on non-carcinogenic effects have been divided by 10 to account for exposure to multiple constituents.

TABLE 4-4
MONITORING WELL
METALS AND EXPLOSIVES ANALYTICAL DATA
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

LOCATION	PSL[1]	PSL REFERENCE	NSF-IH Background Groundwater	S43MW008		S43MW009D		S43MW009S			S43MW010		S43MW011		S43MW012		S43MW013	
SAMPLE ID				S43MW0801	S43MW00802	S43MW09D01	S43MW009D02	S43MW09S01	S43MW009S02	S43MW009S02-D	S43MW1001	S43MW01002	S43MW1101	S43MW01102	S43MW1201	S43MW01202	S43MW1301	S43MW01302
SAMPLE DATE				20120721	20130509	20120722	20130513	20120722	20130513	20130513	20120722	20130509	20120721	20130509	20120722	20130514	20120722	20130519
EXPLOSIVES (µg/L)																		
1,3-DINITROBENZENE	0.15	EPA RSL	--	0.155 U	--	0.168 U	--	0.154 U	--	--	0.168 U	--	0.164 U	--	0.168 U	--	--	--
2,6-DINITROTOLUENE	0.042	MDE	--	0.155 U	--	0.168 U	--	0.154 U	--	--	**0.504 J**	--	0.164 U	--	0.168 U	--	--	--
2-AMINO-4,6-DINITROTOLUENE	3	EPA RSL	--	0.155 U	--	0.168 U	--	0.154 U	--	--	0.168 U	--	0.164 U	--	0.168 U	--	--	--
2-NITROTOLUENE	0.27	EPA RSL	--	0.155 U	--	0.168 U	--	0.154 U	--	--	0.168 U	--	0.164 U	--	0.168 U	--	--	--
3-NITROTOLUENE	0.13	EPA RSL	--	0.107 J	--	0.168 U	--	**0.365 J**	--	--	0.168 U	--	**0.418 J**	--	**0.507**	--	--	--
4-AMINO-2,6-DINITROTOLUENE	3	EPA RSL	--	0.155 U	--	0.168 U	--	0.154 U	--	--	0.168 U	--	0.164 U	--	0.168 U	--	--	--
4-NITROTOLUENE	3.7	EPA RSL	--	0.155 U	--	0.168 U	--	0.381	--	--	0.101 J	--	0.164 U	--	0.174 J	--	--	--
HMX	78	EPA RSL	--	0.155 U	--	0.168 U	--	0.154 U	--	--	0.168 U	--	0.164 U	--	0.168 U	--	--	--
NITROBENZENE	0.12	EPA RSL	--	0.155 U	--	0.168 U	--	0.154 U	--	--	**0.234 B**	--	0.164 U	--	0.168 U	--	--	--
NITROGLYCERIN	0.15	EPA RSL	--	0.388 U	--	0.421 U	--	0.385 U	--	--	0.421 U	--	**0.318 B**	--	0.421 U	--	--	--
RDX	0.61	EPA RSL	--	0.229 B	--	0.168 U	--	0.583 B	--	--	**0.791 B**	--	0.164 U	--	0.168 U	--	--	--
TETRYL	6.1	EPA RSL	--	0.155 U	--	0.168 U	--	0.154 U	--	--	0.168 U	--	0.164 U	--	0.168 U	--	--	--
MISCELLANEOUS PARAMETERS (µg/L)																		
PERCHLORATE	1.1	EPA RSL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METALS (µg/L)																		
ALUMINUM	1,600	EPA RSL	9,620	19.3 J	--	290	--	358	--	--	121	--	25 U	--	321	--	--	--
ARSENIC	0.045	EPA RSL	--	1.5 U	1.5 U	**5.71**	**7.04**	1.5 U	1.5 UL	1.5 UL	**5.86**	**4.49**	**1.56 J**	**1.55 J**	**5.11**	**5.37**	--	1.5 UL
BARIUM	290	EPA RSL	139	56.3	--	167	--	**352**	--	--	116	--	51.9	--	102	--	--	--
BERYLLIUM	4	MDE	NA	0.323 J	--	0.5 U	--	1.91	--	--	0.5 U	--	0.5 U	--	0.5 U	--	--	--
CADMIUM	0.69	EPA RSL	2.8	0.5 U	--	0.5 U	--	0.5 U	--	--	0.5 U	--	0.5 U	--	0.5 U	--	--	--
CHROMIUM	0.031 [2]	EPA RSL	16.4	**1.43 J**	--	**0.906 J**	--	1 U	--	--	1 U	--	1 U	--	**0.842 J**	--	--	--
COBALT	0.47	EPA RSL	15.6	**14.2**	**11.5**	2.5 U	2.5 U	**54.8**	**41.4**	**42.7**	2.5 U	2.5 U	**2.22 J**	**3.22**	**8.32**	**10.4**	**130**	**113**
COPPER	62	EPA RSL	22.4	1.04 J	--	1.01 J	--	1.38 J	--	--	2 U	--	2 U	--	2 U	--	--	--
IRON	300	MDE	19,900	**5000 K**	**1080**	**29800 K**	**29100**	**7640 K**	**9790**	**9940**	**33600 K**	**24500**	**20900**	**21700**	**33000 K**	**32300**	--	65.4
LEAD	15	MDE	NA	0.75 UL	--	0.75 UL	--	0.75 UL	--	--	0.75 U	--	0.75 U	--	0.75 U	--	--	--
MANGANESE	32	EPA RSL	824	**206**	**95.4**	**185**	**176**	**405**	**409**	**417**	**196**	**189**	**497**	**516**	**456**	**520**	--	**491**
NICKEL	30	EPA RSL	16.6	8.2	--	0.761 J	--	**40.2**	--	--	1.5 U	--	1.5 U	--	4.65	--	--	--
THALLIUM	2	MDE	NA	1 U	--	1 U	--	1 U	--	--	1 U	--	1 U	--	1 U	--	--	--
VANADIUM	3.7	MDE	20.9	2.5 U	--	1.64 J	--	1.38 J	--	--	2.5 U	--	1.47 J	--	2.19 J	--	--	--
ZINC	470	EPA RSL	45.2	12	--	2.06 J	--	86.9	--	--	1.65 J	--	1.34 J	--	6.34	--	--	--
DISSOLVED METALS (µg/L)																		
ALUMINUM	1,600	EPA RSL	9,620	25 U	--	46.5 J	--	357	--	--	31.4 J	--	25 U	--	63.7	--	--	--
ARSENIC	0.045	EPA RSL	--	1.5 U	--	**5.76**	**7.27**	1.5 U	--	--	**4.91 K**	**3.83**	**1.49 J**	--	**5.58**	--	--	--
BARIUM	290	EPA RSL	139	52.2	--	163	--	**347**	--	--	104	--	54.5	--	100	--	--	--
BERYLLIUM	4	MDE	NA	0.297 J	--	0.5 U	--	1.9	--	--	0.5 U	--	0.5 U	--	0.5 U	--	--	--
CADMIUM	0.69	EPA RSL	2.8	0.5 U	--	0.5 U	--	0.5 U	--	--	0.5 U	--	0.5 U	--	0.5 U	--	--	--
CHROMIUM	0.031 [2]	EPA RSL	16.4	**1.25 J**	--	1 U	--	1 U	--	--	1 U	--	1 U	--	1 U	--	--	--
COBALT	0.47	EPA RSL	15.6	**12.8**	--	2.5 U	2.5 U	**54.2**	--	--	2.5 U	2.5 U	**2.39 J**	--	**8.11**	--	**127**	--
COPPER	62	EPA RSL	22.4	2 U	--	2 U	--	2.17 J	--	--	2 U	--	2 U	--	2 U	--	--	--
IRON	300	MDE	19,900	**5100 K**	--	**29000 K**	**29400**	**7470 K**	--	--	**30600 K**	**20400**	**21400**	--	**33200 K**	--	--	--
LEAD	15	MDE	NA	0.75 UL	--	1.5 U	--	0.75 UL	--	--	0.75 U	--	0.75 U	--	0.75 U	--	--	--
MANGANESE	32	EPA RSL	824	**192**	--	**180**	**181**	**406**	--	--	**187 L**	**186**	**503**	--	**445 L**	--	--	--
NICKEL	30	EPA RSL	16.6	7.43	--	1.5 U	--	**39.7**	--	--	1.5 U	--	1.5 U	--	4.41	--	--	--
THALLIUM	2	MDE	NA	1 U	--	1 U	--	1 U	--	--	1 U	--	1 U	--	1 U	--	--	--
VANADIUM	3.7	MDE	20.9	2.5 U	--	2.5 U	--	1.34 J	--	--	2.5 U	--	1.47 J	--	1.41 J	--	--	--
ZINC	470	EPA RSL	45.2	11.6	--	2.14 J	--	88.2	--	--	2.08 J	--	2.5 U	--	6.61	--	--	--

Notes:
PSL : Project Screening Level
D : Duplicate sample
µg/L : micrograms per liter
B : Compound detected in blank sample
J : Estimated value
K : Biased high
L : Biased low
U : The chemical was not detected.
Blank cells or -- : The chemical was not analyzed or no value was available.

Bold and Shaded cells indicate an exceedance of PSLs
For metals, values that are shaded indicate exceedances of NSF-IH Background groundwater

[1] Selected PSL is the lowest (most conservative) of the applicable screening criteria
[2] PSL used is for hexavalent chromium

EPA RSL : U.S. Environmental Protection Agency (EPA) (May 2013) Regional Screening Level (RSL) for tap water. RSLs based on non-carcinogenic effects have been divided by 10 to account for exposure to multiple constituents.
MDE : Maryland Department of Environment (2008) Cleanup Standards for Type I and II Aquifers. Standards based on non-carcinogenic effects have been divided by 10 to account for exposure to multiple constituents.

TABLE 4-4
MONITORING WELL
METALS AND EXPLOSIVES ANALYTICAL DATA
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

LOCATION	PSL[1]	PSL REFERENCE	NSF-IH Background Groundwater	S43MW014		S43MW015		S43MW016		S43MW017D			S43MW017S		S43MW018		S43MW019D	
SAMPLE ID				S43MW1401	S43MW01402	S43MW1501	S43MW01502	S43MW1601	S43MW01602	S43MW17D01	S43MW017D02	S43MW017D02-D	S43MW17S01	S43MW017S02	S43MW1801	S43MW01802	S43MW19D01	S43MW019D02
SAMPLE DATE				20120722	20130519	20120722	20130519	20120722	20130519	20120721	20130509	20130509	20120721	20130509	20120721	20130508	20120721	20130508
EXPLOSIVES (µg/L)																		
1,3-DINITROBENZENE	0.15	EPA RSL	--	--	--	--	--	--	--	0.168 U	--	--	0.151 U	--	0.168 U	--	0.16 U	--
2,6-DINITROTOLUENE	0.042	MDE	--	--	--	--	--	--	--	0.168 U	--	--	0.151 U	--	0.168 U	--	0.16 U	--
2-AMINO-4,6-DINITROTOLUENE	3	EPA RSL	--	--	--	--	--	--	--	0.168 U	--	--	0.151 U	--	0.168 U	--	0.16 U	--
2-NITROTOLUENE	0.27	EPA RSL	--	--	--	--	--	--	--	0.168 U	--	--	0.151 U	--	0.168 U	--	0.16 U	--
3-NITROTOLUENE	0.13	EPA RSL	--	--	--	--	--	--	--	0.168 U	--	--	**0.419**	--	0.168 U	--	**0.366 J**	--
4-AMINO-2,6-DINITROTOLUENE	3	EPA RSL	--	--	--	--	--	--	--	0.168 U	--	--	0.151 U	--	0.168 U	--	0.16 U	--
4-NITROTOLUENE	3.7	EPA RSL	--	--	--	--	--	--	--	2.13 J	--	--	0.6 J	--	0.168 U	--	0.0904 J	--
HMX	78	EPA RSL	--	--	--	--	--	--	--	0.135 J	--	--	0.236 J	--	0.123 J	--	0.16 U	--
NITROBENZENE	0.12	EPA RSL	--	--	--	--	--	--	--	0.168 U	--	--	0.151 U	--	0.168 U	--	0.16 U	--
NITROGLYCERIN	0.15	EPA RSL	--	--	--	--	--	--	--	0.421 U	--	--	0.377 U	--	0.421 U	--	0.4 U	--
RDX	0.61	EPA RSL	--	--	--	--	--	--	--	0.103 B	--	--	0.499 B	--	0.348 B	--	0.239 B	--
TETRYL	6.1	EPA RSL	--	--	--	--	--	--	--	0.168 U	--	--	0.151 U	--	0.168 U	--	0.16 U	--
MISCELLANEOUS PARAMETERS (µg/L)																		
PERCHLORATE	1.1	EPA RSL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METALS (µg/L)																		
ALUMINUM	1,600	EPA RSL	9,620	--	--	--	--	--	--	25 B	--	--	30.5 J	--	92.7	--	28 B	--
ARSENIC	0.045	EPA RSL	--	--	1.5 UL	--	1.5 UL	--	1.5 UL	**2.21 J**	**2.44 J**	**2.06 J**	**2.01 J**	**2.32 J**	1.5 U	1.5 U	**1.2 J**	1.5 U
BARIUM	290	EPA RSL	139	--	--	--	--	--	--	109	--	--	80.9	--	143	--	123	--
BERYLLIUM	4	MDE	NA	--	--	--	--	--	--	0.5 U	--	--	0.5 U	--	0.701 J	--	0.5 U	--
CADMIUM	0.69	EPA RSL	2.8	--	--	--	--	--	--	0.5 U	--	--	0.5 U	--	**0.909** J	--	0.5 U	--
CHROMIUM	0.031 [2]	EPA RSL	16.4	--	--	--	--	--	--	1 U	--	--	1 U	--	1 U	--	1 U	--
COBALT	0.47	EPA RSL	15.6	**36**	**37.3**	**5.1**	**14.4**	**108**	**122**	**6.2**	**11.3**	**10.9**	**15.4**	**15.6**	**43.1**	**26.8**	2.5 U	2.5 U
COPPER	62	EPA RSL	22.4	--	--	--	--	--	--	2 U	--	--	2 U	--	1.1 J	--	2 U	--
IRON	300	MDE	19,900	--	**2930**	--	**403**	--	12.4 J	**32900**	**30000**	**29100**	**34900 K**	**29300**	192 K	90.2	**27000**	**23800**
LEAD	15	MDE	NA	--	--	--	--	--	--	0.75 U	--	--	0.75 UL	--	0.75 UL	--	0.75 U	--
MANGANESE	32	EPA RSL	824	--	**263**	--	**451**	--	**95.1**	**498**	**495**	**487**	**561**	**471**	**326**	**190**	**522**	**541**
NICKEL	30	EPA RSL	16.6	--	--	--	--	--	--	1.35 J	--	--	4.47	--	**52.9**	--	1.5 U	--
THALLIUM	2	MDE	NA	--	--	--	--	--	--	1 U	--	--	1 U	--	1 U	--	1 U	--
VANADIUM	3.7	MDE	20.9	--	--	--	--	--	--	1.49 J	--	--	1.83 J	--	1.27 J	--	1.72 J	--
ZINC	470	EPA RSL	45.2	--	--	--	--	--	--	4.06 J	--	--	13.4	--	71.7	--	1.32 J	--
DISSOLVED METALS (µg/L)																		
ALUMINUM	1,600	EPA RSL	9,620	--	--	--	--	--	--	25 B	--	--	25 U	--	79.6	--	25 B	--
ARSENIC	0.045	EPA RSL	--	--	--	--	--	--	--	**2.3 J**	--	--	**2.11 J**	--	1.5 U	--	1.5 U	--
BARIUM	290	EPA RSL	139	--	--	--	--	--	--	111	--	--	82.9	--	144	--	117	--
BERYLLIUM	4	MDE	NA	--	--	--	--	--	--	0.5 U	--	--	0.5 U	--	0.734 J	--	0.5 U	--
CADMIUM	0.69	EPA RSL	2.8	--	--	--	--	--	--	0.5 U	--	--	0.5 U	--	**0.942 J**	--	0.5 U	--
CHROMIUM	0.031 [2]	EPA RSL	16.4	--	--	--	--	--	--	1 U	--	--	1 U	--	1 U	--	1 U	--
COBALT	0.47	EPA RSL	15.6	**34.8**	--	**5.1**	--	**108**	--	**6.24**	--	--	**15.7**	--	**44.2**	--	2.5 U	--
COPPER	62	EPA RSL	22.4	--	--	--	--	--	--	2 U	--	--	1.2 J	--	1.52 J	--	2 U	--
IRON	300	MDE	19,900	--	--	--	--	--	--	**32100**	--	--	**36100 K**	--	192 K	--	**25700**	--
LEAD	15	MDE	NA	--	--	--	--	--	--	0.75 U	--	--	0.75 UL	--	0.75 UL	--	0.75 U	--
MANGANESE	32	EPA RSL	824	--	--	--	--	--	--	**500**	--	--	**572**	--	**326**	--	**502**	--
NICKEL	30	EPA RSL	16.6	--	--	--	--	--	--	1.55 J	--	--	4.63	--	**54.4**	--	1.5 U	--
THALLIUM	2	MDE	NA	--	--	--	--	--	--	1 U	--	--	1 U	--	1 U	--	1 U	--
VANADIUM	3.7	MDE	20.9	--	--	--	--	--	--	1.46 J	--	--	1.73 J	--	2.5 U	--	1.54 J	--
ZINC	470	EPA RSL	45.2	--	--	--	--	--	--	5.51	--	--	16.2	--	74.4	--	1.41 J	--

Notes:
PSL : Project Screening Level
D : Duplicate sample
µg/L : micrograms per liter
B : Compound detected in blank sample
J : Estimated value
K : Biased high
L : Biased low
U : The chemical was not detected.
Blank cells or -- : The chemical was not analyzed or no value was available.

Bold and Shaded cells indicate an exceedance of PSLs
For metals, values that are shaded indicate exceedances of NSF-IH Background groundwater

[1] Selected PSL is the lowest (most conservative) of the applicable screening criteria
[2] PSL used is for hexavalent chromium

EPA RSL : U.S. Environmental Protection Agency (EPA) (May 2013) Regional Screening Level (RSL) for tap water. RSLs based on non-carcinogenic effects have been divided by 10 to account for exposure to multiple constituents.
MDE : Maryland Department of Environment (2008) Cleanup Standards for Type I and II Aquifers. Standards based on non-carcinogenic effects have been divided by 10 to account for exposure to multiple constituents.

TABLE 4-4
MONITORING WELL
METALS AND EXPLOSIVES ANALYTICAL DATA
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

LOCATION	PSL[1]	PSL REFERENCE	NSF-IH Background Groundwater	S43MW019S			S43MW020		S43MW021		S43MW022		S43MW023		S43MW024		S43MW025	
SAMPLE ID				S43MW19S01	S43MW19S01-D	S43MW019S02	S43MW2001	S43MW02002	S43MW2101	S43MW02102	S43MW2201	S43MW02202	S43MW2301	S43MW02302	S43MW2401	S43MW02402	S43MW2501	S43MW02502
SAMPLE DATE				20120721	20120721	20130508	20120719	20130509	20120721	20130508	20120719	20130509	20120720	20130509	20120720	20130508	20120720	20130508
EXPLOSIVES (µg/L)																		
1,3-DINITROBENZENE	0.15	EPA RSL	--	0.157 U	0.157 U	--	0.151 U	--	0.168 U	--	0.16 U	--	0.16 U	--	**0.212 J**	--	**0.186 J**	--
2,6-DINITROTOLUENE	0.042	MDE	--	0.157 U	0.157 U	--	0.151 U	--	0.168 U	--	0.16 U	--	0.16 U	--	0.16 U	--	0.178 U	--
2-AMINO-4,6-DINITROTOLUENE	3	EPA RSL	--	0.157 U	0.157 U	--	0.151 U	--	0.168 U	--	0.16 U	--	0.16 U	--	0.118 B	--	0.178 U	--
2-NITROTOLUENE	0.27	EPA RSL	--	0.0967 B	0.157 U	--	0.0797 B	--	0.168 U	--	0.16 U	--	0.16 U	--	**0.371 B**	--	**0.353 B**	--
3-NITROTOLUENE	0.13	EPA RSL	--	**0.222 J**	0.157 U	--	0.151 U	--	0.168 U	--	0.16 U	--	0.16 U	--	**0.642**	--	**0.301 J**	--
4-AMINO-2,6-DINITROTOLUENE	3	EPA RSL	--	0.157 U	0.157 U	--	0.151 U	--	0.168 U	--	0.16 U	--	0.16 U	--	0.473	--	0.178 U	--
4-NITROTOLUENE	3.7	EPA RSL	--	0.303 J	0.0968 J	--	0.137 J	--	0.168 U	--	0.179 J	--	0.16 U	--	0.115 J	--	0.114 J	--
HMX	78	EPA RSL	--	0.13 J	0.125 J	--	0.151 U	--	0.168 U	--	0.965	--	0.16 U	--	0.16 U	--	0.178 U	--
NITROBENZENE	0.12	EPA RSL	--	0.157 U	0.157 U	--	0.151 U	--	0.117 U	--	0.16 U	--	0.16 U	--	**0.865 B**	--	0.178 U	--
NITROGLYCERIN	0.15	EPA RSL	--	0.392 U	0.392 U	--	0.377 U	--	0.421 U	--	0.4 U	--	0.4 U	--	**0.307 B**	--	**0.295 B**	--
RDX	0.61	EPA RSL	--	0.497 B	0.369 B	--	0.151 U	--	0.168 U	--	0.16 U	--	0.223 B	--	0.16 U	--	0.178 U	--
TETRYL	6.1	EPA RSL	--	0.157 U	0.157 U	--	0.151 U	--	0.168 U	--	0.16 U	--	0.16 U	--	0.198 J	--	0.178 U	--
MISCELLANEOUS PARAMETERS (µg/L)																		
PERCHLORATE	1.1	EPA RSL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METALS (µg/L)																		
ALUMINUM	1,600	EPA RSL	9,620	124 K	122 K	--	122	--	70.5	--	57.9	--	47.7 J	--	127	--	39.3 J	--
ARSENIC	0.045	EPA RSL	--	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 UL	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U
BARIUM	290	EPA RSL	139	248	246	--	84.5	--	86.8	--	170	--	47.9	--	48.9	--	92.9	--
BERYLLIUM	4	MDE	NA	1.95	1.94	--	0.709 J	--	0.422 J	--	1.61	--	0.479 J	--	0.5 U	--	0.5 U	--
CADMIUM	0.69	EPA RSL	2.8	0.652 J	0.614 J	--	0.368 J	--	0.5 U	--	0.29 J	--	0.5 U	--	0.5 U	--	0.5 U	--
CHROMIUM	0.031 [2]	EPA RSL	16.4	1 U	1 U	--	1 U	--	1 U	--	1 U	--	1 U	--	**4.45**	--	1 U	--
COBALT	0.47	EPA RSL	15.6	**124**	**124**	**147**	**19.9**	**15.6**	**33**	**5.21**	**73.2**	**55.7**	**4.31**	**6.67**	**1.95 J**	**3.83**	**2.35 J**	**30.4**
COPPER	62	EPA RSL	22.4	1.4 J	1.29 J	--	2 U	--	2 U	--	1.35 J	--	2 U	--	8.18	--	1.37 J	--
IRON	300	MDE	19,900	**6210**	**5970**	**1910**	**1180**	**2680**	**5990 K**	**1920**	**827**	70.2	**1660**	**468**	115	52.2	**1510**	**402**
LEAD	15	MDE	NA	0.75 U	0.75 U	--	0.75 U	--	0.75 UL	--	0.75 U	--	0.75 U	--	0.75 U	--	0.75 UL	--
MANGANESE	32	EPA RSL	824	**1140**	**1110**	**1160**	**234**	**124**	**888**	**172**	**511**	**319**	**160**	**223**	**79.5**	**60.4**	**184**	**494**
NICKEL	30	EPA RSL	16.6	**46.6**	**45.7**	--	22.5	--	15.3	--	**42.5**	--	9.21	--	1.6 J	--	3.09	--
THALLIUM	2	MDE	NA	0.799 J	0.803 J	--	1 U	--	1 U	--	1 U	--	1 U	--	1 U	--	1 U	--
VANADIUM	3.7	MDE	20.9	3.12	3.03 J	--	2.5 U	--	2.95 J	--	1.56 J	--	2.5 U	--	2.5 U	--	2.5 U	--
ZINC	470	EPA RSL	45.2	92.4	91.1	--	35.6	--	22.2	--	57	--	12.1	--	7.21	--	4.86 J	--
DISSOLVED METALS (µg/L)																		
ALUMINUM	1,600	EPA RSL	9,620	101 B	108 B	--	49.9 B	--	17.3 J	--	73.2 B	--	30.8 B	--	67.7 B	--	41.7 B	--
ARSENIC	0.045	EPA RSL	--	1.5 U	1.5 U	--	1.5 U	1.5 U	1.5 U	--	1.5 U	--	1.5 U	--	**1.14 J**	--	1.5 U	--
BARIUM	290	EPA RSL	139	242	232	--	78.7	--	88.4	--	160	--	42.8	--	48.7	--	85.7	--
BERYLLIUM	4	MDE	NA	1.86	1.85	--	0.629 J	--	0.414 J	--	1.51	--	0.426 J	--	0.5 U	--	0.5 U	--
CADMIUM	0.69	EPA RSL	2.8	0.596 J	**0.765 J**	--	0.348 J	--	0.5 U	--	0.257 J	--	0.5 U	--	0.5 U	--	0.5 U	--
CHROMIUM	0.031 [2]	EPA RSL	16.4	1 U	1 U	--	1 U	--	1 U	--	1 U	--	1 U	--	**4.5 K**	--	1 U	--
COBALT	0.47	EPA RSL	15.6	**121**	**117**	--	**19.7**	**15.1**	**33.6**	--	**71.8**	--	**3.85**	--	**2 J**	--	**2.31 J**	--
COPPER	62	EPA RSL	22.4	1.28 J	1.13 J	--	2 U	--	2 U	--	1.49 J	--	2 U	--	8.61	--	1.42 J	--
IRON	300	MDE	19,900	**5930**	**5800**	--	**1020**	**559**	**6050 K**	--	**821**	--	**1410**	--	66	--	**1580**	--
LEAD	15	MDE	NA	0.75 U	0.75 U	--	0.75 U	--	0.75 UL	--	0.75 U	--	0.75 U	--	0.75 U	--	0.75 U	--
MANGANESE	32	EPA RSL	824	**1090**	**1060**	--	**223**	**119**	**907**	--	**499**	--	**142**	--	**83.3**	--	**179**	--
NICKEL	30	EPA RSL	16.6	**45.1**	**43.3**	--	20.6	--	15.6	--	**39.5**	--	8.32	--	2.03 J	--	2.82	--
THALLIUM	2	MDE	NA	1 U	0.751 J	--	1 U	--	1 U	--	1 U	--	1 U	--	1 U	--	1 U	--
VANADIUM	3.7	MDE	20.9	2.89 J	2.82 J	--	2.5 U	--	2.52 J	--	1.35 J	--	2.5 U	--	2.5 U	--	2.5 U	--
ZINC	470	EPA RSL	45.2	89.1	86.2	--	34.8	--	22.7	--	59.8	--	12.5	--	11.4	--	5.91	--

Notes:
PSL : Project Screening Level
D : Duplicate sample
µg/L : micrograms per liter
B : Compound detected in blank sample
J : Estimated value
K : Biased high
L : Biased low
U : The chemical was not detected.
Blank cells or -- : The chemical was not analyzed or no value was available.

Bold and Shaded cells indicate an exceedance of PSLs
For metals, values that are shaded indicate exceedances of NSF-IH Background groundwater

[1] Selected PSL is the lowest (most conservative) of the applicable screening criteria
[2] PSL used is for hexavalent chromium

EPA RSL : U.S. Environmental Protection Agency (EPA) (May 2013) Regional Screening Level (RSL) for tap water. RSLs based on non-carcinogenic effects have been divided by 10 to account for exposure to multiple constituents.
MDE : Maryland Department of Environment (2008) Cleanup Standards for Type I and II Aquifers. Standards based on non-carcinogenic effects have been divided by 10 to account for exposure to multiple constituents.

TABLE 4-4
MONITORING WELL
METALS AND EXPLOSIVES ANALYTICAL DATA
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

LOCATION	PSL[1]	PSL REFERENCE	NSF-IH Background Groundwater	S43MW026		S43MW027	S43MW028	S43MW029	S43MW030		S43PZ001	S43PZ002	S43PZ003	S43PZ004
SAMPLE ID				S43MW2601	S43MW02602	S43MW02701	S43MW02801	S43MW02901	S43MW03001	S43MW030013-D	S43PZ001	S43PZ002	S43PZ003	S43PZ004
SAMPLE DATE				20120718	20130509	20130513	20130513	20130513	20130513	20130513	20130514	20130514	20130514	20130514
EXPLOSIVES (µg/L)														
1,3-DINITROBENZENE	0.15	EPA RSL	--	0.157 U	--	--	--	--	--	--	--	--	--	--
2,6-DINITROTOLUENE	0.042	MDE	--	0.157 U	--	--	--	--	--	--	--	--	--	--
2-AMINO-4,6-DINITROTOLUENE	3	EPA RSL	--	0.157 U	--	--	--	--	--	--	--	--	--	--
2-NITROTOLUENE	0.27	EPA RSL	--	0.157 U	--	--	--	--	--	--	--	--	--	--
3-NITROTOLUENE	0.13	EPA RSL	--	0.157 U	--	--	--	--	--	--	--	--	--	--
4-AMINO-2,6-DINITROTOLUENE	3	EPA RSL	--	0.157 U	--	--	--	--	--	--	--	--	--	--
4-NITROTOLUENE	3.7	EPA RSL	--	0.157 U	--	--	--	--	--	--	--	--	--	--
HMX	78	EPA RSL	--	0.157 U	--	--	--	--	--	--	--	--	--	--
NITROBENZENE	0.12	EPA RSL	--	0.157 U	--	--	--	--	--	--	--	--	--	--
NITROGLYCERIN	0.15	EPA RSL	--	0.392 U	--	--	--	--	--	--	--	--	--	--
RDX	0.61	EPA RSL	--	0.157 U	--	--	--	--	--	--	--	--	--	--
TETRYL	6.1	EPA RSL	--	0.157 U	--	--	--	--	--	--	--	--	--	--
MISCELLANEOUS PARAMETERS (µg/L)														
PERCHLORATE	1.1	EPA RSL	--	--	--	--	--	--	--	--	--	--	--	--
METALS (µg/L)														
ALUMINUM	1,600	EPA RSL	9,620	49.1 J	--	--	--	--	--	--	--	--	--	--
ARSENIC	0.045	EPA RSL	--	1.5 U	1.5 U	1.5 UL	**1.32 J**	1.5 UL	1.5 UL	1.5 UL	**2.81 L**	**1.64 J**	1.5 UL	1.5 UL
BARIUM	290	EPA RSL	139	45.1	--	--	--	--	--	--	--	--	--	--
BERYLLIUM	4	MDE	NA	0.42 J	--	--	--	--	--	--	--	--	--	--
CADMIUM	0.69	EPA RSL	2.8	0.5 U	--	--	--	--	--	--	--	--	--	--
CHROMIUM	0.031 [2]	EPA RSL	16.4	**1.53 J**	--	--	--	--	--	--	--	--	--	--
COBALT	0.47	EPA RSL	15.6	**4.85**	**6.35**	**25.8**	**5.7**	**45.2**	2.5 U	2.5 U	**7.62**	**15**	2.5 U	**9.42**
COPPER	62	EPA RSL	22.4	2 U	--	--	--	--	--	--	--	--	--	--
IRON	300	MDE	19,900	209	15 U	**14000**	**1200**	**2140**	**24400**	**24700**	**32100**	**10700**	**21400**	102
LEAD	15	MDE	NA	0.75 U	--	--	--	--	--	--	--	--	--	--
MANGANESE	32	EPA RSL	824	**32.7**	**51.6**	**492**	**63.6**	**572**	**376**	**375**	**2060**	**600**	**343**	**135**
NICKEL	30	EPA RSL	16.6	7.88	--	--	--	--	--	--	--	--	--	--
THALLIUM	2	MDE	NA	1 U	--	--	--	--	--	--	--	--	--	--
VANADIUM	3.7	MDE	20.9	2.5 U	--	--	--	--	--	--	--	--	--	--
ZINC	470	EPA RSL	45.2	13.2	--	--	--	--	--	--	--	--	--	--
DISSOLVED METALS (µg/L)														
ALUMINUM	1,600	EPA RSL	9,620	54.3 B	--	--	--	--	--	--	--	--	--	--
ARSENIC	0.045	EPA RSL	--	1.5 U	--	--	--	--	--	--	--	1.5 UL	--	--
BARIUM	290	EPA RSL	139	44.5	--	--	--	--	--	--	--	--	--	--
BERYLLIUM	4	MDE	NA	0.409 J	--	--	--	--	--	--	--	--	--	--
CADMIUM	0.69	EPA RSL	2.8	0.5 U	--	--	--	--	--	--	--	--	--	--
CHROMIUM	0.031 [2]	EPA RSL	16.4	**1.4 J**	--	--	--	--	--	--	--	--	--	--
COBALT	0.47	EPA RSL	15.6	**5.08**	--	--	--	--	--	--	--	**16.6**	--	--
COPPER	62	EPA RSL	22.4	1.17 J	--	--	--	--	--	--	--	--	--	--
IRON	300	MDE	19,900	150	--	--	--	--	--	--	--	**6670**	--	--
LEAD	15	MDE	NA	0.75 U	--	--	--	--	--	--	--	--	--	--
MANGANESE	32	EPA RSL	824	**33.4**	--	--	--	--	--	--	--	**563**	--	--
NICKEL	30	EPA RSL	16.6	7.76	--	--	--	--	--	--	--	--	--	--
THALLIUM	2	MDE	NA	1 U	--	--	--	--	--	--	--	--	--	--
VANADIUM	3.7	MDE	20.9	2.5 U	--	--	--	--	--	--	--	--	--	--
ZINC	470	EPA RSL	45.2	15.7	--	--	--	--	--	--	--	--	--	--

Notes:
PSL : Project Screening Level
D : Duplicate sample
µg/L : micrograms per liter
B : Compound detected in blank sample
J : Estimated value
K : Biased high
L : Biased low
U : The chemical was not detected.
Blank cells or -- : The chemical was not analyzed or no value was available.

Bold and Shaded cells indicate an exceedance of PSLs
For metals, values that are shaded indicate exceedances of NSF-IH Background groundwater

[1] Selected PSL is the lowest (most conservative) of the applicable screening criteria
[2] PSL used is for hexavalent chromium

EPA RSL : U.S. Environmental Protection Agency (EPA) (May 2013) Regional Screening Level (RSL) for tap water. RSLs based on non-carcinogenic effects have been divided by 10 to account for exposure to multiple constituents.
MDE : Maryland Department of Environment (2008) Cleanup Standards for Type I and II Aquifers. Standards based on non-carcinogenic effects have been divided by 10 to account for exposure to multiple constituents.

TABLE 4-5
BUILDINGS 720 AND 1040 INDOOR AIR AND SOIL GAS ANALYTICAL DETECTIONS
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

LOCATION	PSL	PSL REFERENCE	S43-IND01		S43-IND02	S43-ODA01	S43-ODA02	S43-SG01	S43-SG03	S43-SG04
SAMPLE ID			S43IND01	S43IND01-	S43IND02	S43ODA01	S43ODA02	S43SG0106	S43SG0305	S43SG0406
SAMPLE DATE			20120420	20120420	20120420	20110611	20120420	20110611	20110611	20110611
Volatle Organic Compounds (µg/m3)										
1,1,1-TRICHLOROETHANE	520	EPA RSL	0.072 J	0.035 J	0.04 J	0.071 J	0.036 J	45 U	0.24 J	1,000 U
1,1-DICHLOROETHANE	1.5	EPA RSL	0.014 U	0.014 U	0.015 U	0.029 U	0.015 U	**140**	0.069 J	760 U
1,1-DICHLOROETHENE	21	EPA RSL	0.014 U	0.014 U	0.015 U	0.029 U	0.014 U	33 U	0.19	740 U
1,2-DICHLOROETHANE	0.094	EPA RSL	**0.098 B**	0.08 B	0.088 B	0.046 J	0.074 B	33 U	0.07 J	760 U
1,4-DIOXANE	0.32	EPA RSL	0.52 U	0.52 U	0.55 U	0.27 U	0.52 U	67 U	**0.68 J**	1,500 U
2-BUTANONE	520	EPA RSL	1 J	0.91 J	1 J	6.1	1.2 J	160 J	100	**1600 J**
2-HEXANONE	3.1	EPA RSL	0.59 U	0.59 U	0.62 U	0.86 J	0.59 U	76 U	**12**	1,700 U
4-METHYL-2-PENTANONE	310	EPA RSL	0.59 U	0.59 U	0.62 U	0.3 U	0.59 U	76 U	0.6 U	**1600 J**
ACETONE	3,200	EPA RSL	6.5 J	5 J	5.7 J	17	12 J	3,100	190	**690000**
BENZENE	0.31	EPA RSL	**0.45**	0.28 J	0.27 J	**0.31**	0.3	26 U	**1.1**	600 U
CARBON DISULFIDE	73	EPA RSL	0.44 U	0.44 U	0.48 U	0.55 J	0.45 U	26 U	2.8 J	580 U
CARBON TETRACHLORIDE	0.41	EPA RSL	0.9 U	0.9 U	0.96 U	**0.66 J**	0.91 U	52 U	0.92 U	1,200 U
CHLOROETHANE	1,000	EPA RSL	0.38 U	0.38 U	0.4 U	0.31 U	0.38 U	180 J	0.64 J	1,100 U
CHLOROMETHANE	9.4	EPA RSL	0.91	0.68 J	1.1 J	1.8	1.2	**100 J**	2.3	870 U
CIS-1,2-DICHLOROETHENE	6.3	EPA RSL	0.015 B	0.014 U	0.015 U	0.029 U	0.017 B	**140**	**59**	**29000**
DICHLORODIFLUOROMETHANE	10	EPA RSL	2.8	2.7 J	2.4 J	2.6	2.5	41 U	2.7	920 U
ETHYLBENZENE	0.97	EPA RSL	0.13 J	0.11 J	0.12 J	0.068 J	0.064 J	36 U	0.53	810 U
M+P-XYLENES	10	EPA RSL				0.11 J		**100**	1.1	810 U
METHYL TERT-BUTYL ETHER	9.4	EPA RSL	0.1 U	0.1 U	0.11 U	0.026 J	0.1 U	30 U	0.083 J	670 U
METHYLENE CHLORIDE	97	EPA RSL	0.5 U	0.5 U	0.53 U	0.68 J	0.5 U	29 U	5	650 U
O-XYLENE	10	EPA RSL				0.055 J		36 U	0.68	810 U
TETRACHLOROETHENE	9.4	EPA RSL	0.17 J	0.074 J	0.076 J	0.1 J	0.075 J	56 U	0.19 J	1,300 U
TOLUENE	520	EPA RSL	1.3	0.63 J	0.66 J	0.52	0.61	**790**	2	700 U
TRANS-1,2-DICHLOROETHENE	6.3	EPA RSL	0.014 U	0.014 U	0.015 U	0.029 U	0.014 U	33 U	0.44 J	740 U
TRICHLOROETHENE	0.43	EPA RSL	0.16 J	0.019 U	0.023 B	0.029 U	0.03 B	44 U	0.33	1,000 U
TRICHLOROFLUOROMETHANE	73	EPA RSL	1.1	1.2 J	1.3 J	1.6	1.2	46 U	1.6 J	1,000 U
VINYL CHLORIDE	0.16	EPA RSL	0.0091 U	0.0091 U	0.011 J	0.015 U	0.0092 U	**30000**	**100**	1,100 U

Notes:
PSL : Project Screening Level
DUP : Duplicate sample
µg/m^3 : micrograms per cubic meter
J : Estimated value
U : The chemical was not detected.
B : Compound detected in blank sample
Blank cells : The chemical was not analyzed.
Bold and shaded values indicate an exceedance of PSLs
EPA RSL: U.S. Environmental Protection Agency (EPA) (May 2013) Regional Screening Level (RSL) for residential air. RSLs based on non-carcinogenic effects have been divided by 10 to account for exposure to multiple constituents.

TABLE 4-6
BUILDING 716 INDOOR AIR AND SOIL GAS ANALYTICAL DETECTIONS
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

LOCATION	PSL	PSL REFERENCE	S43-716-IND01	S43-716-IND02		S43-716-ODA01	S43-SG05		S43-SG06	S43-SG07	S43-SG08
SAMPLE ID			S43-716-IND01	S43-716-IND02	S43-716-DUP01	S43-716-ODA01	S43SG05-0708	S43SG05-0708-D	S43SG06-0708	S43SG07-1011	S43SG08-0708
SAMPLE DATE			20130725	20130725	20130725	20130725	20130506	20130506	20130506	20130506	20130506
Volatle Organic Compounds (µg/m3)											
1,1,1-TRICHLOROETHANE	520	EPA RSL	--	--	--	--	0.33 J	0.36	21	18	3.9
1,1-DICHLOROETHANE	1.5	EPA RSL	0.031 U	0.024 U	0.029 U	0.031 U	0.48	0.59	**6.7**	**2.7**	0.026 U
1,1-DICHLOROETHENE	21	EPA RSL	0.031 U	0.024 U	0.029 U	0.031 U	1.5	2	9.5	**28**	0.025 U
1,2-DICHLOROETHANE	0.094	EPA RSL	0.062 B	0.053 B	0.054 B	0.074 B	0.067 U	0.03 U	0.24 U	0.24 U	0.027 U
2-BUTANONE	520	EPA RSL	--	--	--	--	26	32	26	38	19
2-HEXANONE	3.1	EPA RSL	--	--	--	--	**9.3**	**12**	8.2 U	**12 J**	**8.3**
4-METHYL-2-PENTANONE	310	EPA RSL	--	--	--	--	14	19	6.5	23	12
ACETONE	3,200	EPA RSL	--	--	--	--	72	84	220	240	140
BENZENE	0.31	EPA RSL	--	--	--	--	**6.6**	**7.4**	**13**	**11**	**12**
BROMOFORM	2.2	EPA RSL	0.8 U	0.62 U	0.75 U	0.8 U	1.6 U	0.73 U	5.9 U	5.9 U	0.66 U
CARBON DISULFIDE	73	EPA RSL	--	--	--	--	21	27	**220**	19 J	20
CHLOROETHANE	1,000	EPA RSL	2 U	1.6 U	1.9 U	2 U	1.4 U	0.65 U	5.3 U	5.3 U	0.59 U
CHLOROFORM	0.11	EPA RSL	0.38 U	0.29 U	0.35 U	0.38 U	0.76 U	0.34 U	**19**	2.8 U	0.31 U
CHLOROMETHANE	9.4	EPA RSL	--	--	--	--	1.2 J	0.83 J	2.4 U	2.4 U	0.58 J
CIS-1,2-DICHLOROETHENE	6.3	EPA RSL	0.039 B	0.024 U	0.029 U	0.031 U	1.6	1.9	6.1	**24**	0.11 J
DICHLORODIFLUOROMETHANE	10	EPA RSL	--	--	--	--	1.2 J	0.85 J	3.8 J	2.8 U	2.5
ETHYLBENZENE	0.97	EPA RSL	--	--	--	--	**15**	**18**	**18**	**29**	**34**
METHYL TERT-BUTYL ETHER	9.4	EPA RSL	--	--	--	--	0.056 U	0.07 J	0.21 U	0.86 J	1.1
METHYLENE CHLORIDE	97	EPA RSL	0.53 J	0.66 J	0.52 J	0.76 J	0.54 U	0.24 U	2 U	2 U	0.22 U
TETRACHLOROETHENE	9.4	EPA RSL	0.081 J	0.07 J	0.066 J	0.068 J	0.75	0.86	2.1	6.8	6.9
TOLUENE	520	EPA RSL	--	--	--	--	180 J	81 J	92	110	100
TRANS-1,2-DICHLOROETHENE	6.3	EPA RSL	0.031 U	0.024 U	0.029 U	0.031 U	0.077 J	0.063 J	0.23 U	1.2 J	0.025 U
TRICHLOROETHENE	0.43	EPA RSL	0.14 J	0.077 J	0.062 J	0.057 U	**58**	**71**	**1200**	**1400**	**0.51**
TRICHLOROFLUOROMETHANE	73	EPA RSL	--	--	--	--	0.88 U	0.4 U	3.2 U	3.2 U	1.2
VINYL CHLORIDE	0.16	EPA RSL	0.02 U	0.015 U	0.018 U	0.05	**0.25**	**0.29**	**0.43**	**22**	0.040 J

Notes:
PSL : Project Screening Level
DUP : Duplicate sample
µg/m^3 : micrograms per cubic meter
J : Estimated value
U : The chemical was not detected.
ND : The chemical was not detected.
Blank cells or -- : The chemical was not analyzed or no value was available.
Bold and shaded values indicate an exceedance of PSLs
EPA RSL: U.S. Environmental Protection Agency (EPA) (May 2013) Regional Screening Level (RSL) for residential air. RSLs based on non-carcinogenic effects have been divided by 10 to account for exposure to multiple constituents.

TABLE 4-7
SEEP ANALYTICAL DETECTIONS
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

LOCATION	Selected PSL [1]	PSL Reference	S43-SP01		S43-SP02	
SAMPLE ID			S43SP01-01	S43SP01-02	S43SP02-01	S43SP02-02
SAMPLE DATE			20130620	20130510	20120621	20130510
VOLATILES (µg/L)						
1,1,1-TRICHLOROETHANE	--	--	2.36	--	0.5 U	--
1,1-DICHLOROETHANE	47	EPA BTAG	1 U	0.840 J	0.49 J	0.5 U
1,1-DICHLOROETHENE	25	EPA BTAG	1 U	1 U	4.43	0.5 U
1,2-DICHLOROETHANE	100	EPA BTAG	1 U	1 U	0.5 U	0.5 U
2-BUTANONE	--	--	10 U	--	5 U	--
ACETONE	--	--	10 U	--	25.8 B	--
BROMOFORM	320	EPA BTAG	1 U	1 U	0.5 U	0.5 U
CARBON DISULFIDE	--	--	1 U	--	0.5 U	--
CHLOROFORM	1.8	EPA BTAG	1 U	1 U	0.5 U	0.5 U
CHLOROMETHANE	--	--	1 U	--	0.5 U	--
CIS-1,2-DICHLOROETHENE	970	EPA BTAG	3.62	2.08	195	0.440 J
METHYLENE CHLORIDE	98.1	EPA BTAG	2 U	1 J	0.65 J	1 U
TETRACHLOROETHENE	--	--	0.24 J	--	0.5 U	--
TRANS-1,2-DICHLOROETHENE	970	EPA BTAG	1 U	1 U	1.09	0.5 U
TRICHLOROETHENE	21	EPA BTAG	**354**	**156**	**28.7**	1.86
VINYL CHLORIDE	830	EPA BTAG	1 U	1 U	1.16	0.5 U
INORGANICS (µg/L)						
ARSENIC	5	EPA BTAG	--	1.5 U	--	1.5 U
COBALT	23	EPA BTAG	--	7.13	--	**25.9**
IRON	300	EPA BTAG	--	**1,290**	--	**761**
MANGANESE	120	EPA BTAG	--	**134**	--	65.7
MISCELLANEOUS						
pH (S.U.)	--	--	--	5.6	--	4.98
Specific Conductivity (mS/cm)	--	--	--	0.161	--	0.087
Temperature (°C)	--	--	--	15.79	--	15.72
Turbidity (NTU)	--	--	--	--	--	--
Dissolved Oxygen (mg/L)	--	--	--	3.37	--	6.9
Salinity (%)	--	--	--	0.1	--	0
ORP (mV)	--	--	--	140	--	239
Iron Algae	--	--	--	NO	--	NO

Notes:
PSL : Project Screening Level
DUP : Duplicate sample
µg/L : micrograms per liter
mg/L : milligram per liter
S.U. : Standard Units
°C : degrees celsius
NTU : Nephelometric Turbidity Units
% : Percentage
mV : millivolts
J : Estimated value
B : Compound detected in blank sample
-- : No Criteria or no analysis
EPA BTAG : U.S. Environmental Protection Agency (EPA) EPA Region 3 BTAG Freshwater Surface Water Screening Benchmarks (July 2006) http://www.epa.gov/reg3hwmd/risk/eco/btag/sbv/fw/screenbench.htm
Bold and Shaded cells indicate an exceedance of PSLs

TABLE 4-8
SURFACE WATER ANALYTICAL DETECTIONS
SITE 43 - TOLUENE DISPOSAL AREA
NSF NDIAN HEAD, MARYLAND

LOCATION	Selected PSL [1]	PSL Reference	S43-SW01		S43-SW02	S43-SW04	S43-CL01	S43-OF01
SAMPLE ID			S43SW01	S43SW01-DUP	S43SW02	S43SW04	S43CL01	S43OF01
SAMPLE DATE			20130510	20130510	20130510	20130510	20130510	20130510
VOLATILE ORGANIC COMPOUNDS (µg/L)								
1,1-DICHLOROETHANE	47	EPA BTAG	0.75 J	0.69 J	0.34 J	0.5 U	0.5 U	0.5 J
1,1-DICHLOROETHENE	25	EPA BTAG	0.5 U	0.5 U	0.5 U	0.7 J	0.5 U	0.37 J
CIS-1,2-DICHLOROETHENE	970	EPA BTAG	1.37	1.31	1.78	48.2	0.5 U	1.79
TRICHLOROETHENE	21	EPA BTAG	**27.2**	**26.6**	10.2	**30.5**	0.5 U	4.98
VINYL CHLORIDE	930	EPA BTAG	0.5 U	0.5 U	0.5 U	1.26	0.5 U	0.5 U
INORGANICS (µg/L)								
ARSENIC	5	EPA BTAG	1.5 U	1.5 U	1.21 J	1.5 U	1.5 U	0.751 J
COBALT	23	EPA BTAG	4.16	4.17	6.38	10.7	2.5 U	6.58
IRON	300	EPA BTAG	**1,450**	**1,450**	**3,340**	**1,670**	**2,590**	**1,750**
MANGANESE	120	EPA BTAG	**128**	**129**	**192**	**256**	41.2	**189**
MISCELLANEOUS								
pH (S.U.)	--	--	6.59	6.59	6.7	5.43	6.83	6.31
Specific Conductivity (mS/cm)	--	--	0.259	0.259	0.236	0.258	0.172	0.219
Temperature (°C)	--	--	16.35	16.35	16.99	16.56	16.57	17.08
Turbidity (NTU)	--	--						
Dissolved Oxygen (mg/L)	--	--	6.5	6.5	6.6	5	7.75	7
Salinity (%)	--	--	0.1	0.1	0.1	0.1	0.1	0.1
ORP (mV)	--	--	13	13	6	266	25	52

Notes:
PSL : Project Screening Level
DUP : Duplicate sample
µg/L : micrograms per liter
mg/L : milligram per liter
S.U. : Standard Units
°C : degrees celsius
NTU : Nephelometric Turbidity Units
% : Percentage
mV : millivolts
J : Estimated value
U : The chemical was not detected.
Bold and Shaded cells indicate an exceedance of PSLs
[1] Selected PSL is the lowest (most conservative) of the applicable screening criteria
EPA BTAG : U.S. Environmental Protection Agency (EPA) EPA Region 3 BTAG Freshwater Surface Water Screening Benchmarks (July 2006) http://www.epa.gov/reg3hwmd/risk/eco/btag/sbv/fw/screenbench.htm

TABLE 4-9
SEDIMENT ANALYTICAL DETECTIONS
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

LOCATION	Selected PSL[1]	PSL Reference	S43-SD01		S43-SD02	S43-SD04
SAMPLE ID			S43SD01	S43SD01-DUP	S43SD02	S43SD04
SAMPLE DATE			20130510	20130510	20130510	20130510
VOLATILE ORGANIC COMPOUNDS (µg/kg)						
CIS-1,2-DICHLOROETHENE	1,050	EPA BTAG	4.97 J	5.86 J	4.55 J	3.18 J
METHYLENE CHLORIDE	56,000	EPA RSL	142 J	222 J	103 J	113 J
TRICHLOROETHENE	96.9	EPA BTAG	22.1 J	22.3 J	8.9 J	2.9 J
INORGANICS (mg/kg)						
ARSENIC	0.43	EPA RSL	**2.55**	**1.63**	**2**	**2.07 L**
COBALT	2.3	EPA RSL	**10.3**	**6.85**	**16.5**	**13**
IRON	5,500	EPA RSL	**6,920**	4,630	4,850	**17,100**
MANGANESE	160	MDE	64.5 J	32.7 J	83 J	129 J
USCS Classification			SW	SW	SP	SP

Notes:
PSL : Project Screening Level
DUP : Duplicate sample
µg/kg : micrograms per kilogram
mg/kg : milligrams per kilogram
J : Estimated value
L : Estimated Low
USCS : Unified Soil Classification System
Bold and Shaded cells indicate an exceedance of PSLs
[1] Selected PSL is the lowest (most conservative) of the evaluated PSLs.
EPA BTAG : U.S. Environmental Protection Agency (EPA) EPA Region 3 BTAG Freshwater Sediment Screening Benchmarks (July 2006) http://www.epa.gov/reg3hwmd/risk/eco/btag/sbv/fwsed/screenbench.htm
EPA RSL : U.S. Environmental Protection Agency (EPA) (May 2012) Regional Screening Level (RSL) for soil under residential scenario. RSLs based on non-carcinogenic effects have been divided by 10 to account for exposure to multiple constituents. RSL for chromium VI used as surrogate for [total] chromium. RSL for methylmercury used as surrogate for mercury.
MDE : Maryland Department of Environment (MDE) (2008) Table 1 Residential Clean-up Soil Standards http://www.mde.state.md.us/assets/document/final%20update%20no%202.1%20dated%205-20-08(1).pdf

TABLE 6-1
SCREENING CRITERIA USED IN SELECTION OF COPCS - SOIL AND SEDIMENT
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

Chemical	USEPA Regional Screening Levels[1]	
	Direct Contact Residential	Protection of Groundwater
EXPLOSIVES(mg/kg)		
1,3-DINITROBENZENE	0.61 N	0.028
1,3,5-TRINITROBENZENE	220 N	34
4-NITROTOLUENE	24 N[2]	0.068
NITROCELLULOSE	18,000,000 N	200,000
NITROGUANIDINE	610 N	7.6
METALS (mg/kg)		
ALUMINUM	7,700 N	460,000
ARSENIC	0.61 C	0.026
BARIUM	1,500 N	2,400
BERYLLIUM	16 N	260
CADMIUM	7 N	10.4
CALCIUM	NA	NA
CHROMIUM	0.29 C [3]	0.0118
COBALT	2.3 N	4.2
COPPER	310 N	440
IRON	5,500 N	5,400
LEAD	400	280 [5]
MAGNESIUM	NA	NA
MANGANESE	180 N	420
MERCURY	2.3 N[4]	NA [4]
NICKEL	150 N	400
POTASSIUM	NA	NA
SELENIUM	39 N	8
SILVER	39 N	12
SODIUM	NA	NA
THALLIUM	0.078 N	0.22
VANADIUM	39 N	1,260
ZINC	2,300 N	5,800
MISCELLANEOUS PARAMETERS		
CYANIDE (mg/kg)	2.2 N	0.28
PERCHLORATE (ug/kg)	5,500 N	NA
VOLATILES (ug/kg)		
2-BUTANONE	2,800,000 N	20,000
2-HEXANONE	21,000 N	158
4-METHYL-2-PENTANONE	530,000 N	4,600
ACETONE	6,100,000 N	48,000
CIS-1,2-DICHLOROETHENE	16,000 N	164
METHYLENE CHLORIDE	36,000 N[2]	50
TETRACHLOROETHENE	8,600 N[2]	88
TOLUENE	500,000 N	11,800
TRICHLOROETHENE	440 N[2]	3.2
VINYL CHLORIDE	60 C	0.106

Notes:

1 - USEPA Regional Screening Levels, May 2013. The noncarcinogenic values (denoted with a "N" flag) are the RSL divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values (denoted with a "C" flag) represent an incremental cancer risk of 1.0E-06. Protection of groundwater values are risk-based SSLs multipled by 20 to correspond to a dilution and attenuation factor (DAF) of 20.

2 - 1/10 the non-carcinogenic value is less than the carcinogenic value. Screening level is the non-carcinogenic value.

3 - Value is for hexavalent chromium.

4- Value is for mercuric chloride (and other mercury salts).

5 - Value is for MCL based SSL.

C - Carcinogenic.
MCL = Maximum contaminant level.
N - Noncarcinogenic.
NA - No criteria available.

TABLE 6-2
SCREENING CRITERIA USED IN SELECTION OF COPCS - GROUNDWATER AND SURFACE WATER
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

Chemical	USEPA Regional Screening Level[1] Tap Water	
EXPLOSIVES (ug/L)		
1,3-DINITROBENZENE	0.15	N
2,6-DINITROTOLUENE	0.042	C
3-NITROTOLUENE	0.13	N
4-AMINO-2,6-DINITROTOLUENE	3	N
4-NITROTOLUENE	3.7	C
HMX	78	N
TETRYL	6.1	N
METALS (ug/L)		
ALUMINUM	1,600	N
ARSENIC	0.045	C
BARIUM	290	N
BERYLLIUM	1.6	N
CADMIUM	0.69	N
CHROMIUM	0.031	C[2]
COBALT	0.47	N
COPPER	62	N
IRON	1,100	N
LEAD	15	[3]
MANGANESE	32	N
NICKEL	30	N
THALLIUM	0.016	N
VANADIUM	6.3	N
ZINC	470	N
VOLATILES (ug/L)		
1,1,1-TRICHLOROETHANE	750	N
1,1-DICHLOROETHANE	2.4	C
1,1-DICHLOROETHENE	26	N
1,2-DICHLOROETHANE	0.15	C
2-BUTANONE	490	N
ACETONE	1,200	N
CARBON DISULFIDE	72	N
CHLOROFORM	0.19	C
CIS-1,2-DICHLOROETHENE	2.8	N
METHYLENE CHLORIDE	8.4	N[4]
TETRACHLOROETHENE	3.5	N[4]
TRANS-1,2-DICHLOROETHENE	8.6	N
TRICHLOROETHENE	0.26	N[4]
VINYL CHLORIDE	0.015	C

Notes:
1 - USEPA Regional Screening Levels, May, 2013. The noncarcinogenic values (denoted with a "N" flag) are the RSL divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values (denoted with a "C" flag) represent an incremental cancer risk of 1.0E-06.
2 - Value is for hexavalent chromium.
3 - Value is the MCL.
4 - One tenth the noncarcinogenic level is less than the carcinogenic level; therefore, the noncarcinogenic level is presented.

C - Carcinogenic
MCL = Maximum contaminant level.
N - Noncarcinogenic

TABLE 6-3
SCREENING CRITERIA USED IN SELECTION OF COPCS - INDOOR AIR AND SOIL GAS
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

Chemical	USEPA Regional Screening Level[1] Indoor Air		Soil Gas Screening Level[2]	
VOLATILES (ug/m^3)				
1,1,1-TRICHLOROETHANE	520	N	5200	N
1,1-DICHLOROETHANE	15	C	150	C
1,1-DICHLOROETHENE	21	N	210	N
1,2-DICHLOROETHANE	0.094	C	0.94	C
1,4-DIOXANE	0.32	C	3.2	C
2-BUTANONE	520	N	5200	N
2-HEXANONE	3.1	N	31	N
4-METHYL-2-PENTANONE	310	N	3100	N
ACETONE	3,200	N	32000	N
BENZENE	0.31	C	3.1	C
CARBON DISULFIDE	73	N	730	N
CHLOROETHANE	1000	N	10000	N
CHLOROFORM	0.11	C	1.1	C
CHLOROMETHANE	9.4	N	94	N
CIS-1,2-DICHLOROETHENE	6.3	N	63	N
DICHLORODIFLUOROMETHANE	10	N	100	N
ETHYLBENZENE	0.97	C	9.7	C
M+P-XYLENES	10	N	100	N
METHYL TERT-BUTYL ETHER	9.4	C	94	C
METHYLENE CHLORIDE	63	N[3]	630	N[3]
O-XYLENE	10	N	100	N
TETRACHLOROETHENE	4.2	N[3]	42	N[3]
TOLUENE	520	N	5200	N
TRANS-1,2-DICHLOROETHENE	6.3	N	63	N
TRICHLOROETHENE	0.21	N[3]	2.1	N[3]
TRICHLOROFLUOROMETHANE	73	N	730	N
VINYL CHLORIDE	0.16	C	1.6	C

Notes:

1 - USEPA Regional Screening Levels, May, 2013. The noncarcinogenic values (denoted with a "N" flag) are the RSL divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values (denoted with a "C" flag) represent an incremental cancer risk of 1.0E-06.

2 - Indoor Air RSLs were multiplied by a factor of 10 to account for an attenuation factor of 0.1.

3 - One tenth the noncarcinogenic level is less than the carcinogenic level; therefore, the noncarcinogenic level is presented.

C - Carcinogenic
N - Noncarcinogenic

TABLE 6-4
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - DIRECT CONTACT WITH SURFACE SOIL
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects[1]	Concentration Used for Screening[2]	NSF-IH Background Value[3]	USEPA RSL Residential Soil[4]	COPC Flag	Rationale for Contaminant Deletion or Selection[5]
Site 43		**EXPLOSIVES**											
	99-35-4	1,3,5-TRINITROBENZENE	0.032 J	0.032 J	mg/kg	S43SB028-0001	1/8	0.0385 - 0.25	0.032	NA	220 N	NO	BSL
	9004-70-0	NITROCELLULOSE	8 J	9 J	mg/kg	S43SS0020001	2/2	--	9	NA	18,000,000 N	NO	BSL
	556-88-7	NITROGUANIDINE	0.429 J	0.429 J	mg/kg	S43SB028-0001	1/8	0.182 - 0.25	0.429	NA	610 N	NO	BSL
		METALS											
	7429-90-5	**ALUMINUM**	4,410 J	20,200	mg/kg	S43SB023-0001	8/8	--	20,200	**19,700**	**7,700 N**	**YES**	ASL
	7440-38-2	ARSENIC	1.6 L	12.3	mg/kg	S43SB028-0001	8/8	--	12.3	14.9	**0.61 C**	NO	BKG
	7440-39-3	BARIUM	25.9 J	233 L	mg/kg	S43SB027-0001	8/8	--	233	**80.4**	1,500 N	NO	BSL
	7440-41-7	BERYLLIUM	0.27	0.883	mg/kg	S43SB028-0001	8/8	--	0.883	1.1	16 N	NO	BSL, BKG
	7440-43-9	**CADMIUM**	0.072 J	12.2	mg/kg	S43SB028-0001	8/8	--	12.2	**2.5**	**7 N**	**YES**	ASL
	7440-70-2	CALCIUM	1,170	1,610	mg/kg	S43SS0010001	2/2	--	1,610	2,060	NA	NO	NUT, BKG
	7440-47-3	**CHROMIUM**	17.1 K	37.5 J	mg/kg	S43SS0020001	8/8	--	37.5	**33.4**	**0.29 C [6]**	**YES**	ASL
	7440-48-4	COBALT	2.94	19.3	mg/kg	S43SS0020001	8/8	--	19.3	22.3	**2.3 N**	NO	BKG
	7440-50-8	COPPER	10.6	57.4	mg/kg	S43SB028-0001	8/8	--	57.4	**20.3**	310 N	NO	BSL
	7439-89-6	IRON	12,500 J	32,100 J	mg/kg	S43SB023-0001-D	8/8	--	32,100	38,500	**5,500 N**	NO	BKG
	7439-92-1	LEAD	9.69	91	mg/kg	S43SS0010001	8/8	--	91	**62.5**	400	NO	BSL
	7439-95-4	MAGNESIUM	765	3,860	mg/kg	S43SS0010001	2/2	--	3,860	**1,620**	NA	NO	NUT
	7439-96-5	MANGANESE	14.7 K	813 J	mg/kg	S43SS0020001	8/8	--	813	1,390	**180 N**	NO	BKG
	7439-97-6	MERCURY	0.0207 J	0.12	mg/kg	S43SB028-0001	2/8	0.033 - 0.05	0.12	NA	2.3 N[7]	NO	BSL
	7440-02-0	NICKEL	7.1	38.8	mg/kg	S43SS0010001	8/8	--	38.8	**15.4**	150 N	NO	BSL
	7440-09-7	POTASSIUM	299	441	mg/kg	S43SS0020001	2/2	--	441	1,470	NA	NO	NUT, BKG
	7782-49-2	SELENIUM	0.256 J	0.801 J	mg/kg	S43SB028-0001	6/8	--	0.801	1.2	39 N	NO	BSL, BKG
	7440-22-4	SILVER	0.0673 J	0.262 J	mg/kg	S43SB028-0001	4/8	0.121 - 0.55	0.262	0.84	39 N	NO	BSL, BKG
	7440-23-5	SODIUM	281	465	mg/kg	S43SS0020001	2/2	--	465	**120**	NA	NO	NUT
	7440-28-0	THALLIUM	0.664 J	0.664 J	mg/kg	S43SB028-0001	1/8	0.242 - 0.38	0.664	2.3	**0.078 N**	NO	BKG
	7440-62-2	VANADIUM	29.5	44.6	mg/kg	S43SB028-0001	8/8	--	44.6	53.3	**39 N**	NO	BKG
	7440-66-6	ZINC	19.4 J	402 J	mg/kg	S43SB028-0001	8/8	--	402	**37.5**	2,300 N	NO	BSL
		VOLATILES											
	156-59-2	CIS-1,2-DICHLOROETHENE	14.4	175 J	µg/kg	S43SB027-0001	3/8	2.17 - 243	175	NA	16,000 N	NO	BSL
	75-09-2	METHYLENE CHLORIDE	210 J	210 J	µg/kg	S43SS0020001	1/8	4.34 - 486	210	NA	36,000 N[8]	NO	BSL
	79-01-6	**TRICHLOROETHENE**	1.91 J	2,720	µg/kg	S43SB027-0001	3/8	2.3 - 243	2,720	NA	**440 N[8]**	**YES**	ASL
	75-01-4	VINYL CHLORIDE	2.18 J	2.18 J	µg/kg	S43SB026-0001	1/8	2.17 - 243	2.18	NA	60 C	NO	BSL

Footnotes:
1 - Values presented are sample-specific quantitation limits.
2 - The maximum detected concentration is used for screening purposes.
3 - NSF Indian Head surface soil background values.
4 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2013. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag).
5 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is greater than site background.
6 - Value is for hexavalent chromium.
7- Value is for mercuric chloride (and other mercury salts).
8- 1/10 the non-carcinogenic value is less than the carcinogenic value. Screening level is the non-carcinogenic value.

Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Definitions:
C = Carcinogen
CAS = Chemical Abstracts Services
COPC = Chemical Of Potential Concern
J = Estimated value
K = Biased High
L = Biased Low
N = Noncarcinogen
NA = Not Applicable/Not Available

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level and site background.

For elimination as a COPC:
BKG = Less than Background Concentration
BSL = Below COPC Screening Level
NUT = Essential Nutrient

Associated Samples
S43SB023-0001
S43SB023-0001-D
S43SB024-0001
S43SB025-0001
S43SB026-0001
S43SB027-0001
S43SB028-0001
S43SS0010001
S43SS0020001

TABLE 6-5
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - DIRECT CONTACT WITH SUBSURFACE SOIL
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil

Exposure Point	CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects[1]	Concentration Used for Screening[2]	NSF-IH Background Value[3]	USEPA RSL Residential Soil[4]	COPC Flag	Rationale for Contaminant Deletion or Selection[5]
Site 43		**EXPLOSIVES**											
	99-65-0	1,3-DINITROBENZENE	0.028 J	0.0375 J	mg/kg	S43SB009-0608	3/19	0.0367 - 0.25	0.0375	NA	0.61 N	NO	BSL
	99-99-0	4-NITROTOLUENE	0.023 J	0.064 J	mg/kg	S43SB011-0709	3/19	0.0367 - 0.25	0.064	NA	24 N[6]	NO	BSL
		METALS											
	7429-90-5	ALUMINUM	2,180	12,300	mg/kg	S43SB014-0709	19/19	--	12,300	21,400	**7,700 N**	NO	BKG
	7440-38-2	ARSENIC	0.834 J	5.24 J	mg/kg	S43SB011-0709-D	19/19	--	5.24	28.7	**0.61 C**	NO	BKG
	7440-39-3	BARIUM	14.9 L	408 K	mg/kg	S43SB023-0607	19/19	--	408	**66.5**	1,500 N	NO	BSL
	7440-41-7	BERYLLIUM	0.26	1.6	mg/kg	S43SB0020101	19/19	--	1.6	**1.5**	16 N	NO	BSL
	7440-43-9	CADMIUM	0.077 J	0.4	mg/kg	S43SB0020101	3/19	0.112 - 0.298	0.4	0.61	7 N	NO	BSL, BKG
	7440-70-2	CALCIUM	176	1,280	mg/kg	S43SB0020101	2/2	--	1,280	**1,270**	NA	NO	NUT
	7440-47-3	CHROMIUM	8.03 K	18.5 K	mg/kg	S43SB013-0608, S43SB028-0405	19/19	--	18.5	59.1	**0.29 C [7]**	NO	BKG
	7440-48-4	COBALT	1.47	6.28	mg/kg	S43SB023-0607	19/19	--	6.28	14.7	**2.3 N**	NO	BKG
	7440-50-8	COPPER	4.8	21.9	mg/kg	S43SB0020101	19/19	--	21.9	47.6	310 N	NO	BSL, BKG
	7439-89-6	IRON	4,010	18,700	mg/kg	S43SB0020101	19/19	--	18,700	35,200	**5,500 N**	NO	BKG
	7439-92-1	LEAD	5.02	13.3	mg/kg	S43SB014-0709	19/19	--	13.3	38.6	400	NO	BSL, BKG
	7439-95-4	MAGNESIUM	196	777	mg/kg	S43SB0020101	2/2	--	777	2,940	NA	NO	NUT, BKG
	7439-96-5	**MANGANESE**	9.75 K	227 J	mg/kg	S43SB0020101	19/19	--	227	**155**	**180 N**	YES	ASL
	7439-97-6	MERCURY	0.013 J	0.0221 J	mg/kg	S43SB028-0405	3/19	0.029 - 0.048	0.0221	NA	2.3 N[8]	NO	BSL
	7440-02-0	NICKEL	5.26	14.5	mg/kg	S43SB023-0607	19/19	--	14.5	15.9	150 N	NO	BSL, BKG
	7440-09-7	POTASSIUM	311	380	mg/kg	S43SB0020101	2/2	--	380	3,440	NA	NO	NUT, BKG
	7782-49-2	SELENIUM	0.223 J	0.358 J	mg/kg	S43SB026-0506	7/19	0.28 - 0.597	0.358	3.8	39 N	NO	BSL, BKG
	7440-23-5	SODIUM	265	288	mg/kg	S43SB0010101	2/2	--	288	461	NA	NO	NUT, BKG
	7440-62-2	VANADIUM	7.53	34	mg/kg	S43SB028-0405	19/19	--	34	102	39 N	NO	BSL, BKG
	7440-66-6	ZINC	9.98	46.6 K	mg/kg	S43SB014-0709	19/19	--	46.6	49.7	2,300 N	NO	BSL, BKG
		MISCELLANEOUS PARAMETERS											
	57-12-5	CYANIDE	1.4	1.4	mg/kg	S43SB0010101	1/13	0.097 - 0.884	1.4	NA	2.2 N	NO	BSL
	14797-73-0	PERCHLORATE	1.08 J	4.84 J	µg/kg	S43SB011-0709-D	3/11	2.33 - 2.45	4.84	NA	5,500 N	NO	BSL
		VOLATILES											
	78-93-3	2-BUTANONE	564 J	837	µg/kg	S43SB022-0708	2/20	4.52 - 5020	837	NA	2,800,000 N	NO	BSL
	591-78-6	2-HEXANONE	16	16	µg/kg	S43SB015-0810	1/20	2.26 - 2510	16	NA	21,000 N	NO	BSL
	108-10-1	4-METHYL-2-PENTANONE	5,190 J	19,100 J	µg/kg	S43SB022-0708	2/20	2.26 - 2510	19,100	NA	530,000 N	NO	BSL
	67-64-1	ACETONE	12 J	4,660,000	µg/kg	S43SB022-0708	8/20	10 - 556	4,660,000	NA	6,100,000 N	NO	BSL
	156-59-2	CIS-1,2-DICHLOROETHENE	100 J	585	µg/kg	S43SB022-0708	5/20	2.26 - 2510	585	NA	16,000 N	NO	BSL
	75-09-2	METHYLENE CHLORIDE	6.81 J	3,590 J	µg/kg	S43SB023-0607	3/20	4.52 - 278	3,590	NA	36,000 N[6]	NO	BSL
	127-18-4	TETRACHLOROETHENE	1.65 J	1.65 J	µg/kg	S43SB010-0709	1/20	2.26 - 2510	1.65	NA	8,600 N[6]	NO	BSL
	108-88-3	TOLUENE	1.29 J	1.29 J	µg/kg	S43SB013-0608	1/20	2.26 - 2510	1.29	NA	500,000 N	NO	BSL
	79-01-6	**TRICHLOROETHENE**	8 J	4,790	µg/kg	S43SB027-0708	8/20	2.26 - 2510	4,790	NA	**440 N[6]**	YES	ASL
	75-01-4	VINYL CHLORIDE	14.3	14.3	µg/kg	S43SB019-0607	1/20	2.3 - 2510	14.3	NA	60 C	NO	BSL

Footnotes:
1 - Values presented are sample-specific quantitation limits.
2 - The maximum detected concentration is used for screening purposes.
3 - NSF Indian Head subsurface soil background values.
4 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2013. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag).
5 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is greater than site background.
6 - 1/10 the non-carcinogenic value is less than the carcinogenic value. Screening level is the non-carcinogenic value.
7 - Value is for hexavalent chromium.
8 - Value is for mercuric chloride (and other mercury salts).

Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Definitions:
C = Carcinogen
CAS = Chemical Abstracts Services
COPC = Chemical Of Potential Concern
J = Estimated value
K = Biased High
L = Baised Low
N = Noncarcinogen
NA = Not Applicable/Not Available

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level and site background.
For elimination as a COPC:
BKG = Less than Background Concentration
BSL = Below COPC Screening Level
NUT = Essential Nutrient

Associated Samples

S43SB0010101	S43SB015-0810
S43SB0020101	S43SB016-0607
S43SB008-0607	S43SB016-0608
S43SB008-0608	S43SB017-0608
S43SB009-0608	S43SB018-0507
S43SB009-0708	S43SB019-0607
S43SB009-0708-D	S43SB022-0708
S43SB010-0709	S43SB023-0607
S43SB011-0507	S43SB024-0607
S43SB011-0709	S43SB024-0607-D
S43SB011-0709-D	S43SB025-0607
S43SB012-0507	S43SB026-0506
S43SB012-0507-D	S43SB027-0708
S43SB013-0608	S43SB028-0405
S43SB014-0709	

TABLE 6-6
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - GROUNDWATER
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects[1]	Concentration Used for Screening[2]	NSF-IH Background Value[3]	USEPA Tapwater RSL[4]	COPC Flag	Rationale for Contaminant Deletion or Selection[5]
Site 43		**EXPLOSIVES**											
	99-65-0	**1,3-DINITROBENZENE**	0.186 J	0.212 J	ug/L	S43MW2401	2/24	0.151 - 0.168	0.212	NA	**0.15 N**	YES	ASL
	606-20-2	**2,6-DINITROTOLUENE**	0.185 J	0.504 J	ug/L	S43MW1001	2/24	0.151 - 0.178	0.504	NA	**0.042 C**	YES	ASL
	99-08-1	**3-NITROTOLUENE**	0.107 J	0.871	ug/L	S43MW0602	14/24	0.151 - 0.168	0.871	NA	**0.13 N**	YES	ASL
	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	0.473	0.473	ug/L	S43MW2401	1/24	0.151 - 0.178	0.473	NA	3 N	NO	BSL
	99-99-0	4-NITROTOLUENE	0.0861 J	2.13 J	ug/L	S43MW17D01	16/24	0.155 - 0.168	2.13	NA	3.7 C	NO	BSL
	2691-41-0	HMX	0.123 J	0.965	ug/L	S43MW2201	5/24	0.151 - 0.178	0.965	NA	78 N	NO	BSL
	479-45-8	TETRYL	0.198 J	0.198 J	ug/L	S43MW2401	1/24	0.151 - 0.178	0.198	NA	6.1 N	NO	BSL
		METALS											
	7429-90-5	ALUMINUM	14.8 J	1,190	ug/L	S43MW0602	21/24	25 - 28	1,190	9,620	1,600 N	NO	BSL, BKG
	7440-38-2	**ARSENIC**	1.02 J	12.2	ug/L	S43MW0302	25/61	1.5 - 1.5	12.2	NA	**0.045 C**	YES	ASL
	7440-39-3	**BARIUM**	27	352	ug/L	S43MW09S01	24/24	--	352	**139**	**290 N**	YES	ASL
	7440-41-7	**BERYLLIUM**	0.306 J	1.95	ug/L	S43MW19S01	14/24	0.5 - 0.5	1.95	NA	**1.6 N**	YES	ASL
	7440-43-9	CADMIUM	0.29 J	0.909 J	ug/L	S43MW1801	5/24	0.5 - 0.5	0.909	2.8	**0.69 N**	NO	BKG
	7440-47-3	CHROMIUM	0.841 J	4.45	ug/L	S43MW2401	7/24	1 - 1	4.45	16.4	**0.031 C[6]**	NO	BKG
	7440-48-4	**COBALT**	1.95 J	147	ug/L	S43MW019S02_20130508	58/66	2.5 - 2.5	147	**15.6**	**0.47 N**	YES	ASL
	7440-50-8	COPPER	1.01 J	8.18	ug/L	S43MW2401	12/24	2 - 2	8.18	22.4	62 N	NO	BSL, BKG
	7439-89-6	**IRON**	12.4 J	54,900 K	ug/L	S43MW0602	60/61	15 - 15	54,900	**19,900**	**1,100 N**	YES	ASL
	7439-92-1	LEAD	0.69 J	1.08	ug/L	S43MW0104-D	2/24	0.75 - 0.75	1.08	NA	15 [7]	NO	BSL
	7439-96-5	**MANGANESE**	32.7	2,060	ug/L	S43PZ001_20130514	61/61	--	2,060	**824**	**32 N**	YES	ASL
	7440-02-0	**NICKEL**	0.761 J	52.9	ug/L	S43MW1801	21/24	1.5 - 1.5	52.9	**16.6**	**30 N**	YES	ASL
	7440-28-0	**THALLIUM**	0.799 J	0.803 J	ug/L	S43MW19S01-D	1/24	1 - 1	0.803	NA	**0.016 N**	YES	ASL
	7440-62-2	VANADIUM	1.27 J	6.68	ug/L	S43MW0602	17/24	2.5 - 2.5	6.68	20.9	**6.3 N**	NO	BKG
	7440-66-6	ZINC	1.32 J	92.4	ug/L	S43MW19S01	24/24	--	92.4	**45.2**	470 N	NO	BSL
		VOLATILES											
	71-55-6	1,1,1-TRICHLOROETHANE	0.37 J	11.1	ug/L	S43MW2001	3/24	0.5 - 50	11.1	NA	750 N	NO	BSL
	75-34-3	**1,1-DICHLOROETHANE**	0.34 J	41.9	ug/L	S43MW02402_20130508	16/61	0.5 - 50	41.9	NA	**2.4 C**	YES	ASL
	75-35-4	**1,1-DICHLOROETHENE**	0.34 J	70	ug/L	S43MW19S01-D	23/61	0.5 - 50	70	NA	**26 N**	YES	ASL
	107-06-2	**1,2-DICHLOROETHANE**	0.36 J	0.36 J	ug/L	S43MW01302_20130519	1/61	0.5 - 50	0.36	NA	**0.15 C**	YES	ASL
	78-93-3	2-BUTANONE	4.04 J	4.04 J	ug/L	S43MW2401	1/24	5 - 500	4.04	NA	490 N	NO	BSL
	67-64-1	ACETONE	7.56 J	7.56 J	ug/L	S43MW2401	1/24	5 - 500	7.56	NA	1,200 N	NO	BSL
	75-15-0	CARBON DISULFIDE	0.55 J	2.65	ug/L	S43MW1001	4/24	0.5 - 50	2.65	NA	72 N	NO	BSL
	67-66-3	CHLOROFORM	0.14 J	0.14 J	ug/L	S43MW01602_20130519	1/61	0.5 - 50	0.14	NA	0.19 C	NO	BSL
	156-59-2	**CIS-1,2-DICHLOROETHENE**	0.77 J	400	ug/L	S43MW0104	28/61	0.5 - 0.5	400	NA	**2.8 N**	YES	ASL
	75-09-2	METHYLENE CHLORIDE	0.5 J	5.3 J	ug/L	S43MW00403_20130513	8/61	1 - 100	5.3	NA	8.4 N[8]	NO	BSL
	156-60-5	TRANS-1,2-DICHLOROETHENE	0.34 J	7.86	ug/L	S43MW03001_20130513	6/61	0.5 - 50	7.86	NA	8.6 N	NO	BSL
	79-01-6	**TRICHLOROETHENE**	0.26 J	17,500	ug/L	S43MW0104	43/66	0.5 - 0.5	17,500	NA	**0.26 N[8]**	YES	ASL
	75-01-4	**VINYL CHLORIDE**	0.81 J	65.6	ug/L	S43MW17D01	16/61	0.5 - 50	65.6	NA	**0.015 C**	YES	ASL

TABLE 6-6
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - GROUNDWATER
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

Footnotes:

1 - Values presented are sample-specific quantitation limits.
2 - The maximum detected concentration is used for screening purposes.
3 - NSF Indian Head groundwater background values.
4 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2013. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag).
5 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is greater than site background.
6 - Value is for hexavalent chromium.
7 - Value is the MCL.
8 - 1/10 the non-carcinogenic value is less than the carcinogenic value. Screening level is the non-carcinogenic value.

Definitions:

C = Carcinogen
CAS = Chemical Abstracts Services
COPC = Chemical Of Potential Concern
J = Estimated value
K = Biased high
N = Noncarcinogen
NA = Not Applicable/Not Available

Rationale Codes:

For selection as a COPC:
ASL = Above Screening Level and site background.

For elimination as a COPC:
BKG = Less than Background Concentration
BSL = Below COPC Screening Level
NSL = No Screening Level
NUT = Essential Nutrient

Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Associated Samples

S43MW0104-AVG	S43MW1301	S43MW2401
S43MW00105_20130508-AVG	S43MW01302_20130519	S43MW02402_20130508
S43MW0204-AVG	S43MW1401	S43MW2501
S43MW00205_20130519	S43MW01402_20130519	S43MW02502_20130508
S43MW0302	S43MW1501	S43MW2601
S43MW00303_20130509	S43MW01502_20130519	S43MW02602_20130509
S43MW0402	S43MW1601	S43MW02701_20130513
S43MW00403_20130513	S43MW01602_20130519	S43MW02801_20130513
S43MW0502	S43MW17D01	S43MW02901_20130513
S43MW00503_20130509	S43MW017D02_20130509-AVG	S43MW03001_20130513-AVG
S43MW0602	S43MW17S01	S43PZ001_20130514
S43MW00603_20130509	S43MW017S02_20130509	S43PZ002_20130514
S43MW0701	S43MW1801	S43PZ003_20130514
S43MW00702_20130513	S43MW01802_20130508	S43PZ004_20130514
S43MW0801	S43MW19D01	
S43MW00802_20130509	S43MW019D02_20130508	
S43MW09D01	S43MW19S01-AVG	
S43MW009D02_20130513	S43MW019S02_20130508	
S43MW09S01	S43MW2001	
S43MW009S02_20130513-AVG	S43MW02002_20130509	
S43MW1001	S43MW2101	
S43MW01002_20130509	S43MW02102_20130508	
S43MW1101	S43MW2201	
S43MW01102_20130509	S43MW02202_20130509	
S43MW1201	S43MW2301	
S43MW01202_20130514	S43MW02302_20130509	

TABLE 6-7
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - SEDIMENT
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Point	CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects(1)	Concentration Used for Screening(2)	Adjusted USEPA RSL Residential Soil(3)	COPC Flag	Rationale for Contaminant Deletion or Selection(4)
Site 43		**METALS**										
	7440-38-2	ARSENIC	1.63	2.55	mg/kg	S43SD01_20130510	3/3	--	2.55	6.1 C	NO	BSL
	7440-48-4	COBALT	6.85	16.5	mg/kg	S43SD02_20130510	3/3	--	16.5	23 N	NO	BSL
	7439-89-6	IRON	4,630	17,100	mg/kg	S43SD04_20130510	3/3	--	17100	55,000 N	NO	BSL
	7439-96-5	MANGANESE	32.7 J	129 J	mg/kg	S43SD04_20130510	3/3	--	129	1,800 N	NO	BSL
		VOLATILES										
	156-59-2	CIS-1,2-DICHLOROETHENE	3.18 J	5.86 J	µg/kg	S43SD01_20130510-D	3/3	--	5.86	160,000 N	NO	BSL
	75-09-2	METHYLENE CHLORIDE	103 J	222 J	µg/kg	S43SD01_20130510-D	3/3	--	222	360,000 N(5)	NO	BSL
	79-01-6	TRICHLOROETHENE	2.9 J	22.3 J	µg/kg	S43SD01_20130510-D	3/3	--	22.3	4,400 N(5)	NO	BSL

Footnotes:
1 - Values presented are sample-specific quantitation limits.
2 - The maximum detected concentration is used for screening purposes.
3 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2013. The RSLs are multiplied by 10 to account for reduced exposure to sediment.
The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10. Carcinogenic values (denoted with a "C" flag) represent an incremental cancer risk of 1.0E-06
4 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level
5 - One tenth the non-carcinogenic value is less than the carciongenic value so the non-carcinogenic value is used.

Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria.
Shaded chemical name indicates that the chemical was retained as a COPC.

Definitions:
C = Carcinogen
CAS = Chemical Abstracts Services
COPC = Chemical Of Potential Concern
J = Estimated value
N = Noncarcinogen

Associated Samples
S43SD01_20130510
S43SD01_20130510-D
S43SD01_20130510-AVG
S43SD02_20130510
S43SD04_20130510

Rationale Codes:
For elimination as a COPC:
BSL = Below COPC Screening Level

TABLE 6-8
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - SURFACE WATER
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Point	CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects[1]	Concentration Used for Screening[2]	USEPA Tapwater RSL[3]	COPC Flag[4]	Rationale for Contaminant Deletion or Selection
Site 43		**METALS**										
	7440-38-2	**ARSENIC**	0.751 J	1.21 J	µg/L	S43SW02_20130510	2/7	1.5 - 1.5	1.21	**0.45 C**	YES	ASL
	7440-48-4	**COBALT**	4.16	25.9	µg/L	S43SP0202_20130510	6/7	2.5 - 2.5	25.9	**4.7 N**	YES	ASL
	7439-89-6	IRON	761	3340	µg/L	S43SW02_20130510	7/7	-	3340	11,000 N	NO	BSL
	7439-96-5	MANGANESE	41.2	256	µg/L	S43SW04_20130510	7/7	-	256	320 N	NO	BSL
		VOLATILES										
	71-55-6	1,1,1-TRICHLOROETHANE	2.36	2.36	µg/L	S43SP01-01	1/2	0.5 - 0.5	2.36	7,500 N	NO	BSL
	75-34-3	1,1-DICHLOROETHANE	0.34 J	0.84 J	µg/L	S43SP0102_20130510	5/9	0.5 - 1	0.84	24 C	NO	BSL
	75-35-4	1,1-DICHLOROETHENE	0.37 J	4.43	µg/L	S43SP02-01	3/9	0.5 - 1	4.43	260 N	NO	BSL
	156-59-2	**CIS-1,2-DICHLOROETHENE**	0.44 J	195	µg/L	S43SP02-01	8/9	0.5 - 0.5	195	**28 N**	YES	ASL
	75-09-2	METHYLENE CHLORIDE	0.65 J	1 J	µg/L	S43SP0102_20130510	2/9	1 - 2	1	84 N[5]	NO	BSL
	127-18-4	TETRACHLOROETHENE	0.24 J	0.24 J	µg/L	S43SP01-01	1/2	0.5 - 0.5	0.24	35 N[5]	NO	BSL
	156-60-5	TRANS-1,2-DICHLOROETHENE	1.09	1.09	µg/L	S43SP02-01	1/9	0.5 - 1	1.09	86 N	NO	BSL
	79-01-6	**TRICHLOROETHENE**	1.86	354	µg/L	S43SP01-01	8/9	0.5 - 0.5	354	**2.6 N[5]**	YES	ASL
	75-01-4	**VINYL CHLORIDE**	1.16	1.26	µg/L	S43SW04_20130510	2/9	0.5 - 1	1.26	**0.15 C**	YES	ASL

Footnotes:
1 - Values presented are sample-specific quantitation limits.
2 - The maximum detected concentration is used for screening purposes.
3 - USEPA tapwater RSL May 2013 multipled by 10 to account for reduced exposure to surface water.
The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10.
Carcinogenic values (denoted with a "C" flag).
4 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level.
5 - One tenth the non-carcinogenic value is less than the carcinogenic value so the non-carcinogenic value is used.

Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria.
Shaded chemical name indicates that the chemical was retained as a COPC.

Definitions:
C = Carcinogen
CAS = Chemical Abstracts Services
COPC = Chemical Of Potential Concern
J = Estimated value
N = Noncarcinogen

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level
For elimination as a COPC:
BSL = Below COPC Screening Level

Associated Samples
S43CL01_20130510
S43OF01_20130510
S43SP01-01
S43SP0102_20130510
S43SP02-01
S43SP0202_20130510
S43SW01_20130510
S43SW01_20130510-D
S43SW01_20130510-avg
S43SW02_20130510
S43SW04_20130510

TABLE 6-9
OCCURENCE, DISTRIBUTION, AND SELECTION OF COPCS - VAPOR INTRUSION BUILDING 716 INDOOR AIR
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Indoor Air
Exposure Medium: Indoor Air

Exposure Point	CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Sample with Maximum Concentration	Frequency of Detection	Range of Nondetects[1]	Concentration Used for Screening[2]	Ambient Air Concentration	USEPA RSL Residential Air[3]	COPC Flag	Rationale for Contaminant Deletion or Selection[4]
Building 716		**VOLATILES**											
	75-35-4	1,2-DICHLOROETHANE	0.053 J	0.062 J	µg/m^3	S43-716-IND01	2/2	--	0.062	0.074 J	0.094 C	NO	BSL
	156-59-2	CIS-1,2-DICHLOROETHENE	0.039 J	0.039 J	µg/m^3	S43-716-IND01	1/2		0.039	--	6.3 N	NO	BSL
	75-09-2	METHYLENE CHLORIDE	0.52 J	0.66 J	µg/m^3	S43-716-IND02	2/2	--	0.66	0.76 J	63 N [5]	NO	BSL
	127-18-4	TETRACHLOROETHENE	0.066 J	0.081 J	µg/m^3	S43-716-IND01	2/2	--	0.081	0.068 J	4.2 N [5]	NO	BSL
	79-01-6	TRICHLOROETHENE	0.062 J	0.14 J	µg/m^3	S43-716-IND02	2/2	--	0.14	--	0.21 N [5]	NO	BSL

Notes:
1 - Values presented are sample-specific quantitation limits.
2 - The maximum detected concentration is used for screening purposes.
3 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2013. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag).
4 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is greater than site background.
5- 1/10 the non-carcinogenic value is less than the carcinogenic value. Screening level is the non-carcinogenic value.

Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that th chemical was retained as a COPC.

Definitions:
C = Carcinogen
CAS = Chemical Abstracts Services
COPC = Chemical Of Potential Concern
J = Estimated value
N = Noncarcinogen
NA = Not Applicable/Not Available

Associated Samples
S43-716-IND01
S43-716-IND02
S43-716-DUP01

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level and site background.

For elimination as a COPC:
BSL = Below COPC Screening Level

TABLE 6-10
OCCURENCE, DISTRIBUTION, AND SELECTION OF COPCS - VAPOR INTRUSION BUILDING 720 INDOOR AIR
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Indoor Air
Exposure Medium: Indoor Air

Exposure Point	CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects(1)	Concentration Used for Screening(2)	Ambient Air Concentration	USEPA RSL Residential Air(3)	COPC Flag	Rationale for Contaminant Deletion or Selection(4)
		VOLATILES											
Building 720	71-55-6	1,1,1-TRICHLOROETHANE	0.035 J	0.072 J	µg/m^3	S43INDO1	2/2	--	0.072	--	520 N	NO	BSL
	107-06-2	1,2-DICHLOROETHANE	0.08 B	0.098 B	µg/m^3	S43INDO1	2/2	--	0.098	0.074 J	**0.094 C**	NO	BSL
	78-93-3	2-BUTANONE	0.91 J	1 J	µg/m^3	S43INDO1	2/2	--	1	--	520 N	NO	BSL
	67-64-1	ACETONE	5 J	6.5 J	µg/m^3	S43INDO1	2/2	--	6.5	--	3,200 N	NO	BSL
	71-43-2	**BENZENE**	0.27 J	0.45	µg/m^3	S43INDO1	2/2	--	0.45	--	**0.31 C**	**YES**	ASL
	74-87-3	**CHLOROMETHANE**	0.68 J	1.1 J	µg/m^3	S43IND02	2/2	--	1.1	--	**0.11 C**	**YES**	ASL
	156-59-2	CIS-1,2-DICHLOROETHENE	0.015 B	0.015 B	µg/m^3	S43-716-IND01	1/2	0.014 -0.015	0.015	--	6.3 N	NO	BSL
	75-71-8	DICHLORODIFLUOROMETHANE	2.4 J	2.8	µg/m^3	S43INDO1	2/2	--	2.8	--	10 N	NO	BSL
	100-41-4	ETHYLBENZENE	0.11 J	0.13 J	µg/m^3	S43INDO1	2/2	--	0.13	--	0.97 C	NO	BSL
	127-18-4	TETRACHLOROETHENE	0.074 J	0.17 J	µg/m^3	S43INDO1	2/2	--	0.17	0.068 J	4.2 N (5)	NO	BSL
	108-88-3	TOLUENE	0.63 J	1.3	µg/m^3	S43INDO1	2/2	--	1.3	--	520 N	NO	BSL
	79-01-6	TRICHLOROETHENE	0.023 B	0.16 J	µg/m^3	S43INDO1	2/2	0.019 -0.019	0.16	--	0.21 N (5)	NO	BSL
	75-69-4	TRICHLOROFLUOROMETHANE	1.1	1.3 J	µg/m^3	S43IND02	2/2	--	1.3	--	73 N	NO	BSL
	75-01-4	VINYL CHLORIDE	0.011 J	0.11 J	µg/m^3	S43IND02	1/2	0.0091 0.0091	0.11	0.05	0.16 C	NO	BSL

Notes:
1 - Values presented are sample-specific quantitation limits.
2 - The maximum detected concentration is used for screening purposes.
3 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2013. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag).
4 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is greater than site background.
5- 1/10 the non-carcinogenic value is less than the carcinogenic value. Screening level is the non-carcinogenic value.

Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Definitions:
C = Carcinogen
CAS = Chemical Abstracts Services
COPC = Chemical Of Potential Concern
J = Estimated value
N = Noncarcinogen
NA = Not Applicable/Not Available
B = Blank Contamination

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level and site background.

For elimination as a COPC:
BSL = Below COPC Screening Level
B = Blank Contamination

Associated Samples
S43-716-IND01
S43-716-IND02
S43-716-DUP01

TABLE 6-11
OCCURENCE, DISTRIBUTION, AND SELECTION OF COPCS - VAPOR INTRUSION BUILDING 716 SOIL GAS
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Soil Gas
Exposure Medium: Indoor Air

Exposure Point	CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Sample with Maximum Concentration	Frequency of Detection	Range of Nondetects(1)	Concentration Used for Screening(2)	USEPA RSL Residential Air(3)	COPC Flag	Rationale for Contaminant Deletion or Selection(4)
Building 716		**VOLATILES**										
	71-55-6	1,1,1-TRICHLOROETHANE	0.33 J	21	µg/m^3	S43SG06-0708	4/4	--	21	5,200 N	NO	BSL
	75-34-3	1,1-DICHLOROETHANE	0.48	6.7	µg/m^3	S43SG06-0708	3/4	0.026 -0.026	6.7	150 C	NO	BSL
	75-35-4	1,1-DICHLOROETHENE	1.5	28	µg/m^3	S43SG07-1011	3/4	0.025 -0.025	28	210 N	NO	BSL
	78-93-3	2-BUTANONE	19	38	µg/m^3	S43SG07-1011	4/4	--	38	5,200 N	NO	BSL
	591-78-6	2-HEXANONE	8.3	12 J	µg/m^3	S43SG07-1011	3/4	8.2 -8.2	12	31 N	NO	BSL
	108-10-1	4-METHYL-2-PENTANONE	6.5	23	µg/m^3	S43SG07-1011	4/4	--	23	3,100 N	NO	BSL
	67-64-1	ACETONE	72	240	µg/m^3	S43SG07-1011	4/4	--	240	32,000 N	NO	BSL
	71-43-2	**BENZENE**	6.6	13	µg/m^3	S43SG06-0708	4/4	--	13	**3.1 C**	**YES**	ASL
	75-15-0	CARBON DISULFIDE	19 J	220	µg/m^3	S43SG06-0708	4/4	--	220	730 N	NO	BSL
	67-66-3	**CHLOROFORM**	19	1.2	µg/m^3	S43SG06-0708	1/4	0.31 -0.76	1.2	**1.1 C**	**YES**	ASL
	74-87-3	CHLOROMETHANE	0.58 J	24	µg/m^3	S43G05-0708	2/4	2.4 -2.4	24	94 N	NO	BSL
	156-59-2	CIS-1,2-DICHLOROETHENE	0.11 J	3.8 J	µg/m^3	S43SG07-1011	4/4	--	3.8	63 N	NO	BSL
	75-71-8	DICHLORODIFLUOROMETHANE	0.85 J	34	µg/m^3	S43SG06-0708	3/4	2.8 -2.8	34	100 N	NO	BSL
	100-41-4	ETHYLBENZENE	15	1	µg/m^3	S43SG08-0708	4/4	--	1	9.7 C	NO	BSL
	1634-04-4	METHYL TERT-BUTYL ETHER	0.07 J	1	µg/m^3	S43SG08-0708	3/4	0.056 -0.21	1	94 C	NO	BSL
	127-18-4	TETRACHLOROETHENE	0.75	6.9 J	µg/m^3	S43SG08-0708	4/4	--	6.9	42 N (5)	NO	BSL
	108-88-3	TOLUENE	81 J	180	µg/m^3	S43G05-0708	4/4	--	180	5,200 N	NO	BSL
	156-60-5	TRANS-1,2-DICHLOROETHENE	0.063 J	1.2 J	µg/m^3	S43SG07-1011	2/4	0.23 -0.25	1.2	63 N	NO	BSL
	79-01-6	**TRICHLOROETHENE**	0.51 J	1400	µg/m^3	S43SG07-1011	4/4	--	1400	**2.1 N (5)**	**YES**	ASL
	75-69-4	TRICHLOROFLUOROMETHANE	1.2	1.2	µg/m^3	S43SG08-0708	1/4	0.4 -3.2	1.2	730 N	NO	BSL
	75-01-4	VINYL CHLORIDE	0.04 J	22	µg/m^3	S43SG07-1011	4/4	--	22	1.6 C	**YES**	ASL

Notes:
1 - Values presented are sample-specific quantitation limits.
2 - The maximum detected concentration is used for screening purposes.
3 - USEPA Residential Air Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2013. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag). An attenuation factor of 0.1 was applied to the screening level.
4 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is greater than site background.
5- 1/10 the non-carcinogenic value is less than the carcinogenic value. Screening level is the non-carcinogenic value.

Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that th chemical was retained as a COPC.

Definitions:
C = Carcinogen
CAS = Chemical Abstracts Services
COPC = Chemical Of Potential Concern
J = Estimated value
N = Noncarcinogen
NA = Not Applicable/Not Available

Associated Samples
S43G05-0708
S43G05-0708-D
S43SG06-0708
S43SG07-1011
S43SG08-0708

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level and site background.

For elimination as a COPC:
BSL = Below COPC Screening Level

TABLE 6-12
OCCURENCE, DISTRIBUTION, AND SELECTION OF COPCS - VAPOR INTRUSION BUILDING 720 SOIL GAS
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Soil Gas
Exposure Medium: Indoor Air

Exposure Point	CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Sample with Maximum Concentration	Frequency of Detection	Range of Nondetects[1]	Concentration Used for Screening[2]	USEPA RSL Residential Air[3]	COPC Flag	Rationale for Contaminant Deletion or Selection[4]
Building 720		**VOLATILES**										
	71-55-6	1,1,1-TRICHLOROETHANE	0.24 J	0.24 J	µg/m^3	S43SG0305	1/3	45 -1000	0.24	5,200 N	NO	BSL
	75-34-3	1,1-DICHLOROETHANE	0.069 J	140	µg/m^3	S43SG0106	2/3	760 -760	140	150 C	NO	BSL
	75-35-4	1,1-DICHLOROETHENE	0.19	0.19	µg/m^3	S43SG0305	1/3	33 -740	0.19	210 N	NO	BSL
	107-06-2	1,2-DICHLOROETHANE	0.07 J	0.07 J	µg/m^3	S43SG0305	1/3	33 -760	0.07	0.94 C	NO	BSL
	123-91-1	1,4-DIOXANE	0.68 J	0.68 J	µg/m^3	S43SG0305	1/3	67 -1500	0.68	3.2 C	NO	BSL
	78-93-3	2-BUTANONE	100	1,600 J	µg/m^3	S43SG0406	3/3	--	1600	5,200 N	NO	BSL
	591-78-6	2-HEXANONE	12	12	µg/m^3	S43SG0305	1/3	76 -1700	12	31 N	NO	BSL
	108-10-1	4-METHYL-2-PENTANONE	1,600 J	1,600 J	µg/m^3	S43SG0406	1/3	0.6 -76	1600	3,100 N	NO	BSL
	67-64-1	**ACETONE**	190	690,000	µg/m^3	S43SG0406	3/3	--	690000	**32,000 N**	**YES**	ASL
	71-43-2	BENZENE	1.1	1.1	µg/m^3	S43SG0305	1/3	26 -600	1.1	3.1 C	NO	BSL
	75-15-0	CARBON DISULFIDE	2.8 J	2.8 J	µg/m^3	S43SG0305	1/3	26 -580	2.8	730 N	NO	BSL
	75-00-03	CHLOROETHANE	0.64 J	180	µg/m^3	S43SG0106	1/3	1100 -1100	180	10,000 N	NO	BSL
	74-87-3	**CHLOROMETHANE**	2.3	100 J	µg/m^3	S43SG0106	2/3	870 -870	100	**94 N**	**YES**	ASL
	156-59-2	**CIS-1,2-DICHLOROETHENE**	59	29,000	µg/m^3	S43SG0406	3/3	--	29000	**63 N**	**YES**	ASL
	75-71-8	DICHLORODIFLUOROMETHANE	2.7	2.7	µg/m^3	S43SG0305	1/3	41 -920	2.7	100 N	NO	BSL
	100-41-4	ETHYLBENZENE	0.53	0.53	µg/m^3	S43SG0305	1/3	36 -810	0.53	9.7 C	NO	BSL
	1330-20-7	M+P-XYLENES	1.1	100	µg/m^3	S43SG0106	2/3	810 -810	100	100 N	NO	BSL
	1634-04-4	METHYL TERT-BUTYL ETHER	0.083 J	0.083 J	µg/m^3	S43SG0305	1/3	30 -670	0.083	94 C	NO	BSL
	75-09-2	METHYLENE CHLORIDE	5	5	µg/m^3	S43SG0305	1/3	29 -650	5	630 N	NO	BSL
	95-47-6	O-XYLENE	0.68	0.68	µg/m^3	S43SG0305	1/3	36 -810	0.68	100 N	NO	BSL
	127-18-4	TETRACHLOROETHENE	0.19 J	0.19 J	µg/m^3	S43SG0305	1/3	56 -1300	0.19	42 N [5]	NO	BSL
	108-88-3	TOLUENE	2	790	µg/m^3	S43SG0106	2/3	700 -700	790	5,200 N	NO	BSL
	156-60-5	TRANS-1,2-DICHLOROETHENE	0.44 J	0.44 J	µg/m^3	S43SG0305	1/3	33 -740	0.44	63 N	NO	BSL
	79-01-6	TRICHLOROETHENE	0.33	0.33	µg/m^3	S43SG0305	1/3	44 -1000	0.33	2.1 N [5]	NO	BSL
	75-69-4	TRICHLOROFLUOROMETHANE	1.6 J	1.6 J	µg/m^3	S43SG0305	1/3	46 -1000	1.6	730 N	NO	BSL
	75-01-4	**VINYL CHLORIDE**	100	30,000	µg/m^3	S43SG0106	2/3	1100 -1100	30000	**1.6 C**	**YES**	ASL

Notes:
1 - Values presented are sample-specific quantitation limits.
2 - The maximum detected concentration is used for screening purposes.
3 - USEPA Residential Air Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2013. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag). An attenuation factor of 0.1 was applied to the screening level.
4 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is greater than site background.
5- 1/10 the non-carcinogenic value is less than the carcinogenic value. Screening level is the non-carcinogenic value.

Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Definitions:
C = Carcinogen
CAS = Chemical Abstracts Services
COPC = Chemical Of Potential Concern
J = Estimated value
N = Noncarcinogen
NA = Not Applicable/Not Available

Associated Samples
S43G05-0708
S43G05-0708-D
S43SG06-0708
S43SG07-1011
S43SG08-0708

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level and site background.

For elimination as a COPC:
BSL = Below COPC Screening Level

TABLE 6-13
CHEMICALS RETAINED AS COPCs
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

Chemical	Surface Soil		Subsurface Soil		Groundwater	Surface water	Sediment	Indoor Air		Soil Gas	
	Direct Contact	Soil to Groundwater	Direct Contact	Soil to Groundwater				Building 716	Building 720	Building 716	Building 720
EXPLOSIVES											
1,3-Dinitrobenzene				X	X						
2,6-Dinitrotoluene					X						
3-Nitrotoluene					X						
METALS											
Aluminum	X										
Arsenic					X	X					
Barium					X						
Beryllium					X						
Cadmium	X	X									
Chromium	X	X									
Cobalt					X	X					
Iron					X						
Manganese			X		X						
Nickel					X						
Thallium					X						
MISCELLANEOUS											
Cyanide				X							
VOLATILES											
1,1-Dichloroethane					X						
1,1-Dichloroethene					X						
1,2-Dichloroethane					X						
2-Hexanone				X							
4-Methyl-2-Pentanone				X							
Acetone				X							X
Benzene									X	X	
Chloroform										X	
Chloromethane									X		X
Cis-1,2-Dichloroethene		X		X	X	X		O	O		X
Toluene				X							
Trichloroethene	X	X	X	X	X	X		O	O	X	
Vinyl Chloride		X		X	X	X			O	X	X

X - Indicates chemical was retained as a COPC.
O - Indicates chemical was retained as a COPC based on the relationship of contaminants among indoor air, soil gas, and groundwater.

TABLE 6-14
RECEPTORS AND EXPOSURE ROUTES FOR QUANTITATIVE EVALUATION
SITE 43 – TOLUENE DISPOSAL
NAVAL SUPPORT FACILITY, INDIAN HEAD

Receptors	Exposure Routes
Construction Worker (current/future land use)	• Soil dermal contact (surface/ subsurface) • Soil incidental ingestion (surface/ subsurface) • Inhalation of air/dust/emissions (surface/ subsurface) • Incidental ingestion of groundwater • Groundwater dermal contact • Inhalation of vapors intruding into a building (groundwater and soil gas) • Incidental ingestion of surface water • Surface water dermal contact
Maintenance Worker (current/future land use)	• Soil dermal contact (surface/ subsurface[(1)]) • Soil incidental ingestion (surface/ subsurface[(1)]) • Inhalation of air/dust/emissions (surface/ subsurface[(1)]) • Incidental ingestion of surface water • Surface water dermal contact
Industrial Worker (current/future land use)	• Soil dermal contact (surface/subsurface[(1)]) • Soil incidental ingestion (surface/subsurface[(1)]) • Inhalation of air/dust/emissions (surface/subsurface[(1)]) • Inhalation of vapors intruding into a building (groundwater and soil gas)
On-Base Residents (Child/ Adult) (future land use)	• Soil dermal contact (surface/ subsurface[(1)]) • Soil incidental ingestion (surface/ subsurface[(1)]) • Inhalation of air/dust/emissions (surface/ subsurface[(1)]) • Ingestion of groundwater • Groundwater dermal contact • Inhalation of vapors intruding into a building (groundwater and soil gas) • Incidental ingestion of surface water • Surface water dermal contact

1 – These receptors are not expected to be exposed to subsurface soil, but exposure to subsurface soil was evaluated to aid in risk management decisions.

TABLE 6-15
SELECTION OF EXPOSURE PATHWAYS
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current/Future	Surface Soil	Surface Soil	Site 43	Maintenance Worker	Adult	Ingestion Dermal	Quant Quant	Maintenance workers may contact surface soil during normal work activities.
				Industrial Worker	Adult	Ingestion Dermal	Quant Quant	Industrial workers may contact surface soil during normal work activities.
				Construction Worker	Adult	Ingestion Dermal	Quant Quant	Construction workers may contact surface soil during normal work activities.
		Air	Site 43	Maintenance Worker	Adult	Inhalation	Quant	Maintenance workers may be exposed to fugitive dust and volatile emissions from surface soil.
				Industrial Worker	Adult	Inhalation	Quant	Industrial workers may be exposed to fugitive dust and volatile emissions from surface soil.
				Construction Worker	Adult	Inhalation	Quant	Construction workers may be exposed to fugitive dust and volatile emissions from surface soil.
	Subsurface Soil	Subsurface Soil	Site 43	Maintenance Worker	Adult	Ingestion Dermal	Quant Quant	Although exposures to subsurface soil by maintenance workers are considered unlikely, this scenario was included to aid in future risk management decisions.
				Industrial Worker	Adult	Ingestion Dermal	Quant Quant	Although exposures to subsurface soil by industrial workers are considered unlikely, this scenario was included to aid in future risk management decisions.
				Construction Worker	Adult	Ingestion Dermal	Quant Quant	Construction workers may contact subsurface soil during normal work activities.
		Air	Site 43	Maintenance Worker	Adult	Inhalation	Quant	Although exposures to subsurface soil by maintenance workers are considered unlikely, this scenario was included to aid in future risk management decisions.
				Industrial Worker	Adult	Inhalation	Quant	Although exposures to subsurface soil by industrial workers are considered unlikely, this scenario was included to aid in future risk management decisions.
				Construction Worker	Adult	Inhalation	Quant	Construction workers may be exposed to fugitive dust and volatile emissions from subsurface soil.
	Groundwater	Groundwater	Site 43	Maintenance Worker	Adult	Ingestion Dermal	None None	Maintenance workers are not expected to be exposed to groundwater.
				Industrial Worker	Adult	Ingestion Dermal	None None	Industrial workers are not expected to be exposed to groundwater.
				Construction Worker	Adult	Ingestion Dermal	Quant Quant	Construction workers may contact groundwater during excavation activities.
		Air	Site 43	Maintenance Worker	Adult	Inhalation	None	Maintenance workers are not expected to be exposed to groundwater.
				Industrial Worker	Adult	Inhalation	None	Industrial workers are not expected to be exposed to groundwater.
				Construction Worker	Adult	Inhalation	Quant	Construction workers may be exposed to chemicals that have volatilized from groundwater during excavation activities.
			Vapor Intrusion	Industrial Worker	Adult	Inhalation	Quant	Industrial workers may be exposed to chemicals that have volatilized from groundwater and migrated through building foundations into indoor air.
	Sediment	Sediment	Site 43	Maintenance Worker	Adult	Ingestion Dermal	None None	No COPCs were selected for sediment.
				Industrial Worker	Adult	Ingestion Dermal	None None	No COPCs were selected for sediment.
				Construction Worker	Adult	Ingestion Dermal	None None	No COPCs were selected for sediment.
Future	Surface Soil	Surface Soil	Site 43	Residents	Child	Ingestion Dermal	Quant Quant	Although a future residential scenario is considered unlikely at the site this scenario is included to aid in future risk management decisions.
					Adult	Ingestion Dermal	Quant Quant	Although a future residential scenario is considered unlikely at the site this scenario is included to aid in future risk management decisions.
		Air	Site 43	Residents	Child	Inhalation	Quant	Although a future residential scenario is considered unlikely at the site this scenario is included to aid in future risk management decisions.
					Adult	Inhalation	Quant	Although a future residential scenario is considered unlikely at the site this scenario is included to aid in future risk management decisions.
	Subsurface Soil	Subsurface Soil	Site 43	Residents	Child	Ingestion Dermal	Quant Quant	Although a future residential scenario is considered unlikely at the site this scenario is included to aid in future risk management decisions.
					Adult	Ingestion Dermal	Quant Quant	Although a future residential scenario is considered unlikely at the site this scenario is included to aid in future risk management decisions.
	Subsurface Soil	Air	Site 43	Residents	Child	Inhalation	Quant	Although a future residential scenario is considered unlikely at the site this scenario is included to aid in future risk management decisions.
					Adult	Inhalation	Quant	Although a future residential scenario is considered unlikely at the site this scenario is included to aid in future risk management decisions.
	Groundwater	Groundwater	Site 43	Residents	Child	Ingestion Dermal	Quant Quant	Although a future residential scenario is considered unlikely at the site this scenario is included to aid in future risk management decisions.
					Adult	Ingestion Dermal	Quant Quant	Although a future residential scenario is considered unlikely at the site this scenario is included to aid in future risk management decisions.
		Air	Site 43	Residents	Child	Inhalation	Quant	Although a future residential scenario is considered unlikely at the site this scenario is included to aid in future risk management decisions.
					Adult	Inhalation	Quant	Although a future residential scenario is considered unlikely at the site this scenario is included to aid in future risk management decisions.
			Vapor Intrusion	Residents	Child	Inhalation	Quant	Although a future residential scenario is considered unlikely at the site this scenario is included to aid in future risk management decisions.
					Adult	Inhalation	Quant	Although a future residential scenario is considered unlikely at the site this scenario is included to aid in future risk management decisions.
	Sediment	Sediment	Site 43	Residents	Child	Ingestion Dermal	None None	No COPCs were selected for sediment.
					Adult	Ingestion Dermal	None None	No COPCs were selected for sediment.

Notes:
Quant - Quantitative.

TABLE 6-16
EXPOSURE POINT CONCENTRATIONS
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

Chemical Units	Surface Soil mg/kg	Subsurface Soil mg/kg	Groundwater µg/L	Surface water µg/L	Indoor Air (Bldg 716) µg/m^3	Indoor Air (Bldg 720) µg/m^3
EXPLOSIVES						
1,3-Dinitrobenzene	NA	NA	0.212	NA	NA	NA
2,6-Dinitrotoluene	NA	NA	0.504	NA	NA	NA
3-Nitrotoluene	NA	NA	0.378	NA	NA	NA
METALS						
Aluminum	17600	NA	NA	NA	NA	NA
Arsenic	NA	NA	2.8	1.21	NA	NA
Barium	NA	NA	138	NA	NA	NA
Beryllium	NA	NA	0.82	NA	NA	NA
Cadmium	10.8	NA	NA	NA	NA	NA
Chromium	28.1	NA	NA	NA	NA	NA
Cobalt	NA	NA	48.9	25.9	NA	NA
Iron	NA	NA	24,800	NA	NA	NA
Manganese	NA	92.3	481	NA	NA	NA
Nickel	NA	NA	32.8	NA	NA	NA
Thallium	NA	NA	0.803	NA	NA	NA
VOLATILES						
1,1-Dichloroethane	NA	NA	4.7	NA	NA	NA
1,1-Dichloroethene	NA	NA	4.4	NA	NA	NA
1,2-Dichloroethane	NA	NA	0.36	NA	NA	NA
cis-1,2-Dichloroethene	NA	NA	58	195	0.039	0.015
Benzene	NA	NA	NA	NA	NA	0.45
Chloromethane	NA	NA	NA	NA	NA	1.1
Toluene	NA	NA	NA	NA	NA	NA
Trichloroethene	2.72	1.37	2,680	240	0.14	0.16
Vinyl Chloride	NA	NA	8	1.26	NA	0.11

Notes:
The exposure point concentrations (EPCs) were calculated according to USEPA's ProUCL guidance.
See the RAGS PART D Table 3s in Appendix Q for details concerning the EPCs.
NA - Not applicable. Not a COPC for this media.

TABLE 6-17
SUMMARY OF EXPOSURE INPUT PARAMETERS - REASONABLE MAXIMUM EXPOSURES
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

Parameter Code	Exposure Parameter	Construction Worker	Maintenance Worker	Industrial Worker	On-Base Child Resident	On-Base Adult Resident
All Exposures						
ED	Exposure Duration (years)	1[1]	25[2]	25[2]	6[3]	24[3]
BW	Body Weight (kg)	70[2]	70[2]	70[2]	15[3]	70[3]
AT-N	Averaging Time (Non-Cancer) (days)	365[3]	9,125[3]	9,125[3]	2,190[3]	8,760[3]
AT-C	Averaging Time (Cancer) (days)	25,550[3]	25,550[3]	25,550[3]	25,550[3]	25,550[3]
Incidental Ingestion/Dermal Contact with Soil						
C_{soil}	Exposure concentration for soil (mg/kg)	Maximum or 95% UCL[4]	Maximum or 95% UCL[4]	Maximum or 95% UCL[4]	Maximum or 95% UCL[4]	Maximum or 95% UCL[4]
IR	Ingestion Rate (mg/day)	330[2]	100[2]	100[2]	200[5]	100[5]
EF	Exposure Frequency (days/year)	150[1]	24[1]	250[2]	350[5]	350[5]
FI	Fraction Ingested (unitless)	1[2]	1[2]	1[2]	1[5]	1[5]
SA	Skin Surface Available for Contact (cm^2)	3,300[2]	3,300[2]	3,300[2]	2,800[6]	5,700[6]
AF	Soil to Skin Adherence Factor (mg/cm^2/event)	0.3[2]	0.2[2]	0.2[2]	0.2[6]	0.07[6]
ABS	Absorption Factor (unitless)	chemical-specific[6]	chemical-specific[6]	chemical-specific[6]	chemical-specific[6]	chemical-specific[6]
CF	Conversion Factor (kg/mg)	1E-06	1E-06	1E-06	1E-06	1E-06
Inhalation Fugitive Dust/Volatile Emissions from Soil						
C_{air}	Exposure concentration for air (mg/m^3)	calculated[2]	calculated[2]	calculated[2]	calculated[2]	calculated[2]
ET	Exposure Time (hours/day)	8[1]	8[1]	8[2]	24[2]	24[2]
EF	Exposure Frequency (days/year)	150[1]	24[1]	250[2]	350[5]	350[5]
PEF	Particulate Emission Factor (m^3/kg)	1.62E+06[2]	3.23E+09[7]	3.23E+09[7]	3.23E+09[7]	3.23E+09[7]
Ingestion/Dermal Contact with Groundwater						
C_{gw}	Exposure concentration for groundwater (ug/L)	Maximum or 95% UCL[4]	NA	NA	Maximum or 95% UCL[4]	Maximum or 95% UCL[4]
IR	Ingestion Rate (L/day)	0.01[1]	NA	NA	1[5]	2[5]
EF	Exposure Frequency (days/year)	90[1]	NA	NA	350[5]	350[5]
ET/t_{event}	Exposure Time (hours/day)/ Event Duration (hours/event)	4[1]	NA	NA	1[6]	0.58[6]
EV	Event Frequency (events/day)	1[1]	NA	NA	1[6]	1[6]
SA	Skin Surface Available for Contact (cm^2)	3,300[2]	NA	NA	6,600[6]	18,000[6]
	Kp (cm/hour), t* (hour/event), τ (hour), and B (unitless)	chemical-specific[6]	NA	NA	chemical-specific[6]	chemical-specific[6]

TABLE 6-17
SUMMARY OF EXPOSURE INPUT PARAMETERS - REASONABLE MAXIMUM EXPOSURES
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

Parameter Code	Exposure Parameter	Construction Worker	Maintenance Worker	Industrial Worker	On-Base Child Resident	On-Base Adult Resident
Inhalation of Volatile Emissions from Groundwater						
C_{air}	Exposure concentration for air (mg/m^3)	calculated[8]	NA	NA	NA	Calculated[9]
ET	Exposure Time (hours/day)	4[2]	NA	NA	NA	NA
EF	Exposure Frequency (days/year)	90[1]	NA	NA	NA	350[5]
VF	Volatilization Factor (L/m^3)	calculated[8]	NA	NA	NA	NA
Ingestion/Dermal Contact with Surface Water						
C_{sw}	Exposure concentration for surface water (ug/L)	Maximum or 95% UCL[4]	Maximum or 95% UCL[4]	NA	Maximum or 95% UCL[4]	Maximum or 95% UCL[4]
CR	Contact Rate (L/hr)	0.01[10]	0.01[10]	NA	0.01[10]	0.01[10]
EF	Exposure Frequency (days/year)	52[1]	24[1]	NA	52[1]	52[1]
ET/t_{event}	Exposure Time (hours/day)/ Event Duration (hours/event)	4[1]	4[1]	NA	4[1]	4[1]
EV	Event Frequency (events/day)	1[1]	1[1]	NA	1[1]	1[1]
SA	Skin Surface Available for Contact (cm^2)	3,300[2]	3,300[2]	NA	2,800[6]	5,700[6]
CF	Conversion Factor (L/m^3)	0.001	0.001	NA	0.001	0.001
	Kp (cm/hour), t* (hour/event), τ (hour), and B (unitless)	chemical-specific[6]	chemical-specific[6]	NA	chemical-specific[6]	chemical-specific[6]

Notes:
1 - Professional judgment.
2 - USEPA, 2002: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9365.4-24.
3 - USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A.
4 - USEPA, 2002. Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10.
5 - USEPA, 1991: Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors. OSWER Directive 9285.6-03.
6 - USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. PA/540/R/99/005.
7 - USEPA, 2013: Soil Screening Guidance calculation Internet site at http://rais.ornl.gov/epa/ssl1.shtml. Site-specific values for Philadelphia, Pennsylvania.
8 - VDEQ February 2013. Virginia Department of Environmental Quality (VDEQ, online - http://www.deq.state.va.us/vrprisk/homepage.html).
9 - Foster, S.A. and P.C. Chrostowski, 1987. Inhalation Exposure to Volatile Organic Contaminants in the Shower.
10 - USEPA Region 4, 2000: Supplemental Guidance to RAGS: Region 4 Bulletins.

TABLE 6-18
SUMMARY OF EXPOSURE INPUT PARAMETERS - CENTRAL TENDENCY EXPOSURES
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

Parameter Code	Exposure Parameter	Construction Worker	Maintenance Worker	Industrial Worker	On-Base Child Resident	On-Base Adult Resident
All Exposures						
ED	Exposure Duration (years)	1[1]	9[2]	9[2]	2[2]	7[2]
BW	Body Weight (kg)	70[3]	70[3]	70[3]	15[4]	70[4]
AT-N	Averaging Time (Non-Cancer) (days)	365[4]	3,285[4]	3,285[4]	730[4]	2,555[4]
AT-C	Averaging Time (Cancer) (days)	25,550[4]	25,550[4]	25,550[4]	25,550[4]	25,550[4]
Incidental Ingestion/Dermal Contact with Soil						
C_{soil}	Exposure concentration for soil (mg/kg)	Maximum or 95% UCL[5]	Maximum or 95% UCL[5]	Maximum or 95% UCL[5]	Maximum or 95% UCL[5]	Maximum or 95% UCL[5]
IR	Ingestion Rate (mg/day)	165[6]	50[2]	50[2]	100[2]	50[2]
EF	Exposure Frequency (days/year)	150[1]	12[6]	219[2]	234[2]	234[2]
FI	Fraction Ingested (unitless)	1[3]	1[3]	1[3]	1[2]	1[2]
SA	Skin Surface Available for Contact (cm^2)	3,300[3]	3,300[3]	3,300[3]	2,800[7]	5,700[7]
AF	Soil to Skin Adherence Factor (mg/cm^2/event)	0.1[7]	0.02[7]	0.02[3]	0.04[7]	0.01[7]
ABS	Absorption Factor (unitless)	chemical-specific[7]	chemical-specific[7]	chemical-specific[7]	chemical-specific[7]	chemical-specific[7]
CF	Conversion Factor (kg/mg)	1E-06	1E-06	1E-06	1E-06	1E-06
Inhalation Fugitive Dust/Volatile Emissions from Soil						
C_{air}	Exposure concentration for air (mg/m^3)	calculated[3]	calculated[3]	calculated[3]	calculated[3]	calculated[3]
ET	Exposure Time (hours/day)	8[1]	8[1]	8[3]	24[3]	24[3]
EF	Exposure Frequency (days/year)	150[1]	12[6]	219[2]	234[2]	234[2]
PEF	Particulate Emission Factor (m^3/kg)	1.62E+06[3]	3.23E+09[8]	3.23E+09[8]	3.23E+09[8]	3.23E+09[8]
Ingestion/Dermal Contact with Groundwater						
C_{gw}	Exposure concentration for groundwater (ug/L)	Maximum or 95% UCL[5]	NA	NA	Maximum or 95% UCL[5]	Maximum or 95% UCL[5]
IR	Ingestion Rate (L/day)	0.01[1]	NA	NA	0.66[9]	1.4[2]
EF	Exposure Frequency (days/year)	30[1]	NA	NA	350[2]	350[2]
ET/t_{event}	Exposure Time (hours/day)/ Event Duration (hours/event)	2[6]	NA	NA	0.33[7]	0.25[7]
EV	Event Frequency (events/day)	1[1]	NA	NA	1[7]	1[7]
SA	Skin Surface Available for Contact (cm^2)	3,300[3]	NA	NA	6,600[7]	18,000[7]
	Kp (cm/hour), t* (hour/event), τ (hour), and B (unitless)	chemical-specific[7]	NA	NA	chemical-specific[7]	chemical-specific[7]

TABLE 6-18
SUMMARY OF EXPOSURE INPUT PARAMETERS - CENTRAL TENDENCY EXPOSURES
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

Parameter Code	Exposure Parameter	Construction Worker	Maintenance Worker	Industrial Worker	On-Base Child Resident	On-Base Adult Resident
Inhalation of Volatile Emissions from Groundwater						
C_{air}	Exposure concentration for air (mg/m^3)	calculated(10)	NA	NA	NA	Calculated(11)
ET	Exposure Time (hours/day)	2(6)	NA	NA	NA	NA
EF	Exposure Frequency (days/year)	30(1)	NA	NA	NA	234(2)
VF	Volatilization Factor (L/m^3)	calculated(10)	NA	NA	NA	NA
Ingestion/Dermal Contact with Surface Water						
C_{sw}	Exposure concentration for surface water (ug/L)	Maximum or 95% UCL(5)	Maximum or 95% UCL(5)	NA	Maximum or 95% UCL(5)	Maximum or 95% UCL(5)
CR	Contact Rate (L/hr)	0.01(12)	0.01(12)	NA	0.01(12)	0.01(12)
EF	Exposure Frequency (days/year)	26(6)	12(6)	NA	26(6)	26(6)
ET/t_{event}	Exposure Time (hours/day)/ Event Duration (hours/event)	2(6)	2(6)	NA	2(6)	2(6)
EV	Event Frequency (events/day)	1(1)	1(1)	NA	1(1)	1(1)
SA	Skin Surface Available for Contact (cm^2)	3,300(3)	3,300(3)	NA	2,800(7)	5,700(7)
CF	Conversion Factor (L/m^3)	0.001	0.001	NA	0.001	0.001
	Kp (cm/hour), t* (hour/event), τ (hour), and B (unitless)	chemical-specific(7)	chemical-specific(7)	NA	chemical-specific(7)	chemical-specific(7)

Notes:
1 - Professional judgment.
2 - USEPA, 1993: Superfund's Standard Default Exposure Factors for Central Tendency and Reasonable Maximum Exposures.
3 - USEPA, 2002: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9365.4-24.
4 - USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A.
5 - USEPA, 2002. Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10.
6 - Central tendency exposure is assumed to be one-half the reasonable maximum exposure value.
7 - USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. PA/540/R/99/005.
8 - USEPA, 2013: Soil Screening Guidance calculation Internet site at http://rais.ornl.gov/epa/ssl1.shtml. Site-specific values for Philadelphia, Pennsylvania.
9 - USEPA, 1997: Exposures Factors Handbook. EPA/600/P-95/0002Fa.
10 - VDEQ February 2013. Virginia Department of Environmental Quality (VDEQ, online - http://www.deq.state.va.us/vrprisk/homepage.html).
11 - Foster, S.A. and P.C. Chrostowski, 1987. Inhalation Exposure to Volatile Organic Contaminants in the Shower.
12 - USEPA Region 4, 2000: Supplemental Guidance to RAGS: Region 4 Bulletins.

TABLE 6-19
SUMMARY OF CANCER RISKS AND HAZARD INDICES - REASONABLE MAXIMUM EXPOSURES
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks > 10^{-4}	Chemicals with Cancer Risks > 10^{-5} and ≤ 10^{-4}	Chemicals with Cancer Risks > 10^{-6} and ≤ 10^{-5}	Hazard Index	Chemicals Contributing to a Target Organ HI > 1
Maintenance Workers	Surface Soil	Incidental Ingestion	5E-07	--	--	--	0.004	--
		Dermal Contact	1E-06	--	--	--	0.003	--
		Inhalation	3E-08	--	--	--	0.01	--
		Total	2E-06	--	--	--	0.02	--
	Subsurface Soil	Incidental Ingestion	2E-09	--	--	--	0.0006	--
		Dermal Contact	4E-10	--	--	--	0.0006	--
		Inhalation	1E-08	--	--	--	0.005	--
		Total	2E-08	--	--	--	0.006	--
	Surface Water	Incidental Ingestion	2E-07	--	--	--	0.03	--
		Dermal Contact	7E-07	--	--	--	0.1	--
		Total	9E-07	--	--	--	0.1	--
	Total Risks (Surface Soil)[1]		**3E-06**				**0.1**	
	Total Risks (Subsurface Soil)[2]		**9E-07**				**0.1**	
Industrial Workers	Surface Soil	Incidental Ingestion	5E-06	--	--	Chromium VI	0.04	--
		Dermal Contact	1E-05	--	--	--	0.03	--
		Inhalation	4E-07	--	--	--	0.1	--
		Total	2E-05	--	--	Chromium VI	0.2	--
	Subsurface Soil	Incidental Ingestion	2E-08	--	--	--	0.006	--
		Dermal Contact	4E-09	--	--	--	0.007	--
		Inhalation	2E-07	--	--	--	0.05	--
		Total	2E-07	--	--	--	0.06	--
	Total Risks (Surface Soil)[1]		**2E-05**				**0.2**	
	Total Risks (Subsurface Soil)[2]		**2E-07**				**0.06**	
Construction Worker	Surface Soil	Incidental Ingestion	4E-07	--	--	--	0.08	--
		Dermal Contact	5E-07	--	--	--	0.018	--
		Inhalation	3E-06	--	--	Chromium VI	0.8	--
		Total	4E-06	--	--	Chromium VI	0.9	--
	Subsurface Soil	Incidental Ingestion	2E-09	--	--	--	0.01	--
		Dermal Contact	2E-10	--	--	--	--	--
		Inhalation	2E-08	--	--	--	0.3	--
		Total	2E-08	--	--	--	0.4	--
	Groundwater	Incidental Ingestion	7E-08	--	--	--	0.19	--
		Dermal Contact	1E-06	--	--	--	4	Trichloroethene
		Inhalation	2E-07	--	--	--	2	Trichloroethene
		Total	2E-06	--	--	--	6	Trichloroethene
	Surface Water	Incidental Ingestion	2E-08	--	--	--	0.04	--
		Dermal Contact	6E-08	--	--	--	0.2	--
		Total	8E-08	--	--	--	0.2	--
	Total Risks (Surface Soil)[1]		**5E-06**				**7**	
	Total Risks (Subsurface Soil)[2]		**2E-06**				**6**	
Child Residents	Surface Soil	Incidental Ingestion	8E-05	--	Chromium VI	--	0.6	--
		Dermal Contact	9E-05	--	--	--	0.2	--
		Inhalation	9E-07	--	--	--	0.4	--
		Total	2E-04	--	Chromium VI	--	1	--
	Subsurface Soil	Incidental Ingestion	1E-07	--	--	--	0.08	--
		Dermal Contact	1E-08	--	--	--	0.04	--
		Inhalation	3E-07	--	--	--	0.2	--
		Total	5E-07	--	--	--	0.3	--
	Groundwater	Incidental Ingestion	2E-03	Trichloroethene, Vinyl Chloride	Arsenic	2,6-Dinitrotoluene	360	Trichloroethene, Iron, cis-1,2-Dichloroethene, Cobalt
		Dermal Contact	7E-05	--	Trichloroethene	Vinyl Chloride	18	Trichloroethene
		Total	2E-03	Trichloroethene, Vinyl Chloride	Arsenic	2,6-Dinitrotoluene	378	Trichloroethene, Iron, cis-1,2-Dichloroethene, Cobalt
	Surface Water	Incidental Ingestion	3E-06	--	--	--	0.3	--
		Dermal Contact	7E-06	--	--	Trichloroethene, Vinyl Chloride	0.9	--
		Total	1E-05	--	--	Trichloroethene, Vinyl Chloride	1	--
	Total Risks (Surface Soil)[1]		**2E-03**				**380**	
	Total Risks (Subsurface Soil)[2]		**2E-03**				**379**	
Adult Residents	Surface Soil	Incidental Ingestion	1E-05	--	--	Chromium VI	0.06	--
		Dermal Contact	2E-05	--	Chromium VI	--	0.02	--
		Inhalation	2E-06	--	--	--	0.4	--
		Total	3E-05	--	Chromium VI	--	0.5	--
	Subsurface Soil	Incidental Ingestion	3E-08	--	--	--	0.009	--
		Dermal Contact	4E-09	--	--	--	0.006	--
		Inhalation	7E-07	--	--	--	0.2	--
		Total	8E-07	--	--	--	0.2	--
	Groundwater	Incidental Ingestion	1E-03	Trichloroethene	Arsenic, Vinyl Chloride	2,6-Dinitrotoluene	154	Trichloroethene, Cobalt
		Dermal Contact	2E-04	Trichloroethene	--	Vinyl Chloride	25	Trichloroethene
		Inhalation	3E-04	Trichloroethene	Trichloroethene	--	83	Trichloroethene
		Total	2E-03	Trichloroethene	Arsenic, Vinyl Chloride	2,6-Dinitrotoluene	263	Trichloroethene, cis-1,2-Dichloroethene, Cobalt
	Surface Water	Incidental Ingestion	4E-07	--	--	--	0.05	--
		Dermal Contact	3E-06	--	--	Trichloroethene	0.4	--
		Total	4E-06	--	--	Trichloroethene	0.4	--
	Total Risks (Surface Soil)[1]		**2E-03**				**264**	
	Total Risks (Subsurface Soil)[2]		**2E-03**				**263**	
Lifelong Residents (Child and Adult)	Surface Soil	Incidental Ingestion	9E-05	--	Chromium VI	--	NA	--
		Dermal Contact	1E-04	--	Chromium VI	--	NA	--
		Inhalation	3E-06	--	--	--	NA	--
		Total	2E-04	Chromium VI	--	--	NA	--
	Subsurface Soil	Incidental Ingestion	2E-07	--	--	--	NA	--
		Dermal Contact	2E-08	--	--	--	NA	--
		Inhalation	1E-06	--	--	--	NA	--
		Total	1E-06	--	--	--	NA	--
	Groundwater	Incidental Ingestion	3E-03	Trichloroethene, Vinyl Chloride	Arsenic	2,6-Dinitrotoluene	NA	--
		Dermal Contact	3E-04	Trichloroethene	--	Vinyl Chloride	NA	--
		Inhalation	3E-04	Trichloroethene	--	--	NA	--
		Total	4E-03	Trichloroethene, Vinyl Chloride	Arsenic	2,6-Dinitrotoluene	NA	--
	Surface Water	Incidental Ingestion	1E-05	--	--	Vinyl Chloride	NA	--
		Dermal Contact	3E-06	--	--	Trichloroethene	NA	--
		Total	1E-05	--	--	Trichloroethene, Vinyl Chloride	NA	--
	Total Risks (Surface Soil)[1]		**4E-03**				**NA**	
	Total Risks (Subsurface Soil)[2]		**4E-03**				**NA**	

[1] Total Risks associated with Surface Soil and other media (excluding Subsurface Soil)
[2] Total Risks associated with Subsurface Soil and other media (excluding Surface Soil)

TABLE 6-20
SUMMARY OF CANCER RISKS AND HAZARD INDICES - CENTRAL TENDENCY EXPOSURES
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks > 10^{-4}	Chemicals with Cancer Risks > 10^{-5} and ≤ 10^{-4}	Chemicals with Cancer Risks > 10^{-6} and ≤ 10^{-5}	Hazard Index	Chemicals Contributing to a Target Organ HI > 1
Maintenance Workers	Surface Soil	Incidental Ingestion	4E-08	--	--	--	0.001	--
		Dermal Contact	2E-08	--	--	--	0.0001	--
		Inhalation	6E-09	--	--	--	0.005	--
		Total	7E-08	--	--	--	0.006	--
	Subsurface Soil	Incidental Ingestion	2E-10	--	--	--	0.0002	--
		Dermal Contact	8E-12	--	--	--	0.00003	--
		Inhalation	3E-09	--	--	--	0.002	--
		Total	3E-09	--	--	--	0.003	--
	Surface Water	Incidental Ingestion	2E-08	--	--	--	0.006	--
		Dermal Contact	8E-08	--	--	--	0.03	--
		Total	1E-07	--	--	--	0.04	--
	Total Risks (Surface Soil)[1]		**2E-07**				**0.04**	
	Total Risks (Subsurface Soil)[2]		**1E-07**				**0.04**	
Industrial Workers	Surface Soil	Incidental Ingestion	8E-07	--	--	--	0.02	--
		Dermal Contact	4E-07	--	--	--	0.003	--
		Inhalation	1E-07	--	--	--	0.09	--
		Total	1E-06	--	--	--	0.1	--
	Subsurface Soil	Incidental Ingestion	3E-09	--	--	--	0.003	--
		Dermal Contact	1E-10	--	--	--	0.0006	--
		Inhalation	5E-08	--	--	--	0.05	--
		Total	5E-08	--	--	--	0.05	--
	Total Risks (Surface Soil)[1]		**1E-06**				**0.1**	
	Total Risks (Subsurface Soil)[2]		**5E-08**				**0.05**	
Construction Worker	Surface Soil	Incidental Ingestion	2E-07	--	--	--	0.04	--
		Dermal Contact	2E-07	--	--	--	0.006	--
		Inhalation	3E-06	--	--	Chromium VI	0.8	--
		Total	3E-06	--	--	Chromium VI	0.8	--
	Subsurface Soil	Incidental Ingestion	9E-10	--	--	--	0.006	--
		Dermal Contact	5E-11	--	--	--	0.002	--
		Inhalation	2E-08	--	--	--	0.3	--
		Total	2E-08	--	--	--	0.4	--
	Groundwater	Incidental Ingestion	2E-08	--	--	--	0.06	--
		Dermal Contact	3E-07	--	--	--	0.8	--
		Inhalation	3E-08	--	--	--	0.3	--
		Total	3E-07	--	--	--	1.1	--
	Surface Water	Incidental Ingestion	4E-09	--	--	--	0.01	--
		Dermal Contact	2E-08	--	--	--	0.06	--
		Total	2E-08	--	--	--	0.07	--
	Total Risks (Surface Soil)[1]		**4E-06**				**2**	
	Total Risks (Subsurface Soil)[2]		**4E-07**				**2**	
Child Residents	Surface Soil	Incidental Ingestion	1E-05	--	--	Chromium VI	0.2	--
		Dermal Contact	5E-06	--	--	--	0.02	--
		Inhalation	2E-07	--	--	--	0.3	--
		Total	2E-05	--	--	Chromium VI	0.5	--
	Subsurface Soil	Incidental Ingestion	2E-08	--	--	--	0.03	--
		Dermal Contact	5E-10	--	--	--	0.005	--
		Inhalation	8E-08	--	--	--	0.1	--
		Total	1E-07	--	--	--	0.2	--
	Groundwater	Incidental Ingestion	6E-04	Trichloroethene, Vinyl Chloride	--	Arsenic	238	Trichloroethene, Iron, Cobalt
		Dermal Contact	6E-05	--	Trichloroethene	Vinyl Chloride	32	Trichloroethene
		Total	6E-04	Trichloroethene, Vinyl Chloride	--	Arsenic	270	Trichloroethene, Iron, Cobalt
	Surface Water	Incidental Ingestion	1E-06	--	--	--	0.06	--
		Dermal Contact	3E-06	--	--	--	0.3	--
		Total	4E-06	--	--	--	0.3	--
	Total Risks (Surface Soil)[1]		**7E-04**				**270**	
	Total Risks (Subsurface Soil)[2]		**6E-04**				**270**	
Adult Residents	Surface Soil	Incidental Ingestion	1E-06	--	--	--	0.02	--
		Dermal Contact	5E-07	--	--	--	0.002	--
		Inhalation	3E-07	--	--	--	0.3	--
		Total	2E-06	--	--	Chromium VI	0.3	--
	Subsurface Soil	Incidental Ingestion	3E-09	--	--	--	0.003	--
		Dermal Contact	1E-10	--	--	--	0.0005	--
		Inhalation	1E-07	--	--	--	0.1	--
		Total	1E-07	--	--	--	0.1	--
	Groundwater	Incidental Ingestion	3E-04	Trichloroethene		Arsenic, Vinyl Chloride	108	Trichloroethene, Cobalt
		Dermal Contact	4E-05	--	Trichloroethene	'--	16	Trichloroethene
		Inhalation	8E-06	--	--	Trichloroethene	8	Trichloroethene
		Total	3E-04	Trichloroethene	--	2,6-Dinitrotoluene, Arsenic, Vinyl Chloride	132	Trichloroethene, cis-1,2-Dichloroethene, Cobalt
	Surface Water	Incidental Ingestion	3E-08	--	--	--	0.01	--
		Dermal Contact	3E-07	--	--	--	0.1	--
		Total	3E-07	--	--	--	0.1	--
	Total Risks (Surface Soil)[1]		**3E-04**				**133**	
	Total Risks (Subsurface Soil)[2]		**3E-04**				**133**	
Lifelong Residents (Child and Adult)	Surface Soil	Incidental Ingestion	1E-05	--	--	Chromium VI	NA	--
		Dermal Contact	5E-06	--	--	Chromium VI	NA	--
		Inhalation	6E-07	--	--	--	NA	--
		Total	2E-05	--	Chromium VI	--	NA	--
	Subsurface Soil	Incidental Ingestion	2E-08	--	--	--	NA	--
		Dermal Contact	7E-10	--	--	--	NA	--
		Inhalation	2E-07	--	--	--	NA	--
		Total	2E-07	--	--	--	NA	--
	Groundwater	Incidental Ingestion	9E-04	Trichloroethene , Vinyl Chloride	Arsenic	2,6-Dinitrotoluene	NA	--
		Dermal Contact	1E-04	--	Trichloroethene	Vinyl Chloride	NA	--
		Inhalation	8E-06	--	--	Trichloroethene	NA	--
		Total	1E-03	Trichloroethene, Vinyl Chloride	Arsenic	2,6-Dinitrotoluene	NA	--
	Surface Water	Incidental Ingestion	4E-06	--	--	Vinyl Chloride	NA	--
		Dermal Contact	3E-07	--	--	--	NA	--
		Total	4E-06	--	--	Vinyl Chloride	NA	--
	Total Risks (Surface Soil)[1]		**1E-03**				**NA**	
	Total Risks (Subsurface Soil)[2]		**1E-03**				**NA**	

[1] Total Risks associated with Surface Soil and other media (excluding Subsurface Soil)

[2] Total Risks associated with Subsurface Soil and other media (excluding Surface Soil)

TABLE 6-21
RISKS BASED ON INDOOR AIR CONCENTRATIONS - BUILDING 716
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

Compound	Residential Regional Screening Levels ($\mu g/m^3$)[1]		Maximum Indoor Air Concentrations ($\mu g/m3$)	Risks		Industrial Regional Screening Levels ($\mu g/m^3$)[1]		Maximum Indoor Air Concentrations ($\mu g/m^3$)	Risks	
	Carcinogenic	Noncarcinogenic		ILCR	HQ	Carcinogenic	Noncarcinogenic		ILCR	HQ
Trichloroethene	0.43	2.1	0.14	3.3E-07	0.07	3	8.8	0.14	4.7E-08	0.02
cis-1,2-Dichloroethene[2]	NA	6.3	0.039	--	0.01	NA	26	0.039	--	0.002
			TOTAL	3E-07	0.07				5E-08	0.02

Notes:
[1] EPA Residential Regional Screening Levels (May 2013)
[2] Screening levels based on trans-1,2-dichloroethene
ILCR - Incremental Lifetime Cancer Risk
HQ - Hazard Quotient
$\mu g/m^3$ - micrograms per cubic meter
NA - Not Available

TABLE 6-22
RISKS BASED ON INDOOR AIR CONCENTRATIONS - BUILDING 720
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

Compound	Residential Regional Screening Levels ($\mu g/m^3$)[1]		Maximum Indoor Air Concentrations ($\mu g/m^3$)	Risks		Industrial Regional Screening Levels ($\mu g/m^3$)[1]		Maximum Indoor Air Concentrations ($\mu g/m^3$)	Risks	
	Carcinogenic	Noncarcinogenic		ILCR	HQ	Carcinogenic	Noncarcinogenic		ILCR	HQ
Benzene	0.31	31	0.45	1.5E-06	0.01	1.6	130	0.45	2.8E-07	0.003
Chloromethane	NA	94	1.1	--	0.01	NA	390	1.1	--	0.003
TCE	0.43	2.1	0.16	3.7E-07	0.08	3	8.8	0.16	5.3E-08	0.018
cis-1,2-Dichloroethene	NA	6.3	0.015	--	0.002	NA	26	0.015	--	0.001
Vinyl Chloride	0.16	10	0.11	6.9E-07	0.01	2.8	44	0.11	3.9E-08	0.003
			TOTAL	3E-06	0.12			TOTAL	4E-07	0.028

Notes:
[1] EPA Residential Regional Screening Levels (May 2013)
[2] Screening levels based on trans-1,2-dichloroethene
ILCR - Incremental Lifetime Cancer Risk
HQ - Hazard Quotient
NA - Not Available
$\mu g/m^3$ - micrograms per cubic meter

TABLE 7-1
ASSESSMENT ENDPOINTS AND MEASUREMENT ENDPOINTS
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

Assessment Endpoint	Measurement Endpoint
Adverse effects on the survival, reproduction, and/or growth of sediment invertebrates	• Survival, growth, and/or reproduction of sediment invertebrates were evaluated by comparing the measured concentrations of chemicals in the sediment to sediment screening levels.
Adverse effects on the survival, reproduction, and/or growth of aquatic organisms	• Survival, growth, and/or reproduction of aquatic organisms were evaluated by comparing the measured concentrations of chemicals in the surface water and porewater to surface water screening levels.

TABLE 7-2
ECOLOGICAL COPC SELECTION FOR SEDIMENT
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

Parameter	Ecological Screening Level[1]	Southern Drainage Channel						Northern Drainage Channel	
		S43SD01		S43SD01-DUP		S43SD02		S43SD04	
		Result	EEQ[2]	Result	EEQ[2]	Result	EEQ[2]	Result	EEQ[2]
Volatile Organic Compounds (µg/kg)									
Cis-1,2-Dichloroethene	1050[3]	4.97 J	0.005	5.86 J	0.006	4.55 J	0.004	3.18 J	0.003
Methylene Chloride	NA	142 J	NA	222 J	NA	103 J	NA	113 J	NA
Trichloroethene	96.9	22.1 J	0.23	22.3 J	0.23	8.9 J	0.09	2.9 J	0.03
Inorganics (mg/kg)									
Arsenic	9.8	2.55	0.26	1.63	0.17	2	0.20	2.07 L	0.21
Cobalt	50	10.3	0.21	6.85	0.14	16.5	0.33	13	0.26
Iron	20,000	6920	0.35	4630	0.23	4850	0.24	17100	0.86
Manganese	460	64.5 J	0.14	32.7 J	0.07	83 J	0.18	129 J	0.28

Notes:

Shaded chemical name indicates the parameter is retained as a COPC for sediment invertebrates because an EEQ exceeds 1 or a screening level is not available.

1 - Source: USEPA Region 3 BTAG Freshwater Sediment Screening Benchmarks (USEPA, 2006).
2 - EEQs were calculated by dividing the sample results by the ecological screening levels. Values are unitless.
3 - Value for trans-1,2-dichloroethene.

EEQ - Ecological Effects Quotient
J - Estimated concentration
L - Estimated low
NA - Not available

TABLE 7-3
ECOLOGICAL COPC SELECTION FOR SURFACE WATER
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

Parameter	Ecological Screening Level[1]	Southern Drainage Channel										Northern Drainage Channel	
		S43SW01		S43SW01-DUP		S43SW02		S43CL01		S43OF01		S43SW04	
		Result	EEQ[2]	Result	EEQ[2]	Result	EEQ[2]	Result	EEQ[2]	Result	EEQ[2]	Result	EEQ[2]
Volatile Organic Compounds (µg/L)													
1,1-Dichloroethane	47	0.75 J	0.02	0.69 J	0.01	0.34 J	0.007	0.5 U	0.011	0.5 J	0.01	0.5 U	0.01
1,1-Dichloroethene	25	0.5 U	0.02	0.5 U	0.02	0.5 U	0.02	0.5 U	0.020	0.37 J	0.01	0.7 J	0.03
Cis-1,2-Dichloroethene	970[3]	1.37	0.001	1.31	0.001	1.78	0.002	0.5 U	0.0005	1.79	0.002	48.2	0.05
Trichloroethene	21	27.2	**1.3**	26.6	**1.3**	10.2	0.49	0.5 U	0.02	4.98	0.24	30.5	**1.5**
Vinyl Chloride	930	0.5 U	0.0005	0.5 U	0.0005	0.5 U	0.0005	0.5 U	0.0005	0.5 U	0.0005	1.26	0.001
Inorganics (µg/L)													
Arsenic	5	1.5 U	0.30	1.5 U	0.30	1.21 J	0.24	1.5 U	0.30	0.751 J	0.15	1.5 U	0.30
Cobalt	23	4.16	0.18	4.17	0.18	6.38	0.28	2.5 U	0.11	6.58	0.29	10.7	0.47
Iron	300	1450	**4.8**	1450	**4.8**	3340	**11.1**	2590	**8.6**	1750	**5.8**	1670	**5.6**
Manganese	120	128	**1.1**	129	**1.1**	192	**1.6**	41.2	0.34	189	**1.6**	256	**2.1**

Notes:

Shaded chemical name indicates the parameter is retained as a COPC for aquatic organisms because an EEQ exceeds 1.

1 - Source: USEPA Region 3 BTAG Freshwater Surface Water Screening Benchmarks (USEPA, 2006).
2 - EEQs were calculated by dividing the sample results by the ecological screening levels. Values are unitless.
3 - Value for trans-1,2-dichloroethene.

J - Estimated concentration
U - Not detected

TABLE 7-4
ECOLOGICAL COPC SELECTION FOR SEEPS
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

Parameter	Ecological Screening Level[1]	Southern Drainage Channel				Northern Drainage Channel			
		S43SP01				S43SP02			
		Round 1		Round 2		Round 1		Round 2	
		Result	EEQ[2]	Result	EEQ[2]	Result	EEQ[2]	Result	EEQ[2]
Volatiles (µg/L)									
1,1,1-Trichloroethane	11	2.36	0.21	--	--	0.5 U	0.05	--	--
1,1-Dichloroethane	47	1 U	0.02	0.84 J	0.02	0.49 J	0.01	0.5 U	0.01
1,1-Dichloroethene	25	1 U	0.04	1 U	0.04	4.43	0.18	0.5 U	0.02
Acetone	1500	10 U	0.007	--	--	25.8 B	0.02	--	--
Cis-1,2-Dichloroethene	970[3]	3.62	0.004	2.08	0.002	195	0.20	0.44 J	0.0005
Methylene Chloride	98.1	2 U	0.02	1 J	0.01	0.65 J	0.007	1 U	0.01
Tetrachloroethene	111	0.24 J	0.002	--	--	0.5 U	0.005	--	--
Trans-1,2-Dichloroethene	970	1 U	0.001	1 U	0.001	1.09	0.001	0.5 U	0.0005
Trichloroethene	21	354	**16.9**	156	**7.4**	28.7	**1.4**	1.86	0.09
Vinyl Chloride	930	1 U	0.001	1 U	0.001	1.16	0.001	0.5 U	0.0005

Notes:

Shaded chemical name indicates the parameter is retained as a COPC for aquatic organisms because an EEQ exceeds 1.

1 - Source: USEPA Region 3 BTAG Freshwater Surface Water Screening Benchmarks (USEPA, 2006).
2 - EEQs were calculated by dividing the sample results by the ecological screening levels. Values are unitless.
3 - Value for trans-1,2-dichloroethene.

B - Blank contamination
J - Estimated concentration
U - Not detected

TABLE 7-5
ECOLOGICAL COPC SELECTION FOR PIEZOMETERS
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

Parameter	Ecological Screening Level[1]	S43PZ001		S43PZ002		S43PZ003		S43PZ004	
		Result	EEQ[2]	Result	EEQ[2]	Result	EEQ[2]	Result	EEQ[2]
Volatiles (µg/L)									
1,1-Dichloroethane	47	0.5 U	0.011	0.5 U	0.011	0.59 J	0.013	0.47 J	0.01
1,1-Dichloroethene	25	0.5 U	0.02	0.5 U	0.02	1.34	0.05	0.5 U	0.02
Cis-1,2-Dichloroethene	970[3]	0.5 U	0.0005	2.53	0.003	9.9	0.01	0.5 U	0.0005
Methylene Chloride	98.1	1 U	0.010	0.5 J	0.005	1 U	0.01	1 U	0.01
Trans-1,2-Dichloroethene	970	0.5 U	0.0005	0.5 U	0.0005	0.69 J	0.0007	0.5 U	0.0005
Trichloroethene	21	0.5 U	0.02	0.5 U	0.02	41.8	**2.0**	0.5 U	0.02
Vinyl Chloride	930	0.5 U	0.0005	0.91 J	0.001	0.81 J	0.0009	0.5 U	0.0005
Metals (µg/L)									
Arsenic	5	2.81 L	0.56	1.64 J	0.33	1.5 UL	0.30	1.5 UL	0.30
Cobalt	23	7.62	0.33	15	0.65	2.5 U	0.11	9.42	0.41
Iron	300	32100	**107**	10700	**35.7**	21400	**71**	102	0.34
Manganese	120	2060	**17.2**	600	**5.0**	343	**2.9**	135	**1.1**
Dissolved Metals (µg/L)									
Cobalt	23	--	--	16.6	0.72	--	--	--	--
Iron	300	--	--	6670	**22.2**	--	--	--	--
Manganese	120	--	--	563	**4.7**	--	--	--	--

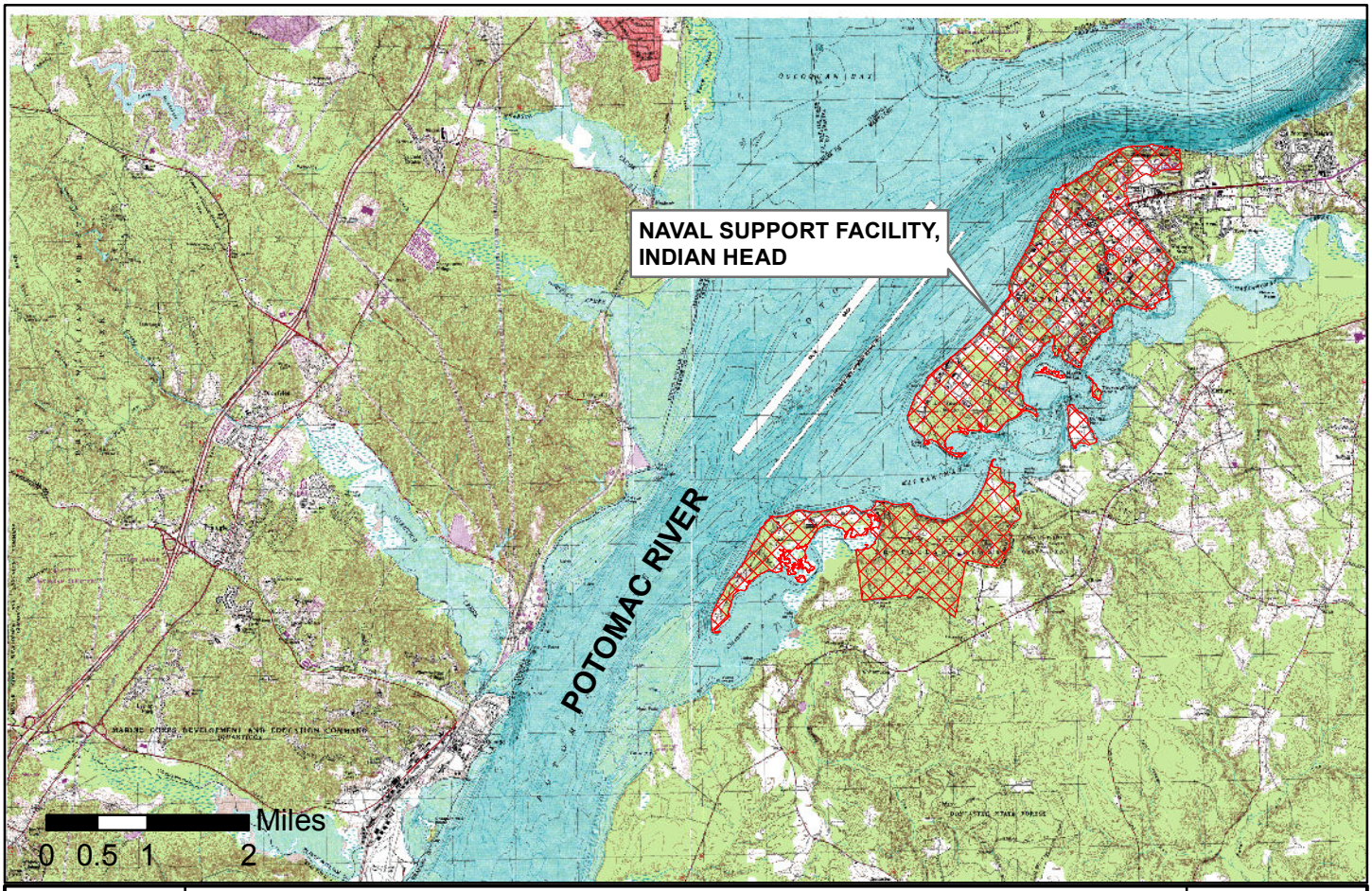
Notes:

Shaded chemical name indicates the parameter is retained as a COPC for aquatic organisms because an EEQ exceeds 1.

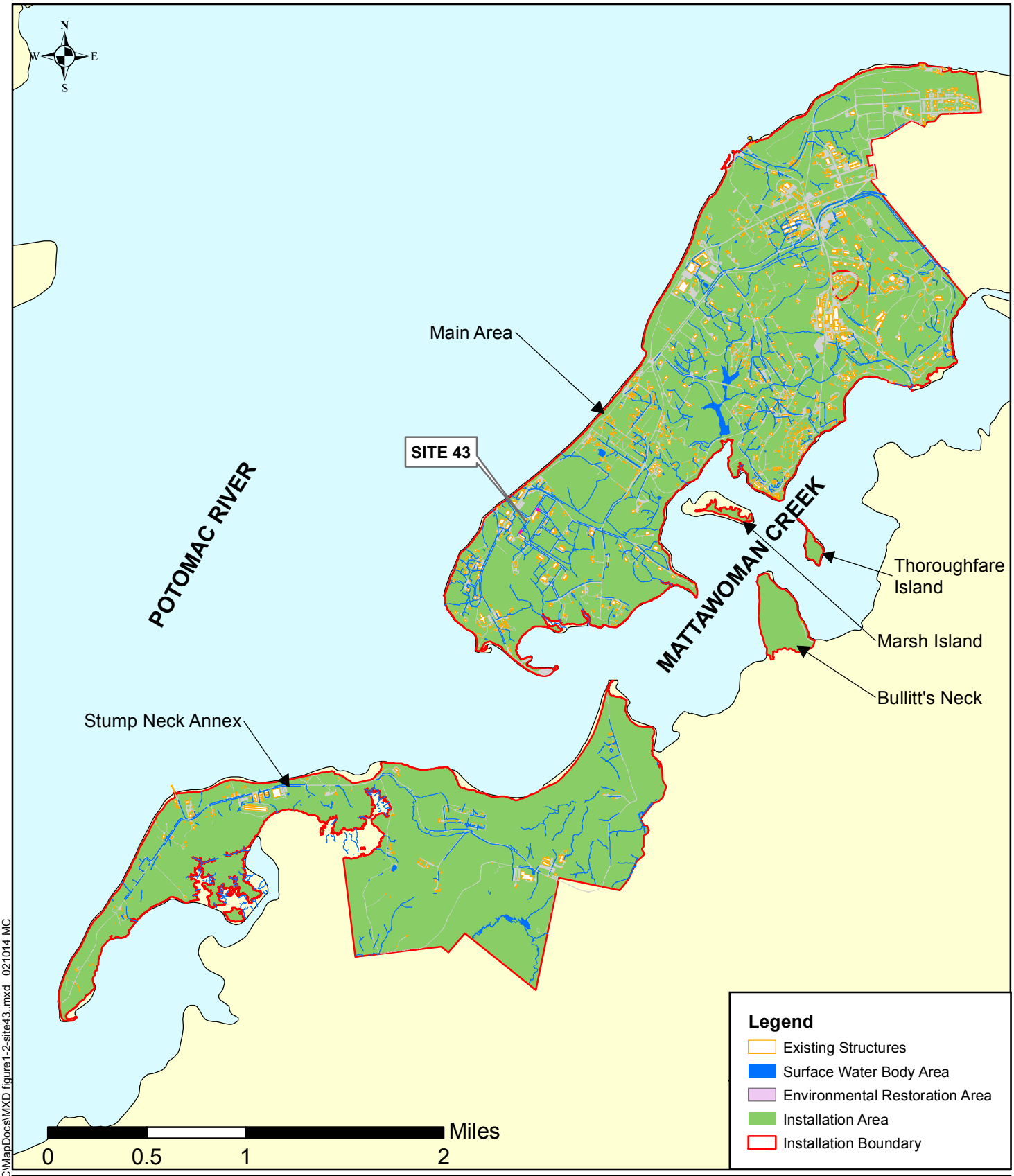
1 - Source: USEPA Region 3 BTAG Freshwater Surface Water Screening Benchmarks (USEPA, 2006).
2 - EEQs were calculated by dividing the sample results by the ecological screening levels. Values are unitless.
3 - Value for trans-1,2-dichloroethene.

J - Estimated concentration
L - Biased low
U - Not detected
UL - Not detected, biased low

FIGURES



DRAWN BY MC	DATE 2/11/14	**FACILITY LOCATION MAP** **SITE 43 TOLUENE DISPOSAL AREA** **NAVAL SUPPORT FACILITY - INDIAN HEAD** **INDIAN HEAD, MARYLAND**	CONTRACT NUMBER 112G03107
CHECKED BY	DATE		APPROVED BY — DATE
REVISED BY	DATE		APPROVED BY — DATE
SCALE AS NOTED			FIGURE NO. **1-1** REV



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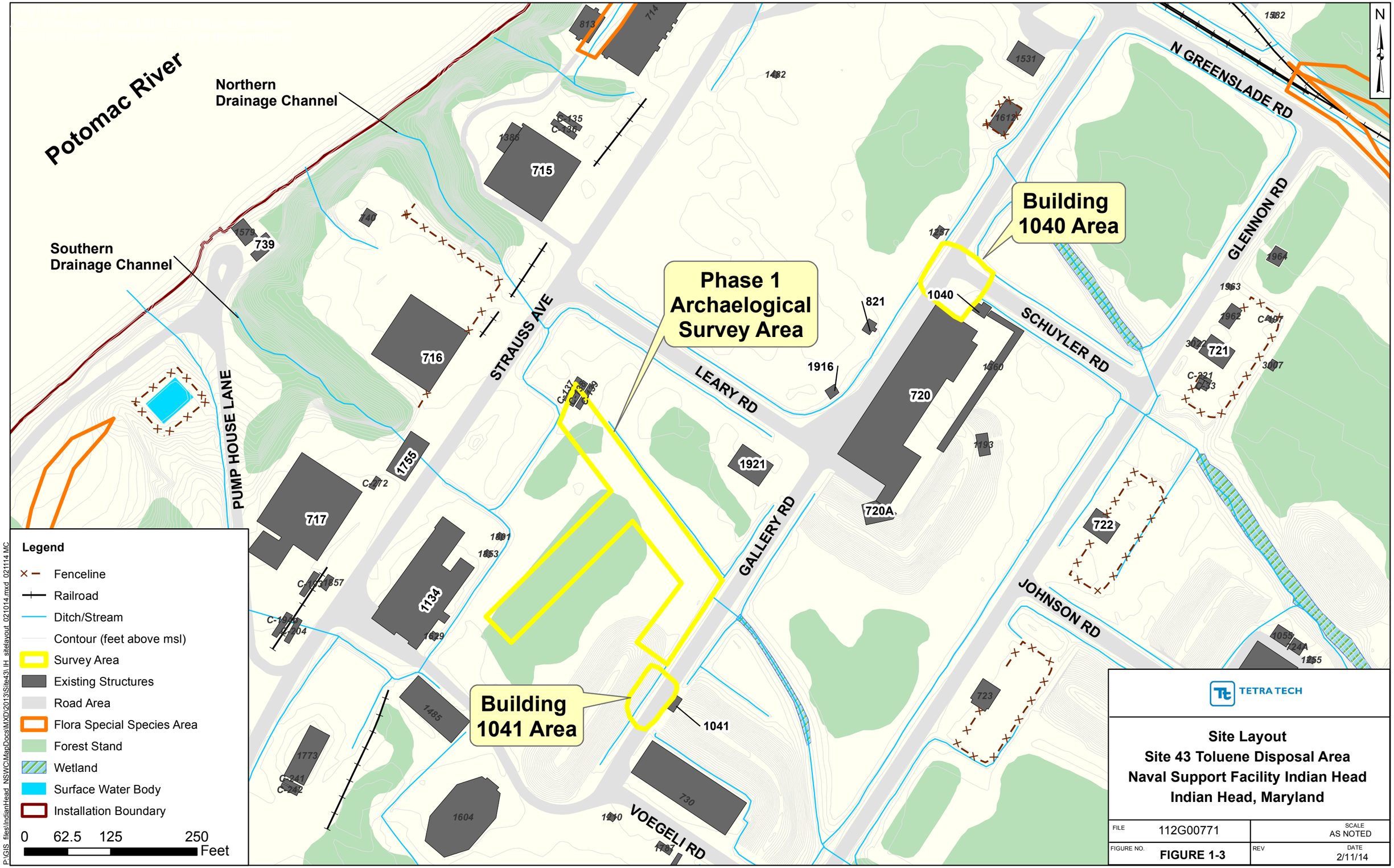
DRAWN BY MC	DATE 2/10/14	**SITE LOCATION MAP** **SITE 43 TOLUENE DISPOSAL** **NAVAL SUPPORT FACILITY - INDIAN HEAD** **INDIAN HEAD, MARYLAND**	CONTRACT NUMBER 112G03107
CHECKED BY	DATE		APPROVED BY — DATE
REVISED BY	DATE		APPROVED BY — DATE
SCALE AS NOTED			FIGURE NO. **1-2** REV


Potomac River
Northern Drainage Channel
Southern Drainage Channel
Phase 1 Archaelogical Survey Area
Building 1040 Area
Building 1041 Area
N GREENSLADE RD
GLENNON RD
SCHUYLER RD
LEARY RD
STRAUSS AVE
PUMP HOUSE LANE
GALLERY RD
JOHNSON RD
VOEGELI RD
715
716
717
720
720A
721
722
723
730
739
1040
1041
1134
1755
1921
1916
821
1485
1604
1773
1531
813
714
N
Legend
Fenceline
Railroad
Ditch/Stream
Contour (feet above msl)
Survey Area
Existing Structures
Road Area
Flora Special Species Area
Forest Stand
Wetland
Surface Water Body
Installation Boundary
0 62.5 125 250 Feet
TETRA TECH
Site Layout
Site 43 Toluene Disposal Area
Naval Support Facility Indian Head
Indian Head, Maryland
FILE 112G00771
SCALE AS NOTED
FIGURE NO. FIGURE 1-3
REV
DATE 2/11/14
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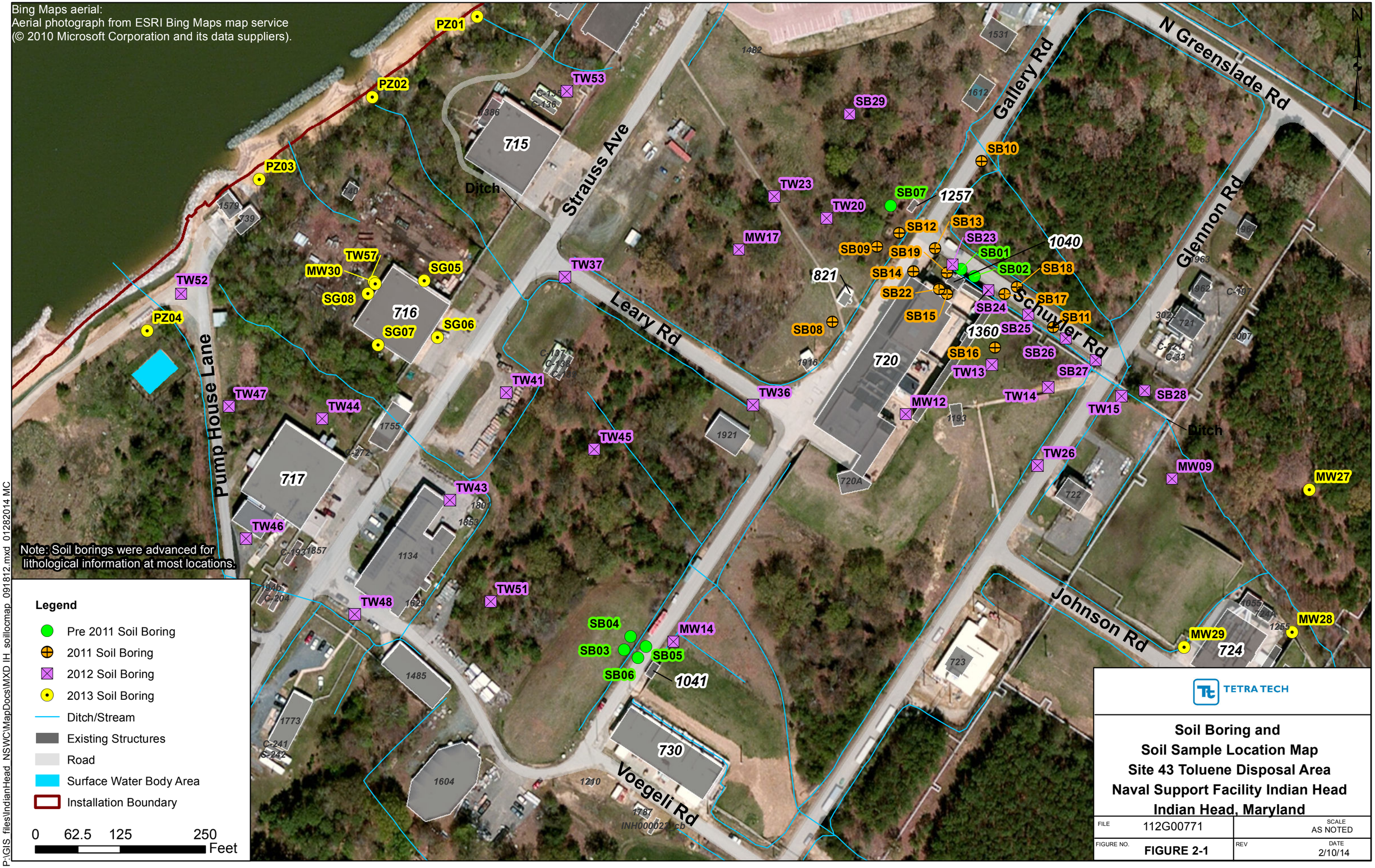
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N
PZ01
PZ02
PZ03
PZ04
TW53
TW52
TW57
MW30
SG05
SG08
SG07
SG06
TW37
TW47
TW44
TW41
TW36
TW45
TW43
TW46
TW48
TW51
TW23
TW20
MW17
SB29
SB10
SB07
1257
SB12
SB13
SB23
SB01
1040
SB09
SB19
SB02
SB18
SB14
821
SB22
SB24
SB17
SB15
SB11
SB08
1360
SB25
SB16
SB26
TW13
SB27
TW14
MW12
TW15
SB28
TW26
MW09
MW27
MW14
SB04
SB03
SB05
SB06
1041
MW29
MW28
715
716
717
720
720A
722
723
724
730
1134
1485
1604
Strauss Ave
Leary Rd
Pump House Lane
Gallery Rd
Schuyler Rd
Glennon Rd
N Greenslade Rd
Johnson Rd
Voegeli Rd
Ditch
Ditch
Note: Soil borings were advanced for lithological information at most locations.
Legend
Pre 2011 Soil Boring
2011 Soil Boring
2012 Soil Boring
2013 Soil Boring
Ditch/Stream
Existing Structures
Road
Surface Water Body Area
Installation Boundary
0 62.5 125 250 Feet
TETRA TECH
Soil Boring and
Soil Sample Location Map
Site 43 Toluene Disposal Area
Naval Support Facility Indian Head
Indian Head, Maryland
FILE 112G00771
SCALE AS NOTED
FIGURE NO. FIGURE 2-1
REV
DATE 2/10/14
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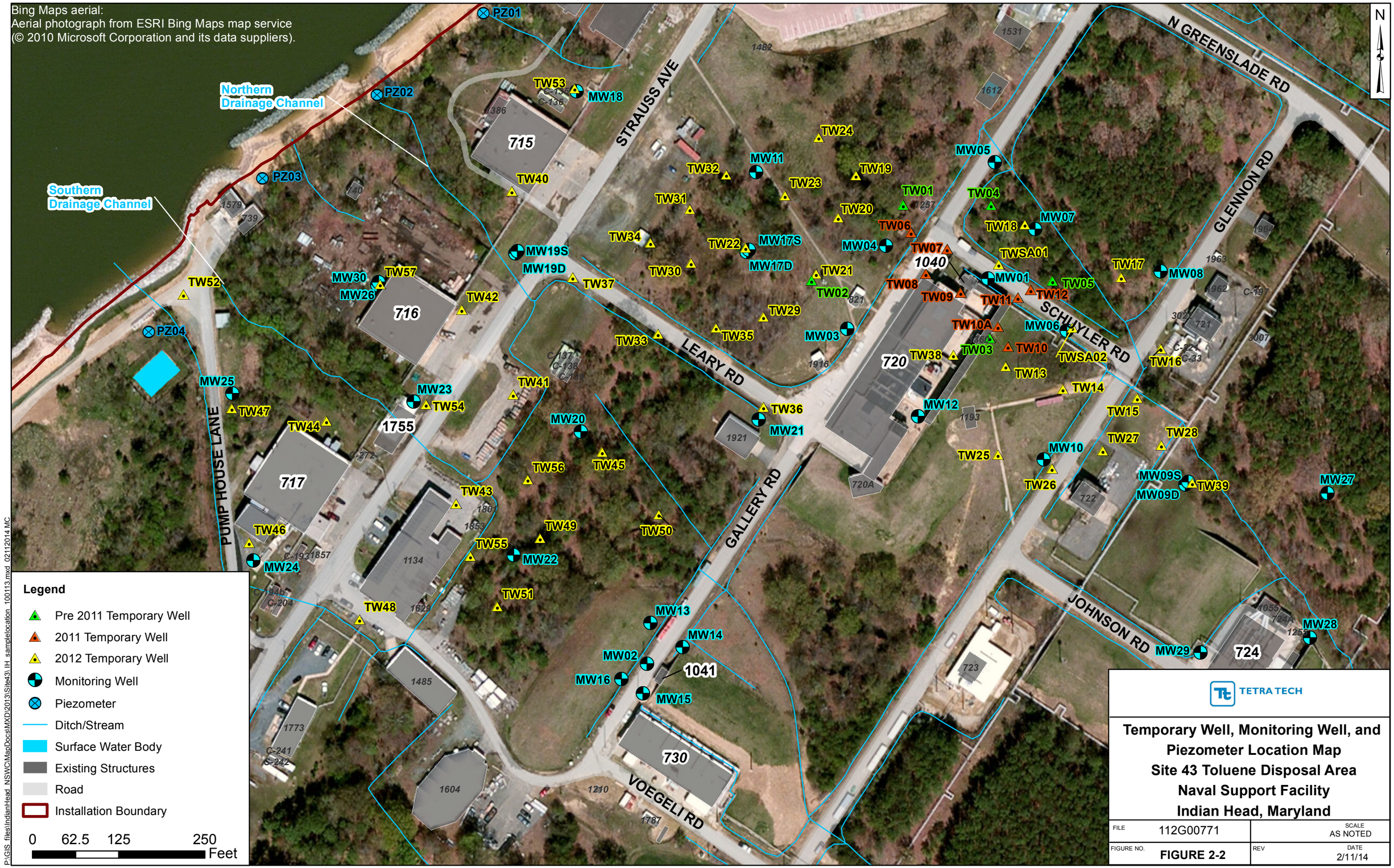
Bing Maps aerial:
Aerial photograph from ESRI Bing Maps map service
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N
Northern Drainage Channel
Southern Drainage Channel
PZ01
PZ02
PZ03
PZ04
STRAUSS AVE
LEARY RD
GALLERY RD
VOEGELI RD
JOHNSON RD
N GREENSLADE RD
GLENNON RD
SCHUYLER RD
PUMP HOUSE LANE
715
716
717
720
722
723
724
730
1040
1041
1755
TW53
MW18
TW40
TW24
MW11
TW32
TW19
TW23
MW05
TW01
TW04
TW31
TW20
TW06
TW18
MW07
TW34
TW22
MW17S
MW04
TW07
TWSA01
MW19S
MW19D
TW30
MW17D
TW21
TW08
MW01
TW05
TW17
MW08
TW52
MW30
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MW26
TW37
TW02
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TW11
TW12
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MW06
TW33
TW35
MW03
TW03
TW10
TW38
TWSA02
TW16
TW13
TW14
MW25
TW41
MW23
TW54
TW36
MW12
TW15
TW47
MW20
MW21
TW44
TW27
TW28
TW25
MW10
TW56
TW45
TW26
MW09S
TW39
MW27
TW43
MW09D
TW46
TW49
TW50
TW55
MW22
MW24
TW51
TW48
MW13
MW14
MW28
MW02
MW29
MW16
MW15
Legend
Pre 2011 Temporary Well
2011 Temporary Well
2012 Temporary Well
Monitoring Well
Piezometer
Ditch/Stream
Surface Water Body
Existing Structures
Road
Installation Boundary
0 62.5 125 250 Feet
TETRA TECH
Temporary Well, Monitoring Well, and Piezometer Location Map
Site 43 Toluene Disposal Area
Naval Support Facility
Indian Head, Maryland
FILE 112G00771
SCALE AS NOTED
FIGURE NO. FIGURE 2-2
REV
DATE 2/11/14
P:\GIS_files\IndianHead_NSWC\MapDocs\MXD\2013\Site43\IH_samplelocation_100113.mxd 02112014 MC

Bing Maps aerial:
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N
1257
ODA01
1963
Ditch
SG01
1040
SG04
SG02
SG03
1962
821
Gallery Rd
IND01
IND02
Schuyler Rd
Glennon Rd
3022
721
ODA02
720
1360
Ditch
C-205
C-221
C-33
1916
Several attempts were made to colect a soil gas sample. Due to site conditions, no sample was obtained.
1193
Legend
Indoor Air Sample
Outdoor Air Sample
Soil Gas Sample
Ditch/Stream
Existing Structures
Road
0 25 50 100 Feet
TETRA TECH
Indoor Air and Soil Gas Location Map
Buildings 720 and 1040
Site 43 Toluene Disposal Area
Naval Support Facility Indian Head
Indian Head, Maryland
FILE 112G00771
SCALE AS NOTED
FIGURE NO. FIGURE 2-3
REV
DATE 2/11/14
P:\GIS files\IndianHead NSWC\MapDocs\MXD\2013\Site43\ IH SGlocmap 100113.mxd 02112014 MC

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N

Northern Drainage Channel

Southern Drainage Channel

PZ01
PZ02
PZ03
PZ04
SW04
SD04
SW02
SD02
SW01
SD01
SP02
SP01
CL01
ODA01
OF01
SG08
SG05
IND02
IND01
SG06
SG07

715
716
717
720
1040
1755

STRAUSS AVE
LEARY RD
PUMP HOUSE LANE
GALLERY RD

N/A

Legend

- Culvert (Surface Water Sample)
- Outfall (Surface Water Sample)
- Piezometer
- Sediment Sample
- Seep Sample
- Surface Water Sample
- Indoor Air Sample
- Outdoor Air Sample
- Soil Gas Sample
- Ditch/Stream
- Road
- Building
- Surface Water Body
- Installation Boundary

0 25 50 100 Feet

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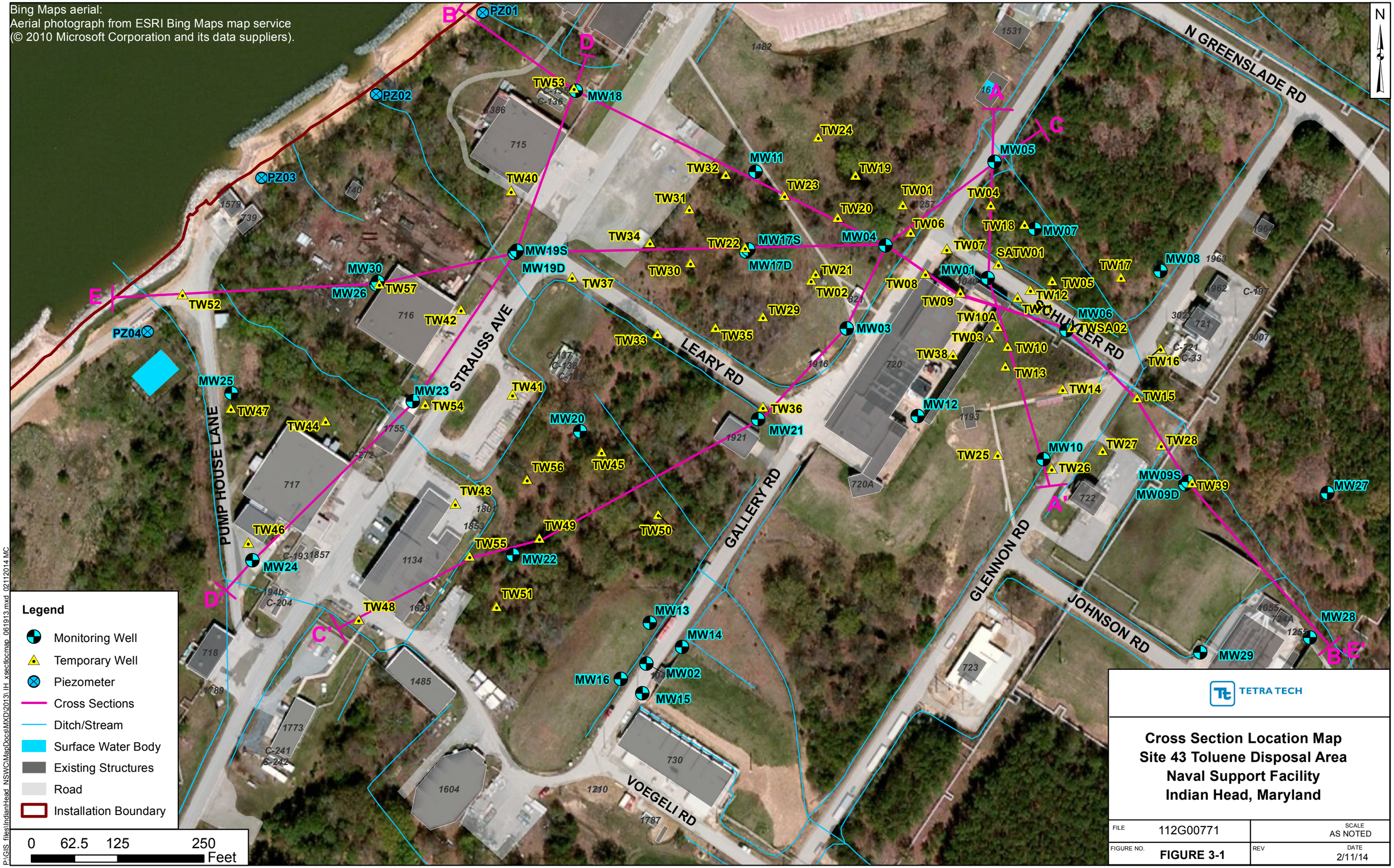
TETRA TECH

Drainage Sample and Building 716 Indoor Air and Soil Gas Location Map Site 43 Toluene Disposal Area Naval Support Facility Indian Head, Maryland

FILE	112G00771	SCALE	AS NOTED
FIGURE NO.	FIGURE 2-4	REV	DATE 2/11/14


Bing Maps aerial:
Aerial photograph from ESRI Bing Maps map service
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N
N GREENSLADE RD
STRAUSS AVE
LEARY RD
SCHULTZER RD
PUMP HOUSE LANE
GALLERY RD
GLENNON RD
JOHNSON RD
VOEGELI RD
A
A'
B
B'
C
C'
D
D'
E
E'
PZ01
PZ02
PZ03
PZ04
MW01
MW02
MW03
MW04
MW05
MW06
MW07
MW08
MW09S
MW09D
MW10
MW11
MW12
MW13
MW14
MW15
MW16
MW17S
MW17D
MW18
MW19S
MW19D
MW20
MW21
MW22
MW23
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TW45
TW46
TW47
TW48
TW49
TW50
TW51
TW52
TW53
TW54
TW55
TW56
TW57
SATW01
TWSA02
Legend
Monitoring Well
Temporary Well
Piezometer
Cross Sections
Ditch/Stream
Surface Water Body
Existing Structures
Road
Installation Boundary
0 62.5 125 250
Feet
TETRA TECH
Cross Section Location Map
Site 43 Toluene Disposal Area
Naval Support Facility
Indian Head, Maryland
FILE 112G00771
SCALE AS NOTED
FIGURE NO. FIGURE 3-1
REV
DATE 2/11/14
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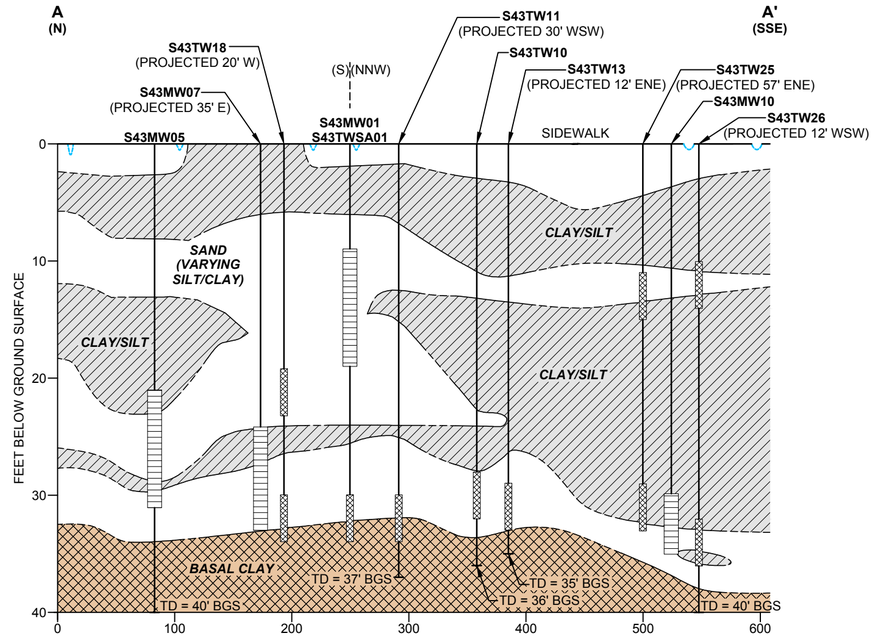
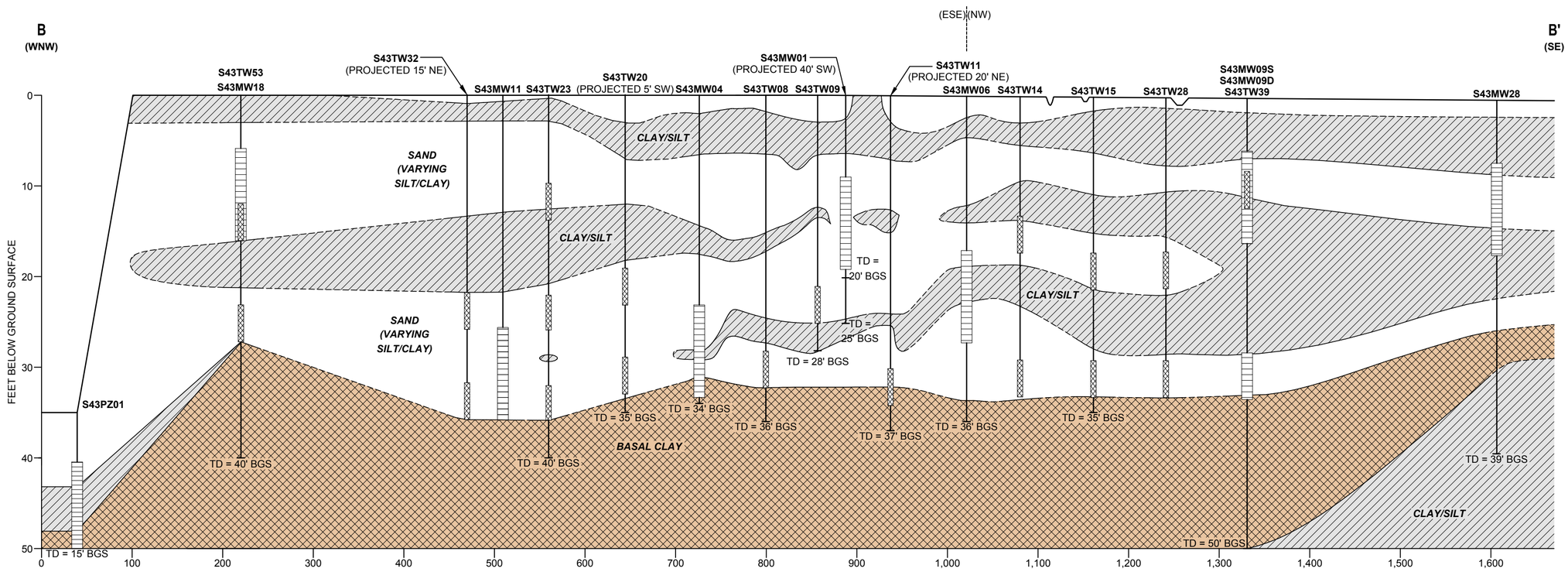
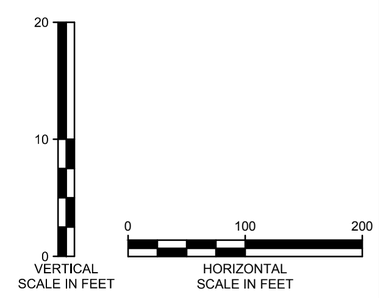






LEGEND

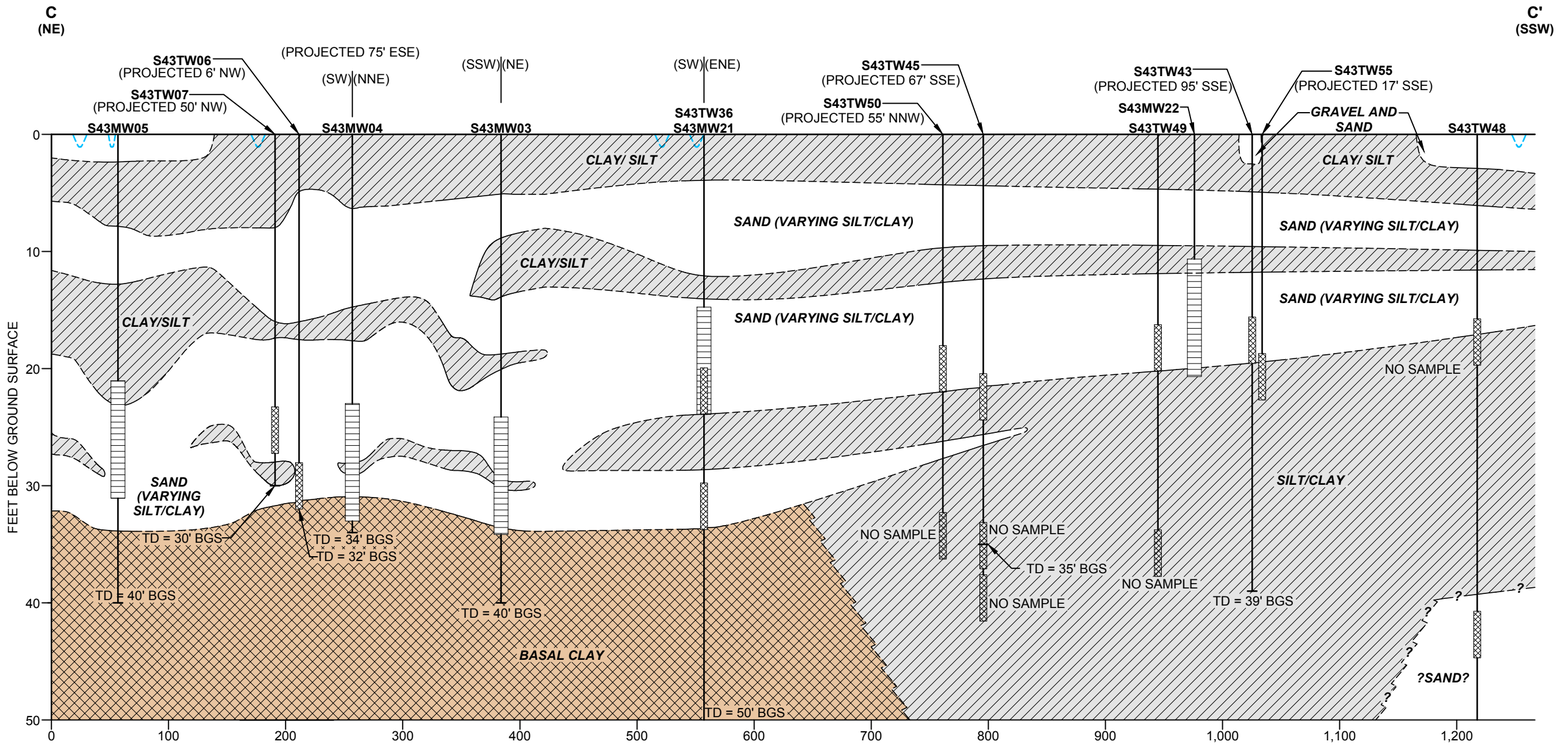
S43MW04	MONITORING WELL
S43TW08	GROUNDWATER GRAB SAMPLE
(PROJECTED 5' S)	PROJECTED DISTANCE AND DIRECTION TO CROSS SECTION LINE
	GROUND SURFACE DITCH WITH STANDING WATER
	GEOLOGIC CONTACT (DASHED WHERE INFERRED)
	BOREHOLE
	GROUNDWATER GRAB SAMPLE
	MONITORING WELL SCREEN
TD = 40' BGS	TOTAL DEPTH
	SAND WITH VARYING AMOUNTS OF SILT, CLAY, AND GRAVEL
	CLAY OR SILT WITH VARYING AMOUNTS OF SAND
	BASAL CLAY

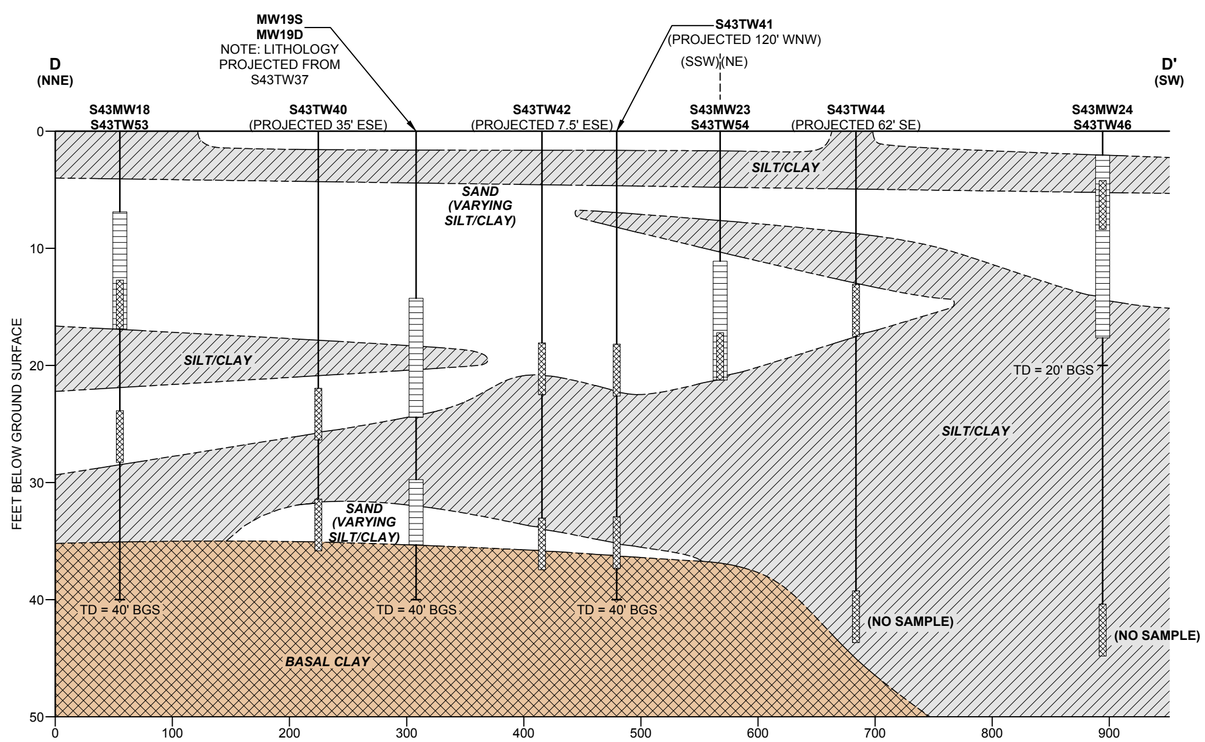
TETRA TECH

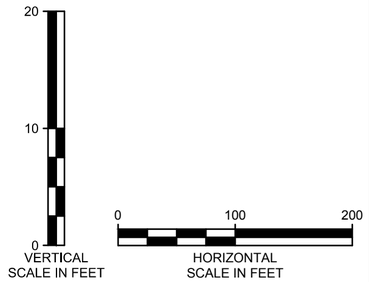
GEOLOGIC CROSS SECTIONS
A – A' AND B – B'
SITE 43 – TOLUENE DISPOSAL AREA
NAVAL SUPPORT FACILITY INDIAN HEAD
INDIAN HEAD, MARYLAND

FILE	SCALE
112G01358GS02-1	AS NOTED
FIGURE NUMBER	REV / DATE
FIGURE 3-2	0 / 01/31/14

112G01358/0620/112G01358GS02-2.DWG 01/31/14 MKB







LEGEND

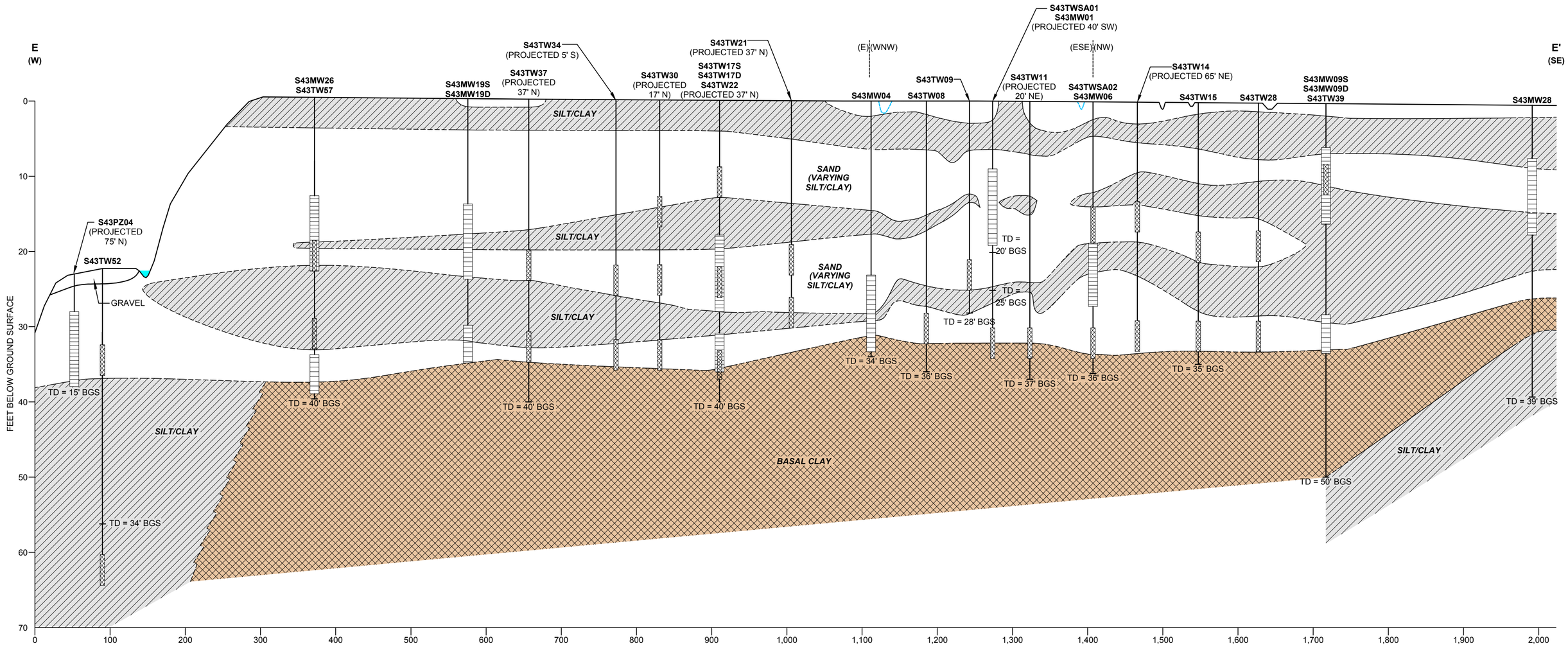
S43MW04 S43TW08 (PROJECTED 5' S)	MONITORING WELL GROUNDWATER GRAB SAMPLE PROJECTED DISTANCE AND DIRECTION TO CROSS SECTION LINE
	GROUND SURFACE (APPROXIMATED TO BE FLAT) DITCH WITH STANDING WATER
	GEOLOGIC CONTACT (DASHED WHERE INFERRED)
	BOREHOLE
	GROUNDWATER GRAB SAMPLE
	MONITORING WELL SCREEN
TD = 40' BGS	TOTAL DEPTH
	SAND WITH VARYING AMOUNTS OF SILT, CLAY, AND GRAVEL
	CLAY OR SILT WITH VARYING AMOUNTS OF SAND
	BASAL CLAY

TETRA TECH

GEOLOGIC CROSS SECTIONS
C – C' AND D – D'
SITE 43 – TOLUENE DISPOSAL AREA
NAVAL SUPPORT FACILITY INDIAN HEAD
INDIAN HEAD, MARYLAND

FILE	SCALE
112G01358GS02-2	AS NOTED
FIGURE NUMBER	REV / DATE
FIGURE 3-3	0 / 01/31/14

112G01358/0620/112G01358GS02-3.DWG 07/15/13 MKB



LEGEND

S43MW04	MONITORING WELL
S43TW08	GROUNDWATER GRAB SAMPLE
(PROJECTED 5' S)	PROJECTED DISTANCE AND DIRECTION TO CROSS SECTION LINE
	GROUND SURFACE DITCH WITH STANDING WATER
	GEOLOGIC CONTACT (DASHED WHERE INFERRED)
	BOREHOLE
	GROUNDWATER GRAB SAMPLE
	MONITORING WELL SCREEN
TD = 40' BGS	TOTAL DEPTH
	SAND WITH VARYING AMOUNTS OF SILT, CLAY, AND GRAVEL
	CLAY OR SILT WITH VARYING AMOUNTS OF SAND
	BASAL CLAY

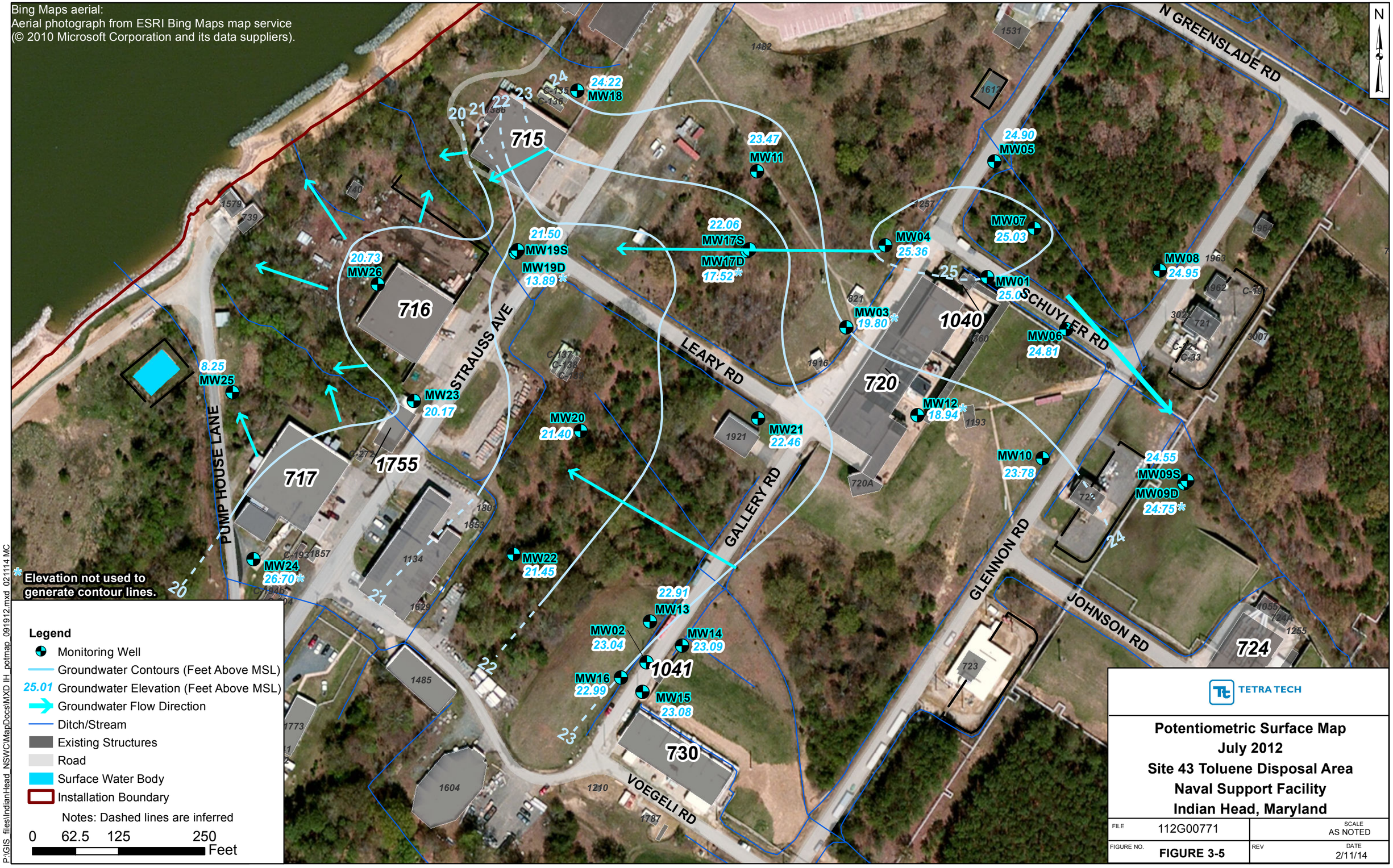
20
10
0
VERTICAL
SCALE IN FEET

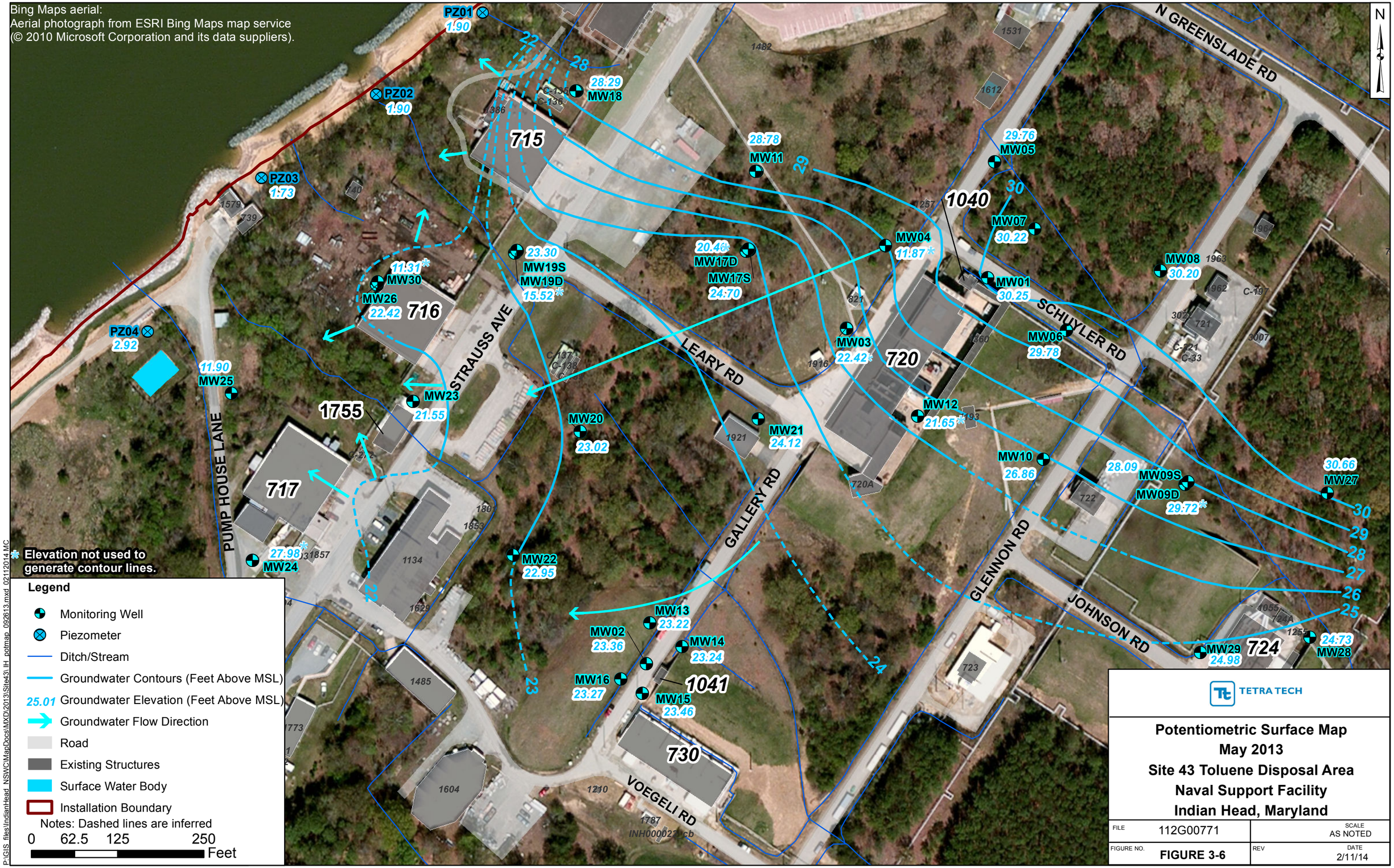
0 100 200
HORIZONTAL
SCALE IN FEET

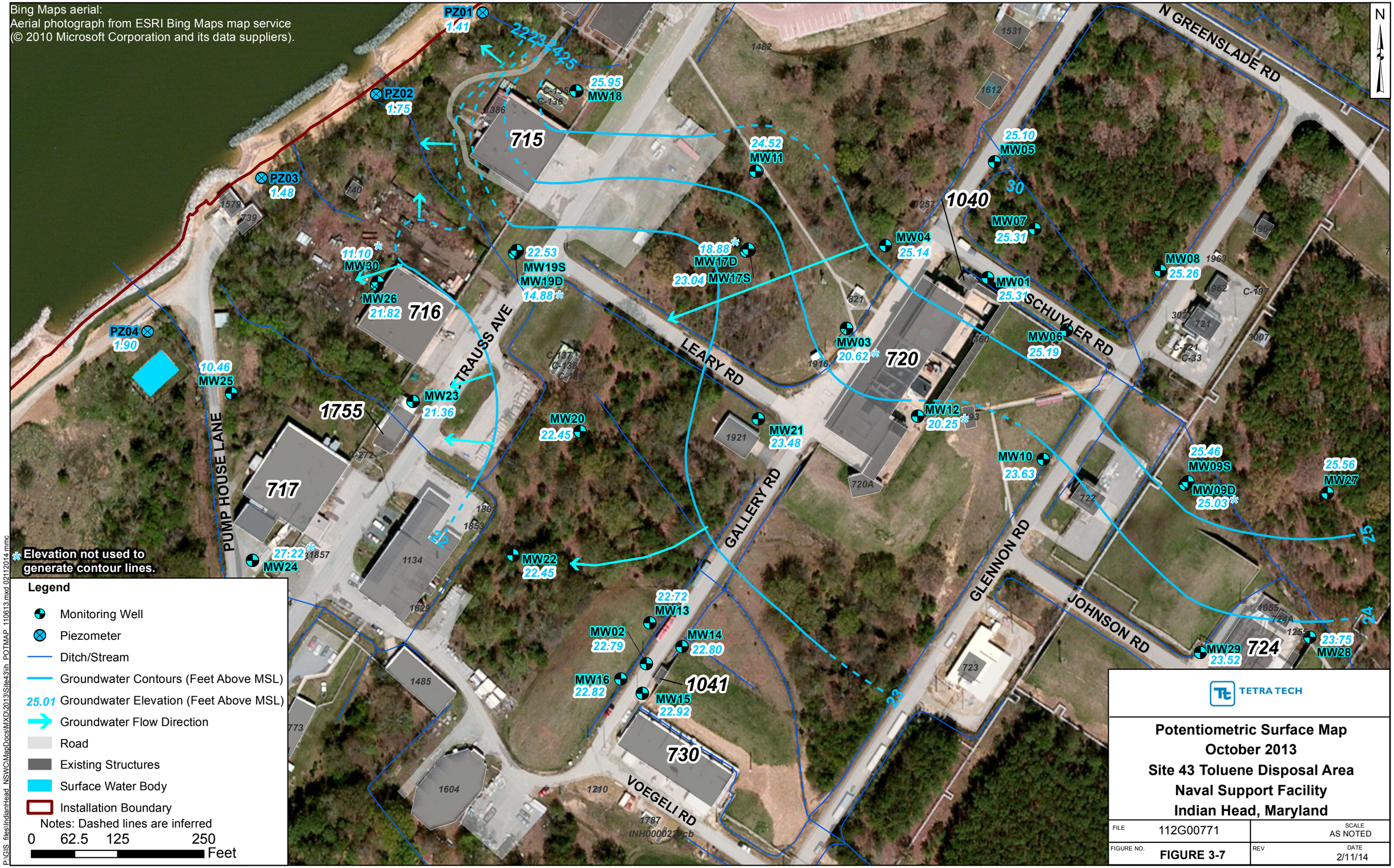
TETRA TECH

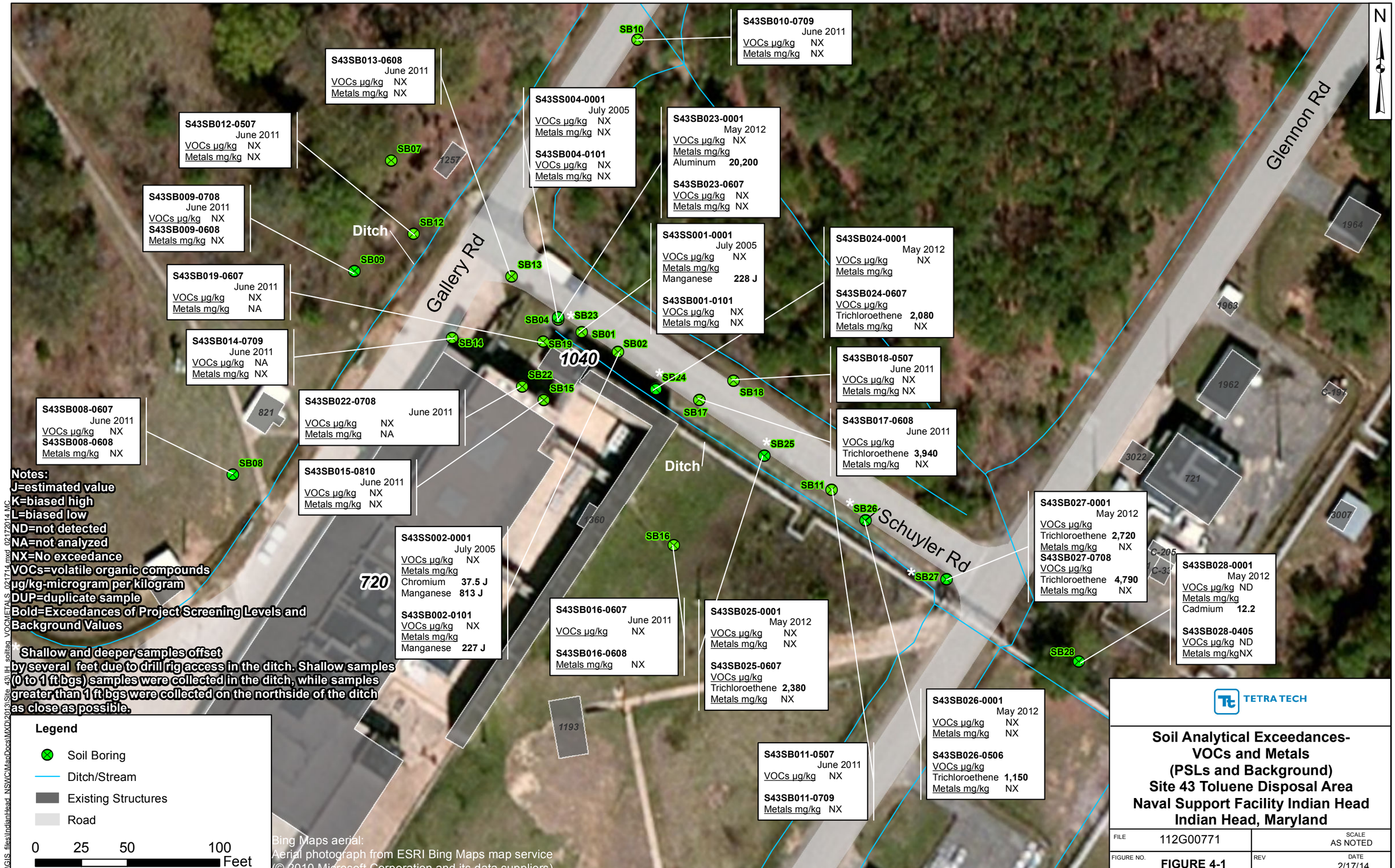
GEOLOGIC CROSS SECTION E – E'
SITE 43 – TOLUENE DISPOSAL AREA
NAVAL SUPPORT FACILITY INDIAN HEAD
INDIAN HEAD, MARYLAND

FILE 112G01358GS02-3	SCALE AS NOTED
FIGURE NUMBER FIGURE 3-4	REV 0 DATE 07/15/13


Bing Maps aerial:
Aerial photograph from ESRI Bing Maps map service
(© 2010 Microsoft Corporation and its data suppliers).
N
N GREENSLADE RD
STRAUSS AVE
LEARY RD
SCHUYLER RD
PUMP HOUSE LANE
GALLERY RD
GLENNON RD
JOHNSON RD
VOEGELI RD
715
716
717
720
724
730
1040
1041
1755
MW18 24.22
MW11 23.47
MW05 24.90
MW07 25.03
MW04 25.36
MW08 24.95
MW01 25.0
MW03 19.80*
MW06 24.81
MW12 18.94*
MW10 23.78
MW09S 24.55
MW09D 24.75*
MW17S 22.06
MW17D 17.52*
MW19S 21.50
MW19D 13.89*
MW26 20.73
MW25 8.25
MW23 20.17
MW20 21.40
MW21 22.46
MW22 21.45
MW24 26.70*
MW13 22.91
MW02 23.04
MW14 23.09
MW16 22.99
MW15 23.08
20
21
22
23
24
25
26
* Elevation not used to generate contour lines.
Legend
Monitoring Well
Groundwater Contours (Feet Above MSL)
25.01 Groundwater Elevation (Feet Above MSL)
Groundwater Flow Direction
Ditch/Stream
Existing Structures
Road
Surface Water Body
Installation Boundary
Notes: Dashed lines are inferred
0 62.5 125 250 Feet
TETRA TECH
Potentiometric Surface Map
July 2012
Site 43 Toluene Disposal Area
Naval Support Facility
Indian Head, Maryland
FILE 112G00771
SCALE AS NOTED
FIGURE NO. FIGURE 3-5
REV
DATE 2/11/14
P:\GIS_files\IndianHead_NSWC\MapDocs\MXD IH_potmap_091912.mxd 021114 MC


Bing Maps aerial:
Aerial photograph from ESRI Bing Maps map service
(© 2010 Microsoft Corporation and its data suppliers).
N
N GREENSLADE RD
SCHUYLER RD
LEARY RD
STRAUSS AVE
PUMP HOUSE LANE
GALLERY RD
GLENNON RD
JOHNSON RD
VOEGELI RD
PZ01 1.90
PZ02 1.90
PZ03 1.73
PZ04 2.92
MW18 28.29
MW11 28.78
MW05 29.76
MW07 30.22
MW08 30.20
MW01 30.25
MW06 29.78
MW04 11.87*
MW03 22.42*
MW12 21.65*
MW10 26.86
MW09S 28.09
MW09D 29.72*
MW27 30.66
MW28 24.73
MW29 24.98
MW17D 20.46*
MW17S 24.70
MW19S 23.30
MW19D 15.52*
MW30 11.31*
MW26 22.42
MW25 11.90
MW23 21.55
MW20 23.02
MW21 24.12
MW24 27.98*
MW22 22.95
MW13 23.22
MW02 23.36
MW14 23.24
MW16 23.27
MW15 23.46
715
716
717
720
724
730
1040
1041
1755
22
23
24
25
26
27
28
29
30
* Elevation not used to generate contour lines.
Legend
Monitoring Well
Piezometer
Ditch/Stream
Groundwater Contours (Feet Above MSL)
25.01 Groundwater Elevation (Feet Above MSL)
Groundwater Flow Direction
Road
Existing Structures
Surface Water Body
Installation Boundary
Notes: Dashed lines are inferred
0 62.5 125 250 Feet
TETRA TECH
Potentiometric Surface Map
May 2013
Site 43 Toluene Disposal Area
Naval Support Facility
Indian Head, Maryland
FILE 112G00771
SCALE AS NOTED
FIGURE NO. FIGURE 3-6
REV
DATE 2/11/14
P:\GIS_files\IndianHead_NSWC\MapDocs\MXD\2013\Site43\IH_potmap_092813.mxd 02112014 MC


Bing Maps aerial:
Aerial photograph from ESRI Bing Maps map service
(© 2010 Microsoft Corporation and its data suppliers).
N
N GREENSLADE RD
PZ01
1.41
PZ02
1.75
PZ03
1.48
PZ04
1.90
25.95
MW18
24.52
MW11
25.10
MW05
30
1040
MW07
25.31
MW04
25.14
MW08
25.26
MW01
25.31
SCHUYLER RD
MW06
25.19
MW03
20.62
720
MW12
20.25
MW10
23.63
25.46
MW09S
MW09D
25.03
25.56
MW27
25
24
23
MW29
23.52
724
23.75
MW28
715
716
717
720
730
724
1040
1041
1755
22.53
MW19S
MW19D
14.88
18.88
MW17D
23.04
MW17S
11.10
MW30
MW26
21.82
10.46
MW25
MW23
21.36
MW20
22.45
MW21
23.48
MW22
22.45
27.22
MW24
22.72
MW13
MW02
22.79
MW14
22.80
MW16
22.82
MW15
22.92
STRAUSS AVE
LEARY RD
GALLERY RD
GLENNON RD
JOHNSON RD
PUMP HOUSE LANE
VOEGELI RD
Elevation not used to generate contour lines.
Legend
Monitoring Well
Piezometer
Ditch/Stream
Groundwater Contours (Feet Above MSL)
25.01 Groundwater Elevation (Feet Above MSL)
Groundwater Flow Direction
Road
Existing Structures
Surface Water Body
Installation Boundary
Notes: Dashed lines are inferred
0 62.5 125 250
Feet
P:\GIS_files\IndianHead_NSWC\MapDocs\MXD\2013\Site43\h_POTMAP_110613.mxd 02112014 mmc
TETRA TECH
Potentiometric Surface Map
October 2013
Site 43 Toluene Disposal Area
Naval Support Facility
Indian Head, Maryland
FILE 112G00771
SCALE AS NOTED
FIGURE NO. FIGURE 3-7
REV
DATE 2/11/14

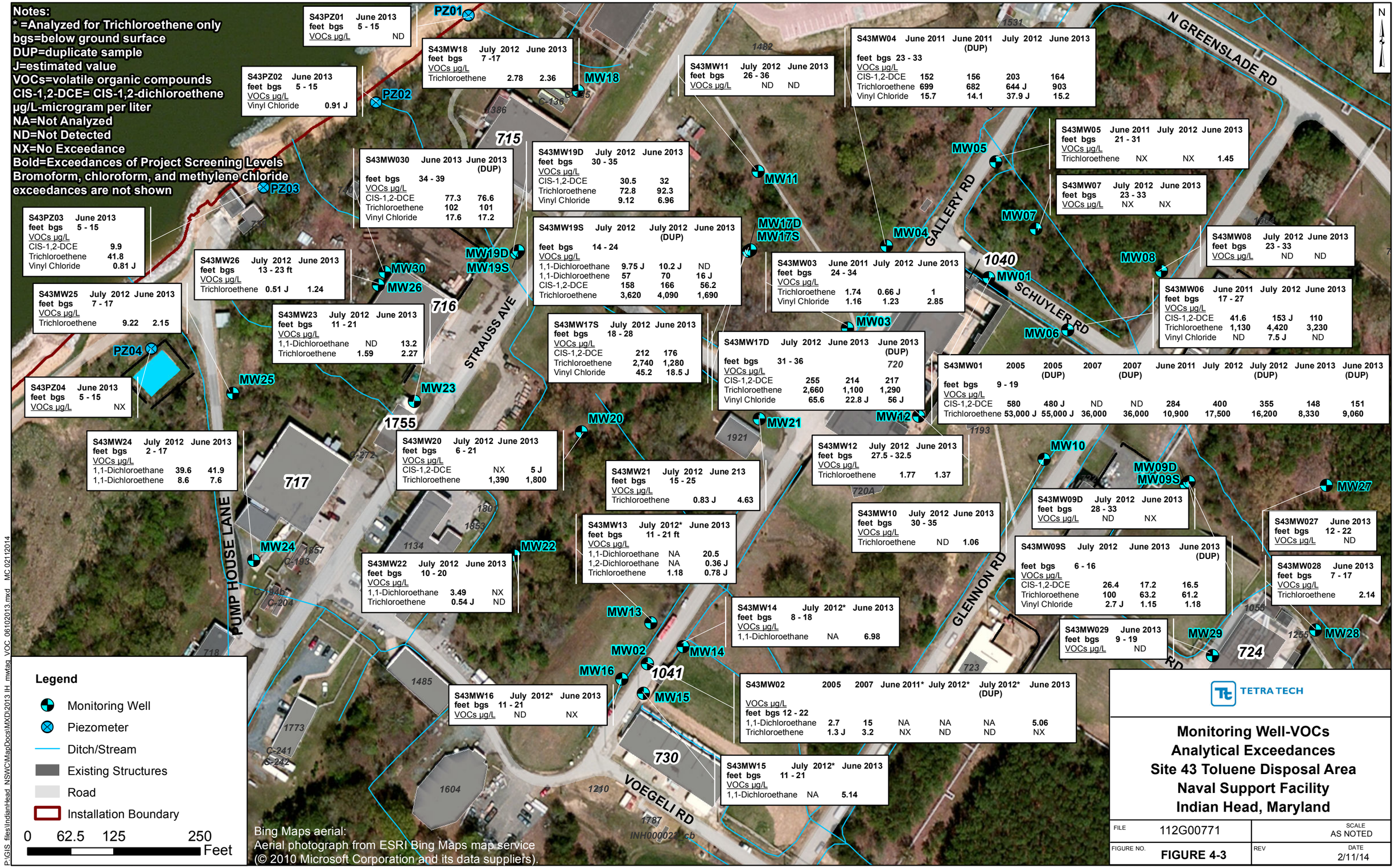


TETRA TECH

Soil Analytical Exceedances-
VOCs and Metals
(PSLs and Background)
Site 43 Toluene Disposal Area
Naval Support Facility Indian Head
Indian Head, Maryland

FILE	112G00771	SCALE	AS NOTED
FIGURE NO.	FIGURE 4-1	REV	DATE 2/17/14

Notes:
All results are in µg/L
ND= Not Detected
NX=No exceedance
NS=Not Sampled
J=estimated value
VOCs=volatile organic compounds
µg/L-microgram per liter
DUP=duplicate sample
Bold=Exceedances of Project Screening Levels
CIS-1,2-DCE= CIS-1,2-dichloroethene
1,1-DCA= 1,1-dichloroethane
1,2-DCA= 1,2-dichloroethane
Chloroform and methylene chloride exceedances are not shown
S43TW31 May 2012
feet bgs 14 ft 26 ft 36 ft
Trichloroethene ND 0.63 J ND
S43TW53 June 2012
feet bgs 17 ft 28 ft 28 ft (DUP)
CIS-1,2-DCE 12.4 ND ND
Trichloroethene 1.00 ND ND
S43TW34 May 2012
feet bgs 26 ft 36 ft 36ft (DUP)
CIS-1,2-DCE NX 23.9 25
Trichloroethene 8.98 80.6 78.7
Vinyl Chloride ND 8.01 J 11 J
S43TW40 June 2012
feet bgs 26 ft 36 ft
Trichloroethene 102 ND
S43TW37 June 2012
feet bgs 24 ft 24 ft (DUP) 35 ft
CIS-1,2-DCE 4.18 4.20 23.3
Trichloroethene 24.6 24.3 29.0
Vinyl Chloride 0.5 J 0.47 J 20.6 J
S43TW57 July 2012
feet bgs 23ft 33 ft
CIS-1,2-DCE 87.7 205
Trichloroethene 766 259
Vinyl Chloride ND 47.9
S43TW42 June 2012
feet bgs 22 ft 37 ft
CIS-1,2-DCE 30.7 10.7
Trichloroethene 137 8.75
Vinyl Chloride 2.37 6.25
S43TW47 June 2012
feet bgs 14 ft
1,1-DCA 5.84 J
Trichloroethene 1.58
S43TW44 June 2012
feet bgs 17 ft
1,1-DCA 3.37
Trichloroethene 8.14
S43TW54 June 2012
feet bgs 21 ft
Trichloroethene 1.79
S43TW41 June 2012
feet bgs 22 ft 22 ft (DUP) 37 ft
CIS-1,2-DCE 13.4 13.6 ND
Trichloroethene 22.5 22.5 ND
Vinyl Chloride 2.88 2.81 ND
S43TW43 June 2012
feet bgs 19 ft
1,1-DCA 8.89
Trichloroethene 1.11
S43TW49 June 2012
feet bgs 21 ft 21 ft (DUP)
1,1-DCA 23.3 23
1,2-DCA 0.62 J 0.62 J
Trichloroethene 1.53 1.43
S43TW45 June 2012
feet bgs 24 ft
Trichloroethene 731 J
S43TW33 May 2012
feet bgs 26 ft 36 ft
CIS-1,2-DCE 164 5.8
Trichloroethene 1,270 5.81
Vinyl Chloride 39.1 4.02
S43TW30 May 2012
feet bgs 17 ft 17 ft (DUP) 26 ft 36 ft
CIS-1,2-DCE ND ND 25.9 66.8
Trichloroethene ND ND 68.5 93.7
Vinyl Chloride ND ND 2.25 54.5
S43TW35 May 2012
feet bgs 26 ft 36 ft
CIS-1,2-DCE NX 3.35
Trichloroethene 1.48 0.520 J
Vinyl Chloride ND 0.390 J
S43TW20 April 2012
feet bgs 23 ft 33 ft 33 ft (DUP)
CIS-1,2-DCE 81.8 50.2 47
Trichloroethene 298 298 287
Vinyl Chloride 13.1 12.3 11.5
S43TW23 April 2012
feet bgs 14 ft 26 ft 36 ft
CIS-1,2-DCE NX 197 ND
Trichloroethene 1.21 833 1.61
Vinyl Chloride ND 29.7 ND
S43TW01 Nov 2007
feet bgs 32 ft
Trichloroethene 3.2
S43TW06 June 2011
feet bgs 32 ft
CIS-1,2-DCE 4.49
Trichloroethene 53.9
Vinyl Chloride 0.724 J
S43TW08 June 2011
feet bgs 32 ft
CIS-1,2-DCE 21.8
Trichloroethene 41.9
Vinyl Chloride 16.2
S43TW07 June 2011
feet bgs 27 ft 27 ft (DUP)
CIS-1,2-DCE 56.5 61.3
Trichloroethene 923 1,010
Vinyl Chloride 26.2 25.8
S43TWSA01 May 2012
feet bgs 34 ft
Trichloroethene 15.4
S43TW09 June 2011
feet bgs 25 ft
Trichloroethene 563
S43TW11 June 2011
feet bgs 34 ft
Trichloroethene 1.68
S43TWSA02 May 2012
feet bgs 18 ft 34 ft
CIS-1,2-DCE 4.8 62.6
Trichloroethene 135 1,730
Vinyl Chloride ND 4.1 J
S43TW28 May 2012
feet bgs 21 ft 33 ft 33 ft (DUP)
CIS-1,2-DCE 120 ND ND
Trichloroethene 2.52 ND ND
Vinyl Chloride 3.46 ND ND
S43TW39 June 2012
feet bgs 12 ft
CIS-1,2-DCE 8.64
Trichloroethene 17.9
Vinyl Chloride 0.360 J
S43TW21 April 2012
feet bgs 23 ft 30 ft
Trichloroethene 1.04 NX
S43TW38 June 2012
feet bgs 22 ft 32 ft
CIS-1,2-DCE 3.06 NX
Trichloroethene 0.940 J 4.63
Vinyl Chloride 0.730 J ND
S43TW14 April 2012
feet bgs 17 ft 33 ft
CIS-1,2-DCE ND 3.35
Trichloroethene ND 79.9
Vinyl Chloride ND 0.74 J
S43TW15 April 2012
feet bgs 21 ft 33 ft
CIS-1,2-DCE 25.7 NX
Trichloroethene 158 0.64 J
Vinyl Chloride 1.4 J 0.58 J
S43TW29 May 2012
feet bgs 26 ft 36 ft
CIS-1,2-DCE NX 10.5
Trichloroethene 1.36 23.7
Vinyl Chloride ND 0.490 J
S43TW36 June 2012
feet bgs 24 ft 34 ft
CIS-1,2-DCE ND 4.38
Trichloroethene 0.510 J NX
S43TW13 April 2012
feet bgs 33 ft
Trichloroethene 20.3
S43TW22 April 2012
feet bgs 14 ft 26 ft 37 ft
CIS-1,2-DCE NX 288 170
Trichloroethene 1.64 4,440 384
Vinyl Chloride ND 54 47.2
Legend
Temporary Well
Ditch/Stream
Existing Structures
Road
Installation Boundary
0 50 100 200 Feet
STRAUSS AVE
LEARY RD
GALLERY RD
SCHUYLER RD
N GREENSLADE RD
DROP TOWER DR.
PUMP HOUSE LANE
CANNON RD
715
716
717
720
720A
722
724
724A
725
730
1040
1041
1755
TETRA TECH
Groundwater Grab
VOC Analytical Exceedances
Site 43 Toluene Disposal Area
Naval Support Facility
Indian Head, Maryland
FILE 112G01358
SCALE AS NOTED
FIGURE NO. FIGURE 4-2
REV
DATE 2/11/14
P:\GIS_files\IndianHead_NSWC\MapDocs\MXD IH_tvtag_12052012.mxd 02112014 MC



Notes:
* =Analyzed for Trichloroethene only
bgs=below ground surface
DUP=duplicate sample
J=estimated value
VOCs=volatile organic compounds
CIS-1,2-DCE= CIS-1,2-dichloroethene
µg/L-microgram per liter
NA=Not Analyzed
ND=Not Detected
NX=No Exceedance
Bold=Exceedances of Project Screening Levels
Bromoform, chloroform, and methylene chloride exceedances are not shown

S43PZ01	June 2013
feet bgs	5 - 15
VOCs µg/L	ND

S43PZ02	June 2013
feet bgs	5 - 15
VOCs µg/L	
Vinyl Chloride	0.91 J

S43PZ03	June 2013
feet bgs	5 - 15
VOCs µg/L	
CIS-1,2-DCE	9.9
Trichloroethene	41.8
Vinyl Chloride	0.81 J

S43PZ04	June 2013
feet bgs	5 - 15
VOCs µg/L	NX

S43MW18	July 2012	June 2013
feet bgs	7 -17	
VOCs µg/L		
Trichloroethene	2.78	2.36

S43MW11	July 2012	June 2013
feet bgs	26 - 36	
VOCs µg/L	ND	ND

S43MW04	June 2011	June 2011 (DUP)	July 2012	June 2013
feet bgs	23 - 33			
VOCs µg/L				
CIS-1,2-DCE	152	156	203	164
Trichloroethene	699	682	644 J	903
Vinyl Chloride	15.7	14.1	37.9 J	15.2

S43MW05	June 2011	July 2012	June 2013
feet bgs	21 - 31		
VOCs µg/L			
Trichloroethene	NX	NX	1.45

S43MW07	July 2012	June 2013
feet bgs	23 - 33	
VOCs µg/L	NX	NX

S43MW08	July 2012	June 2013
feet bgs	23 - 33	
VOCs µg/L	ND	ND

S43MW06	June 2011	July 2012	June 2013
feet bgs	17 - 27		
VOCs µg/L			
CIS-1,2-DCE	41.6	153 J	110
Trichloroethene	1,130	4,420	3,230
Vinyl Chloride	ND	7.5 J	ND

S43MW01	2005	2005 (DUP)	2007	2007 (DUP)	June 2011	July 2012	July 2012 (DUP)	June 2013	June 2013 (DUP)
feet bgs	9 - 19								
VOCs µg/L									
CIS-1,2-DCE	580	480 J	ND	ND	284	400	355	148	151
Trichloroethene	53,000 J	55,000 J	36,000	36,000	10,900	17,500	16,200	8,330	9,060

S43MW030	June 2013	June 2013 (DUP)
feet bgs	34 - 39	
VOCs µg/L		
CIS-1,2-DCE	77.3	76.6
Trichloroethene	102	101
Vinyl Chloride	17.6	17.2

S43MW19D	July 2012	June 2013
feet bgs	30 - 35	
VOCs µg/L		
CIS-1,2-DCE	30.5	32
Trichloroethene	72.8	92.3
Vinyl Chloride	9.12	6.96

S43MW19S	July 2012	July 2012 (DUP)	June 2013
feet bgs	14 - 24		
VOCs µg/L			
1,1-Dichloroethane	9.75 J	10.2 J	ND
1,1-Dichloroethene	57	70	16 J
CIS-1,2-DCE	158	166	56.2
Trichloroethene	3,620	4,090	1,690

S43MW03	June 2011	July 2012	June 2013
feet bgs	24 - 34		
VOCs µg/L			
Trichloroethene	1.74	0.66 J	1
Vinyl Chloride	1.16	1.23	2.85

S43MW26	July 2012	June 2013
feet bgs	13 - 23 ft	
VOCs µg/L		
Trichloroethene	0.51 J	1.24

S43MW25	July 2012	June 2013
feet bgs	7 - 17	
VOCs µg/L		
Trichloroethene	9.22	2.15

S43MW23	July 2012	June 2013
feet bgs	11 - 21	
VOCs µg/L		
1,1-Dichloroethane	ND	13.2
Trichloroethene	1.59	2.27

S43MW17S	July 2012	June 2013
feet bgs	18 - 28	
VOCs µg/L		
CIS-1,2-DCE	212	176
Trichloroethene	2,740	1,280
Vinyl Chloride	45.2	18.5 J

S43MW17D	July 2012	June 2013	June 2013 (DUP)
feet bgs	31 - 36		720
VOCs µg/L			
CIS-1,2-DCE	255	214	217
Trichloroethene	2,660	1,100	1,290
Vinyl Chloride	65.6	22.8 J	56 J

S43MW24	July 2012	June 2013
feet bgs	2 - 17	
VOCs µg/L		
1,1-Dichloroethane	39.6	41.9
1,1-Dichloroethene	8.6	7.6

S43MW20	July 2012	June 2013
feet bgs	6 - 21	
VOCs µg/L		
CIS-1,2-DCE	NX	5 J
Trichloroethene	1,390	1,800

S43MW21	July 2012	June 213
feet bgs	15 - 25	
VOCs µg/L		
Trichloroethene	0.83 J	4.63

S43MW12	July 2012	June 2013
feet bgs	27.5 - 32.5	
VOCs µg/L		
Trichloroethene	1.77	1.37

S43MW10	July 2012	June 2013
feet bgs	30 - 35	
VOCs µg/L		
Trichloroethene	ND	1.06

S43MW09D	July 2012	June 2013
feet bgs	28 - 33	
VOCs µg/L	ND	NX

S43MW09S	July 2012	June 2013	June 2013 (DUP)
feet bgs	6 - 16		
VOCs µg/L			
CIS-1,2-DCE	26.4	17.2	16.5
Trichloroethene	100	63.2	61.2
Vinyl Chloride	2.7 J	1.15	1.18

S43MW027	June 2013
feet bgs	12 - 22
VOCs µg/L	ND

S43MW028	June 2013
feet bgs	7 - 17
VOCs µg/L	
Trichloroethene	2.14

S43MW029	June 2013
feet bgs	9 - 19
VOCs µg/L	ND

S43MW22	July 2012	June 2013
feet bgs	10 - 20	
VOCs µg/L		
1,1-Dichloroethane	3.49	NX
Trichloroethene	0.54 J	ND

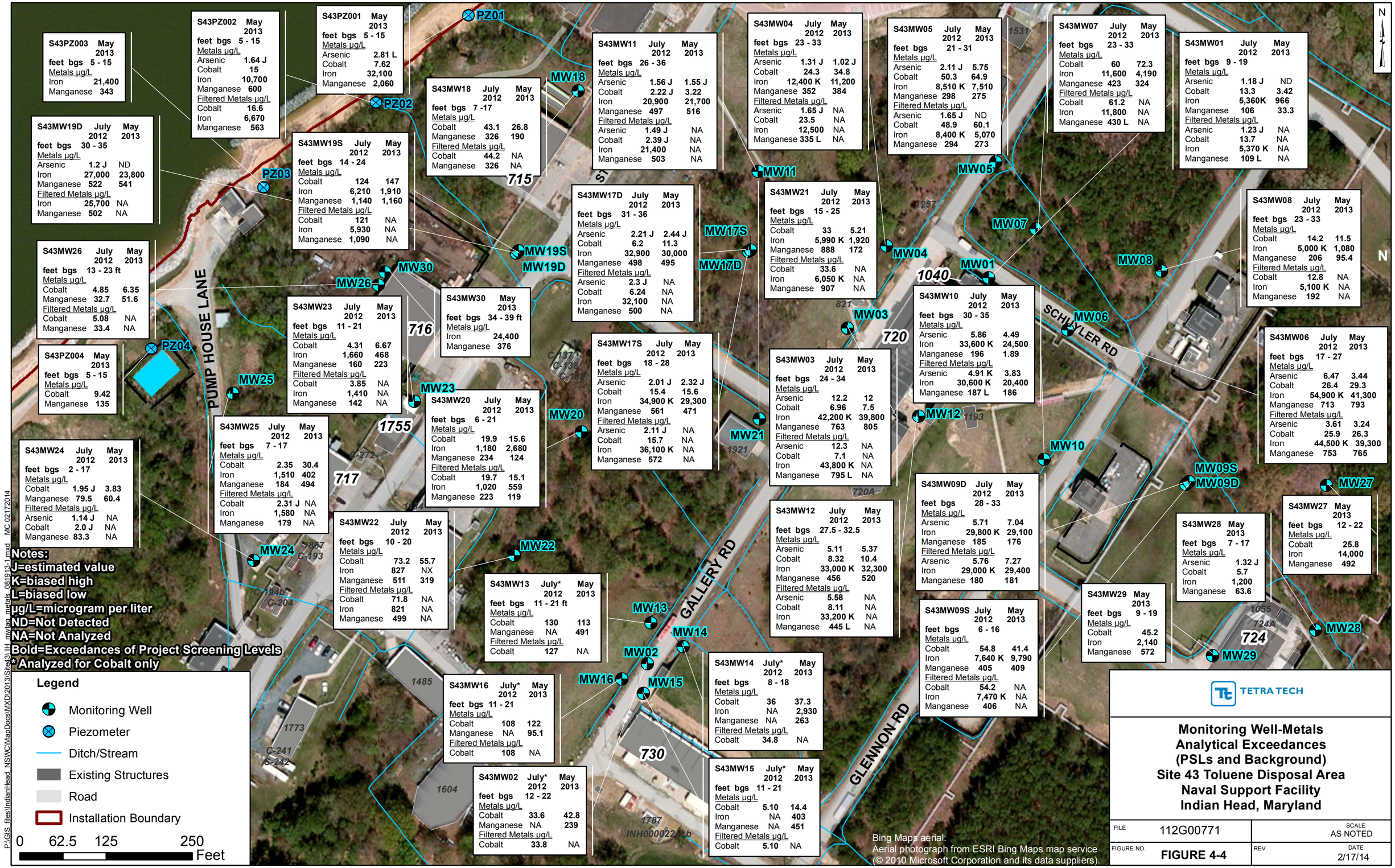
S43MW13	July 2012*	June 2013
feet bgs	11 - 21 ft	
VOCs µg/L		
1,1-Dichloroethane	NA	20.5
1,2-Dichloroethane	NA	0.36 J
Trichloroethene	1.18	0.78 J

S43MW14	July 2012*	June 2013
feet bgs	8 - 18	
VOCs µg/L		
1,1-Dichloroethane	NA	6.98

S43MW16	July 2012*	June 2013
feet bgs	11 - 21	
VOCs µg/L	ND	NX

S43MW02	2005	2007	June 2011*	July 2012*	July 2012* (DUP)	June 2013
VOCs µg/L						
feet bgs	12 - 22					
1,1-Dichloroethane	2.7	15	NA	NA	NA	5.06
Trichloroethene	1.3 J	3.2	NX	ND	ND	NX

S43MW15	July 2012*	June 2013
feet bgs	11 - 21	
VOCs µg/L		
1,1-Dichloroethane	NA	5.14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PZ01
PZ02
PZ03
PZ04
MW18
MW11
MW05
MW07
MW01
MW08
MW04
MW17S
MW17D
MW19S
MW19D
MW30
MW26
MW03
MW06
MW12
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MW09S
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PUMP HOUSE LANE
SCHUYLER RD
GALLERY RD
GLENNON RD
715
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724A
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1040
1755
1531
1193
1921
1485
1773
1604
1787
1055
257
821
272
S43PZ003 May 2013
feet bgs 5 - 15
Metals µg/L
Iron 21,400
Manganese 343
S43PZ002 May 2013
feet bgs 5 - 15
Metals µg/L
Arsenic 1.64 J
Cobalt 15
Iron 10,700
Manganese 600
Filtered Metals µg/L
Cobalt 16.6
Iron 6,670
Manganese 563
S43PZ001 May 2013
feet bgs 5 - 15
Metals µg/L
Arsenic 2.81 L
Cobalt 7.62
Iron 32,100
Manganese 2,060
S43MW19D July 2012 May 2013
feet bgs 30 - 35
Metals µg/L
Arsenic 1.2 J ND
Iron 27,000 23,800
Manganese 522 541
Filtered Metals µg/L
Iron 25,700 NA
Manganese 502 NA
S43MW18 July 2012 May 2013
feet bgs 7 -17
Metals µg/L
Cobalt 43.1 26.8
Manganese 326 190
Filtered Metals µg/L
Cobalt 44.2 NA
Manganese 326 NA
S43MW19S July 2012 May 2013
feet bgs 14 - 24
Metals µg/L
Cobalt 124 147
Iron 6,210 1,910
Manganese 1,140 1,160
Filtered Metals µg/L
Cobalt 121 NA
Iron 5,930 NA
Manganese 1,090 NA
S43MW11 July 2012 May 2013
feet bgs 26 - 36
Metals µg/L
Arsenic 1.56 J 1.55 J
Cobalt 2.22 J 3.22
Iron 20,900 21,700
Manganese 497 516
Filtered Metals µg/L
Arsenic 1.49 J NA
Cobalt 2.39 J NA
Iron 21,400 NA
Manganese 503 NA
S43MW04 July 2012 May 2013
feet bgs 23 - 33
Metals µg/L
Arsenic 1.31 J 1.02 J
Cobalt 24.3 34.8
Iron 12,400 K 11,200
Manganese 352 384
Filtered Metals µg/L
Arsenic 1.65 J NA
Cobalt 23.5 NA
Iron 12,500 NA
Manganese 335 L NA
S43MW05 July 2012 May 2013
feet bgs 21 - 31
Metals µg/L
Arsenic 2.11 J 5.75
Cobalt 50.3 64.9
Iron 8,510 K 7,510
Manganese 298 275
Filtered Metals µg/L
Arsenic 1.65 J ND
Cobalt 48.9 60.1
Iron 8,400 K 5,070
Manganese 294 273
S43MW07 July 2012 May 2013
feet bgs 23 - 33
Metals µg/L
Cobalt 60 72.3
Iron 11,600 4,190
Manganese 423 324
Filtered Metals µg/L
Cobalt 61.2 NA
Iron 11,800 NA
Manganese 430 L NA
S43MW01 July 2012 May 2013
feet bgs 9 - 19
Metals µg/L
Arsenic 1.18 J ND
Cobalt 13.3 3.42
Iron 5,360K 966
Manganese 106 33.3
Filtered Metals µg/L
Arsenic 1.23 J NA
Cobalt 13.7 NA
Iron 5,370 K NA
Manganese 109 L NA
S43MW26 July 2012 May 2013
feet bgs 13 - 23 ft
Metals µg/L
Cobalt 4.85 6.35
Manganese 32.7 51.6
Filtered Metals µg/L
Cobalt 5.08 NA
Manganese 33.4 NA
S43MW17D July 2012 May 2013
feet bgs 31 - 36
Metals µg/L
Arsenic 2.21 J 2.44 J
Cobalt 6.2 11.3
Iron 32,900 30,000
Manganese 498 495
Filtered Metals µg/L
Arsenic 2.3 J NA
Cobalt 6.24 NA
Iron 32,100 NA
Manganese 500 NA
S43MW21 July 2012 May 2013
feet bgs 15 - 25
Metals µg/L
Cobalt 33 5.21
Iron 5,990 K 1,920
Manganese 888 172
Filtered Metals µg/L
Cobalt 33.6 NA
Iron 6,050 K NA
Manganese 907 NA
S43MW08 July 2012 May 2013
feet bgs 23 - 33
Metals µg/L
Cobalt 14.2 11.5
Iron 5,000 K 1,080
Manganese 206 95.4
Filtered Metals µg/L
Cobalt 12.8 NA
Iron 5,100 K NA
Manganese 192 NA
S43MW23 July 2012 May 2013
feet bgs 11 - 21
Metals µg/L
Cobalt 4.31 6.67
Iron 1,660 468
Manganese 160 223
Filtered Metals µg/L
Cobalt 3.85 NA
Iron 1,410 NA
Manganese 142 NA
S43MW30 May 2013
feet bgs 34 - 39 ft
Metals µg/L
Iron 24,400
Manganese 376
S43MW17S July 2012 May 2013
feet bgs 18 - 28
Metals µg/L
Arsenic 2.01 J 2.32 J
Cobalt 15.4 15.6
Iron 34,900 K 29,300
Manganese 561 471
Filtered Metals µg/L
Arsenic 2.11 J NA
Cobalt 15.7 NA
Iron 36,100 K NA
Manganese 572 NA
S43MW10 July 2012 May 2013
feet bgs 30 - 35
Metals µg/L
Arsenic 5.86 4.49
Iron 33,600 K 24,500
Manganese 196 1.89
Filtered Metals µg/L
Arsenic 4.91 K 3.83
Iron 30,600 K 20,400
Manganese 187 L 186
S43MW06 July 2012 May 2013
feet bgs 17 - 27
Metals µg/L
Arsenic 6.47 3.44
Cobalt 26.4 29.3
Iron 54,900 K 41,300
Manganese 713 793
Filtered Metals µg/L
Arsenic 3.61 3.24
Cobalt 25.9 26.3
Iron 44,500 K 39,300
Manganese 753 765
S43PZ004 May 2013
feet bgs 5 - 15
Metals µg/L
Cobalt 9.42
Manganese 135
S43MW03 July 2012 May 2013
feet bgs 24 - 34
Metals µg/L
Arsenic 12.2 12
Cobalt 6.96 7.5
Iron 42,200 K 39,800
Manganese 763 805
Filtered Metals µg/L
Arsenic 12.3 NA
Cobalt 7.1 NA
Iron 43,800 K NA
Manganese 795 L NA
S43MW25 July 2012 May 2013
feet bgs 7 - 17
Metals µg/L
Cobalt 2.35 30.4
Iron 1,510 402
Manganese 184 494
Filtered Metals µg/L
Cobalt 2.31 J NA
Iron 1,580 NA
Manganese 179 NA
S43MW20 July 2012 May 2013
feet bgs 6 - 21
Metals µg/L
Cobalt 19.9 15.6
Iron 1,180 2,680
Manganese 234 124
Filtered Metals µg/L
Cobalt 19.7 15.1
Iron 1,020 559
Manganese 223 119
S43MW09D July 2012 May 2013
feet bgs 28 - 33
Metals µg/L
Arsenic 5.71 7.04
Iron 29,800 K 29,100
Manganese 185 176
Filtered Metals µg/L
Arsenic 5.76 7.27
Iron 29,000 K 29,400
Manganese 180 181
S43MW27 May 2013
feet bgs 12 - 22
Metals µg/L
Cobalt 25.8
Iron 14,000
Manganese 492
S43MW24 July 2012 May 2013
feet bgs 2 - 17
Metals µg/L
Cobalt 1.95 J 3.83
Manganese 79.5 60.4
Filtered Metals µg/L
Arsenic 1.14 J NA
Cobalt 2.0 J NA
Manganese 83.3 NA
S43MW12 July 2012 May 2013
feet bgs 27.5 - 32.5
Metals µg/L
Arsenic 5.11 5.37
Cobalt 8.32 10.4
Iron 33,000 K 32,300
Manganese 456 520
Filtered Metals µg/L
Arsenic 5.58 NA
Cobalt 8.11 NA
Iron 33,200 K NA
Manganese 445 L NA
S43MW28 May 2013
feet bgs 7 - 17
Metals µg/L
Arsenic 1.32 J
Cobalt 5.7
Iron 1,200
Manganese 63.6
S43MW22 July 2012 May 2013
feet bgs 10 - 20
Metals µg/L
Cobalt 73.2 55.7
Iron 827 NX
Manganese 511 319
Filtered Metals µg/L
Cobalt 71.8 NA
Iron 821 NA
Manganese 499 NA
S43MW13 July* 2012 May 2013
feet bgs 11 - 21 ft
Metals µg/L
Cobalt 130 113
Manganese NA 491
Filtered Metals µg/L
Cobalt 127 NA
S43MW29 May 2013
feet bgs 9 - 19
Metals µg/L
Cobalt 45.2
Iron 2,140
Manganese 572
S43MW09S July 2012 May 2013
feet bgs 6 - 16
Metals µg/L
Cobalt 54.8 41.4
Iron 7,640 K 9,790
Manganese 405 409
Filtered Metals µg/L
Cobalt 54.2 NA
Iron 7,470 K NA
Manganese 406 NA
S43MW14 July* 2012 May 2013
feet bgs 8 - 18
Metals µg/L
Cobalt 36 37.3
Iron NA 2,930
Manganese NA 263
Filtered Metals µg/L
Cobalt 34.8 NA
S43MW16 July* 2012 May 2013
feet bgs 11 - 21
Metals µg/L
Cobalt 108 122
Manganese NA 95.1
Filtered Metals µg/L
Cobalt 108 NA
S43MW02 July* 2012 May 2013
feet bgs 12 - 22
Metals µg/L
Cobalt 33.6 42.8
Manganese NA 239
Filtered Metals µg/L
Cobalt 33.8 NA
S43MW15 July* 2012 May 2013
feet bgs 11 - 21
Metals µg/L
Cobalt 5.10 14.4
Iron NA 403
Manganese NA 451
Filtered Metals µg/L
Cobalt 5.10 NA
Notes:
J=estimated value
K=biased high
L=biased low
µg/L=microgram per liter
ND=Not Detected
NA=Not Analyzed
Bold=Exceedances of Project Screening Levels
* Analyzed for Cobalt only
Legend
Monitoring Well
Piezometer
Ditch/Stream
Existing Structures
Road
Installation Boundary
0 62.5 125 250 Feet
Bing Maps aerial:
Aerial photograph from ESRI Bing Maps map service
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TETRA TECH
Monitoring Well-Metals
Analytical Exceedances
(PSLs and Background)
Site 43 Toluene Disposal Area
Naval Support Facility
Indian Head, Maryland
FILE 112G00771
SCALE AS NOTED
FIGURE NO. FIGURE 4-4
REV
DATE 2/17/14
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N

PZ01
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MW19D
MW17S
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MW09S
MW09D
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715
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720A
722
723
724
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1040
1755
1134
1629
1485
1773
1604
1857
1579
739
1386
1482
1531
1612
1257
821
1921
1193
1801
1853
1210
1787
1055
1255

N GREENSLADE RD
STRAUSS AVE
LEARY RD
SCHUYLER RD
GALLERY RD
GLENNON RD
PUMP HOUSE LANE

S43MW18 July 2012
feet bgs 7 -17
Explosives µg/L NX

S43MW11 July 2012
feet bgs 26 - 36
Explosives µg/L
3-Nitrotoluene 0.418 J

S43MW01 July 2005 June 2011 July 2012
feet bgs 9 - 19
Explosives µg/L
2,6-Dinitrotoluene ND ND 0.185 J
3-Nitrotoluene ND 0.723 J 0.511 J
Nitroglycerin ND 25.2 J ND

S43MW05 July 2011 July 2012
feet bgs 21 - 31
Explosives µg/L
3-Nitrotoluene NX 0.439 J

S43MW07 July 2012
feet bgs 23 - 33
Explosives µg/L
3-Nitrotoluene 0.227 J

S43MW19S July 2012
feet bgs 14 - 24
Explosives µg/L
3-Nitrotoluene 0.222 J

S43MW17D July 2012
feet bgs 31 - 36
Explosives µg/L NX

S43MW04 June 2011 July 2012
feet bgs 23 - 33
Explosives µg/L
3-Nitrotoluene 2.91 0.28 J

S43MW08 July 2012
feet bgs 23 - 33
Explosives µg/L NX

S43MW17S July 2012
feet bgs 18 - 28
Explosives µg/L
3-Nitrotoluene 0.419

S43MW25 July 2012
feet bgs 7 - 17
Explosives µg/L
1,3-Dinitrobenzene 0.186 J
3-Nitrotoluene 0.301 J

S43MW26 July 2012
feet bgs 13 - 23 ft
Explosives µg/L ND

S43MW19D July 2012
feet bgs 30 - 35
Explosives µg/L
3-Nitrotoluene 0.366 J

S43MW06 June 2011 July 2012
feet bgs 17 - 27
Explosives µg/L
1,3-Dinitrobenzene 0.244 J ND
3-Nitrotoluene ND 0.871
Nitroglycerin 32.3 J ND
RDX 1.7 J NX

S43MW03 June 2011 July 2012
feet bgs 24 - 34
Explosives µg/L
Nitroglycerin 0.262 J ND

S43MW10 July 2012
feet bgs 30 - 35
Explosives µg/L
2,6-Dinitrotoluene 0.504 J

S43MW23 July 2012
feet bgs 11 - 21
Explosives µg/L NX

S43MW20 July 2012
feet bgs 6 - 21
Explosives µg/L NX

S43MW21 July 2012
feet bgs 15 - 25
Explosives µg/L NX

S43MW12 July 2012
feet bgs 27.5 - 32.5
Explosives µg/L
3-Nitrotoluene 0.507

S43MW24 July 2012
feet bgs 2 - 17
Explosives µg/L
1,3-Dinitrobenzene 0.212 J
3-Nitrotoluene 0.642

S43MW13 July 2012
feet bgs 11 - 21 ft
Explosives µg/L NA

S43MW09S July 2012
feet bgs 6 - 16
Explosives µg/L
3-Nitrotoluene 0.365 J

S43MW09D July 2012
feet bgs 28 - 33
Explosives µg/L ND

S43MW22 July 2012
feet bgs 10 - 20
Explosives µg/L NX

S43MW14 July 2012
feet bgs 8 - 18
Explosives µg/L NA

S43MW16 July 2012
feet bgs 11 - 21
Explosives µg/L NA

S43MW02 July 2005 June 2011 July 2012
feet bgs 12 - 22
Explosives µg/L NX NA NA

S43MW15 July 2012
feet bgs 11 - 21
Explosives µg/L NA

Notes:
J=estimated value
B=detected in blank sample
µg/L-microgram per liter
ND=Not Detected
NA=Not Analyzed
NX=No Exceedance
RDX=cyclotrimethylenetrinitramine
Bold=Exceedances of Project Screening Levels

Legend
- Monitoring Well
- Piezometer
- Ditch/Stream
- Existing Structures
- Road
- Installation Boundary

0 62.5 125 250 Feet

TETRA TECH

Monitoring Well-Explosives Analytical Exceedances
Site 43 Toluene Disposal Area
Naval Support Facility
Indian Head, Maryland

FILE	112G00771	SCALE	AS NOTED
FIGURE NO.	FIGURE4-5	REV	DATE 2/11/14

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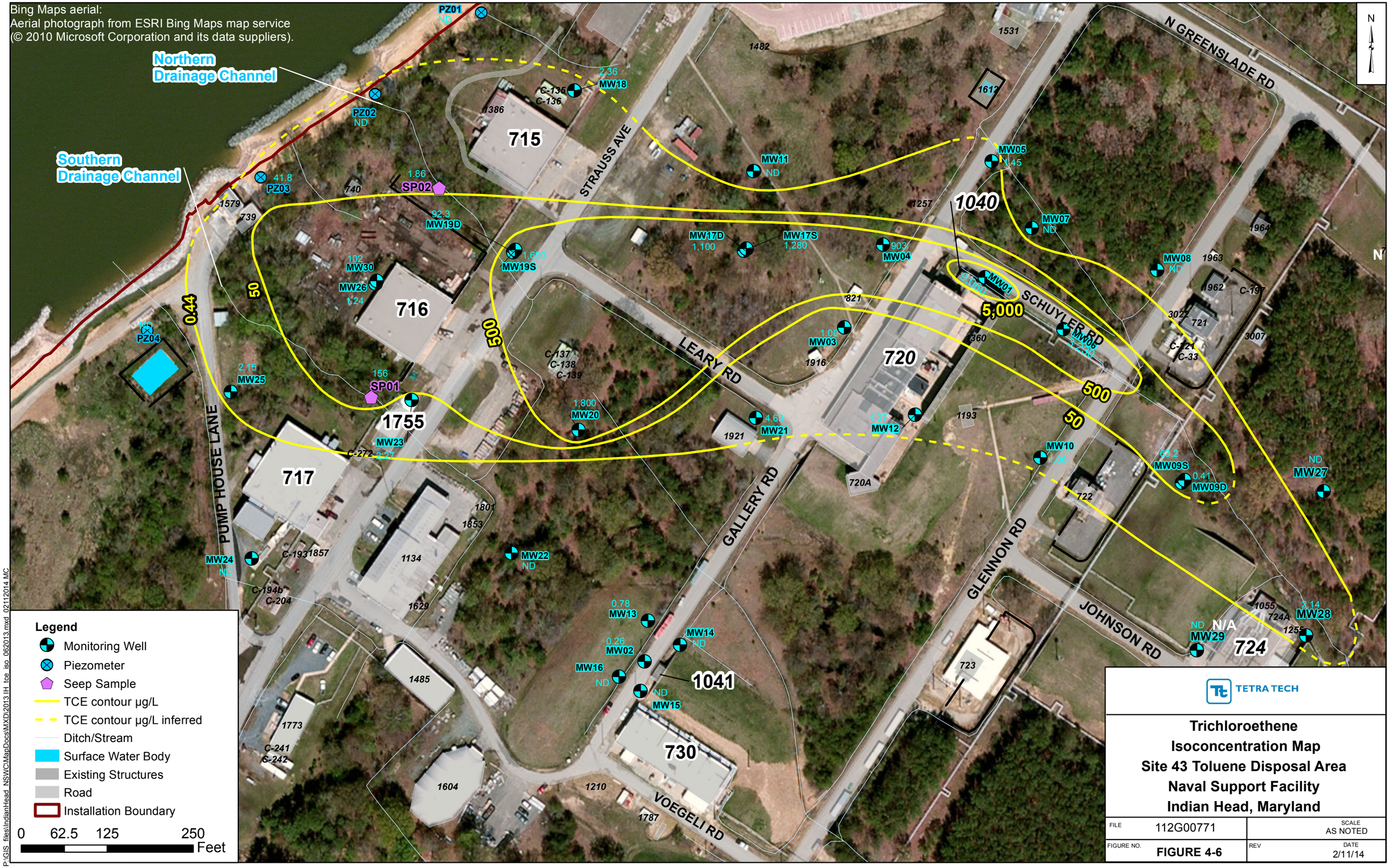
Bing Maps aerial:
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Northern Drainage Channel
Southern Drainage Channel
N GREENSLADE RD
STRAUSS AVE
LEARY RD
SCHUYLER RD
PUMP HOUSE LANE
GALLERY RD
GLENNON RD
JOHNSON RD
VOEGELI RD
715
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1755
5,000
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0.44
PZ01
ND
PZ02
ND
PZ03
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PZ04
MW18
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MW05
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MW07
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MW08
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MW01
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MW04
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MW17S
1,280
MW19D
92.3
MW19S
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SP02
1.86
SP01
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MW30
102
MW26
1.24
MW25
2.15
MW23
MW20
1,800
MW21
4.63
MW12
1.37
MW03
1.03
MW10
1.06
MW09S
65.2
MW09D
0.41
MW27
ND
MW28
2.14
MW29
ND
N/A
MW24
ND
MW22
ND
MW13
0.78
MW02
0.26
MW14
ND
MW16
ND
MW15
ND
Legend
Monitoring Well
Piezometer
Seep Sample
TCE contour µg/L
TCE contour µg/L inferred
Ditch/Stream
Surface Water Body
Existing Structures
Road
Installation Boundary
0 62.5 125 250 Feet
N
TETRA TECH
Trichloroethene
Isoconcentration Map
Site 43 Toluene Disposal Area
Naval Support Facility
Indian Head, Maryland
FILE 112G00771
SCALE AS NOTED
FIGURE NO. FIGURE 4-6
REV
DATE 2/11/14
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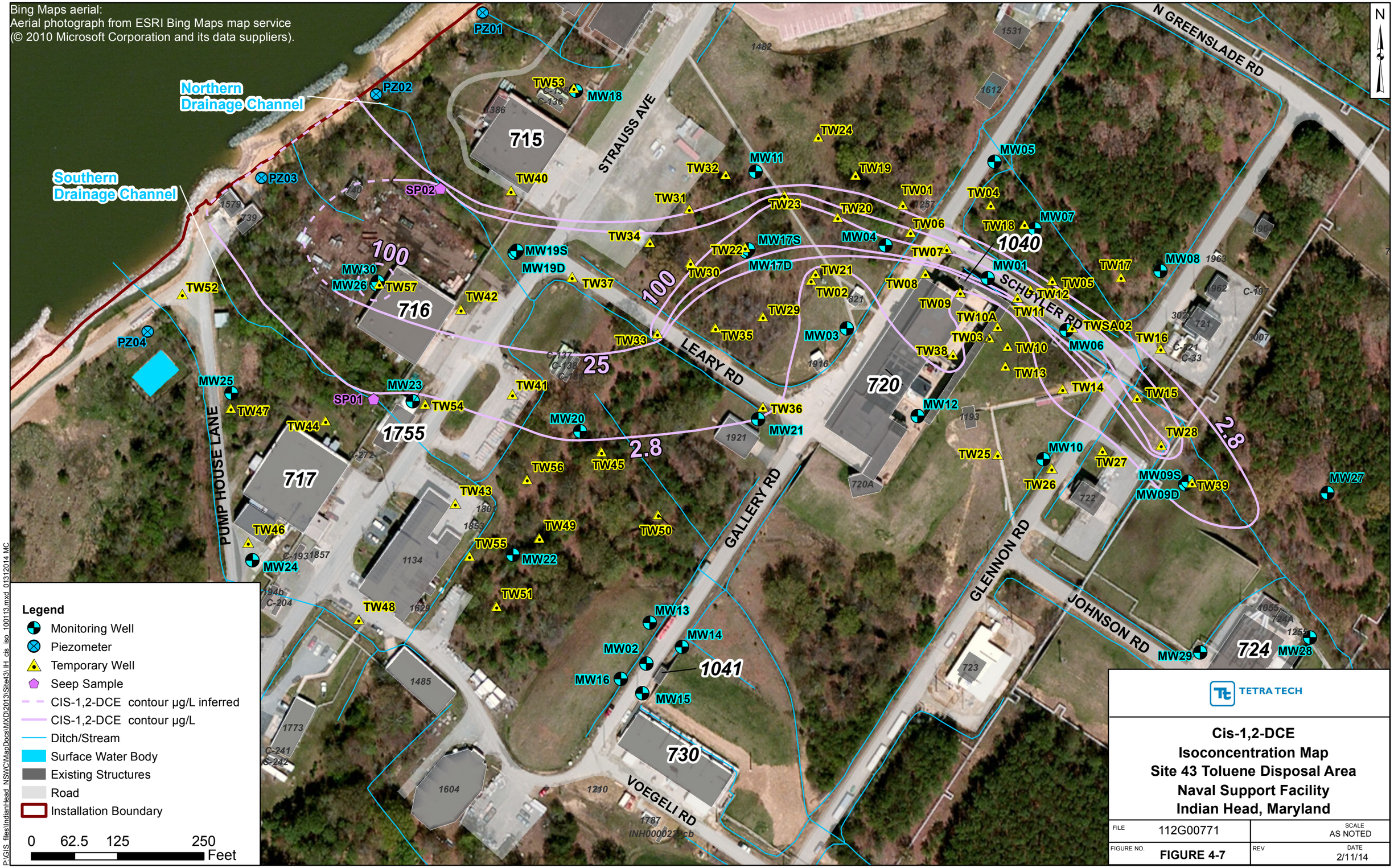
Bing Maps aerial:
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Northern Drainage Channel
Southern Drainage Channel
N GREENSLADE RD
STRAUSS AVE
LEARY RD
SCHUYLER RD
GALLERY RD
GLENNON RD
JOHNSON RD
VOEGELI RD
PUMP HOUSE LANE
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1604
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1921
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2.8
PZ01
PZ02
PZ03
PZ04
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SP02
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TW08
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MW30
MW26
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TW37
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TWSA02
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MW25
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TW41
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MW12
MW23
TW54
MW20
MW21
TW28
TW44
TW45
TW25
MW10
TW27
TW56
TW26
MW09S
TW39
MW27
TW43
MW09D
TW46
TW49
TW50
TW55
MW22
MW24
TW51
TW48
MW13
MW14
MW02
MW16
MW15
MW29
MW28
Legend
Monitoring Well
Piezometer
Temporary Well
Seep Sample
CIS-1,2-DCE contour µg/L inferred
CIS-1,2-DCE contour µg/L
Ditch/Stream
Surface Water Body
Existing Structures
Road
Installation Boundary
0 62.5 125 250
Feet
N
TETRA TECH
Cis-1,2-DCE
Isoconcentration Map
Site 43 Toluene Disposal Area
Naval Support Facility
Indian Head, Maryland
FILE 112G00771
SCALE AS NOTED
FIGURE NO. FIGURE 4-7
REV
DATE 2/11/14
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Northern Drainage Channel
Southern Drainage Channel
N GREENSLADE RD
STRAUSS AVE
LEARY RD
SCHUYLER RD
PUMP HOUSE LANE
GALLERY RD
GLENNON RD
JOHNSON RD
VOEGELI RD
715
716
717
720
1040
1041
1755
724
730
0.015
50
5

Legend
- Monitoring Well
- Piezometer
- Temporary Well
- Seep Sample
- Vinyl Chloride contour µg/L
- Vinyl Chloride contour µg/L inferred
- Ditch/Stream
- Surface Water Body
- Existing Structures
- Road
- Installation Boundary

0 62.5 125 250 Feet

TETRA TECH

Vinyl Chloride Isoconcentration Map
Site 43 Toluene Disposal Area
Naval Support Facility
Indian Head, Maryland

FILE	112G00771	SCALE	AS NOTED
FIGURE NO.	FIGURE 4-8	REV	DATE 2/11/14

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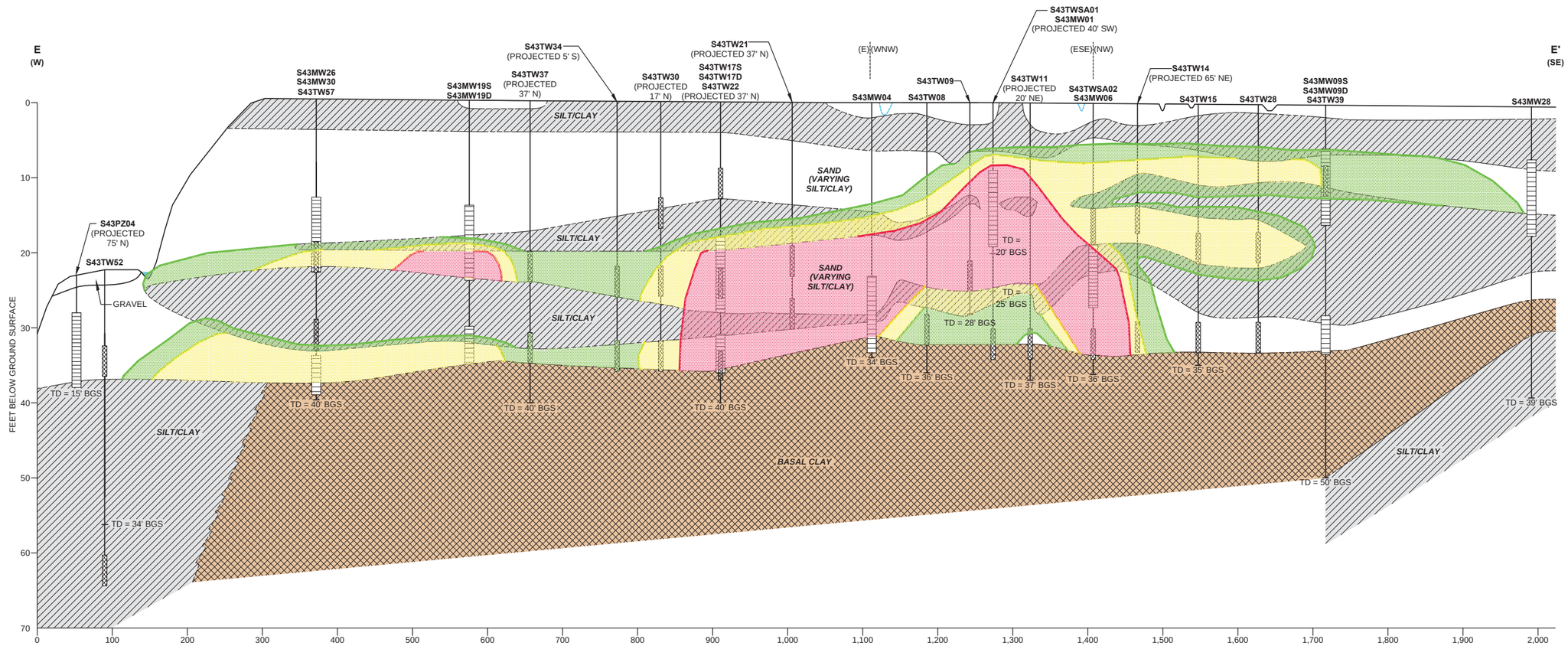


LEGEND

S43MW04	MONITORING WELL
S43TW08	GROUNDWATER GRAB SAMPLE
(PROJECTED 5' S)	PROJECTED DISTANCE AND DIRECTION TO CROSS SECTION LINE
	GROUND SURFACE DITCH WITH STANDING WATER
	GEOLOGIC CONTACT (DASHED WHERE INFERRED)
	BOREHOLE
	GROUNDWATER GRAB SAMPLE
	MONITORING WELL SCREEN
TD = 40' BGS	TOTAL DEPTH
	SAND WITH VARYING AMOUNTS OF SILT, CLAY, AND GRAVEL
	CLAY OR SILT WITH VARYING AMOUNTS OF SAND
	BASAL CLAY
	TOTAL CHLORINATED VOC ISOCONCENTRATION CONTOUR 5 µg/L
	TOTAL CHLORINATED VOC ISOCONCENTRATION CONTOUR 100 µg/L
	TOTAL CHLORINATED VOC ISOCONCENTRATION CONTOUR 1,000 µg/L

NOTE:
1. µg/L = MICROGRAMS PER LITER

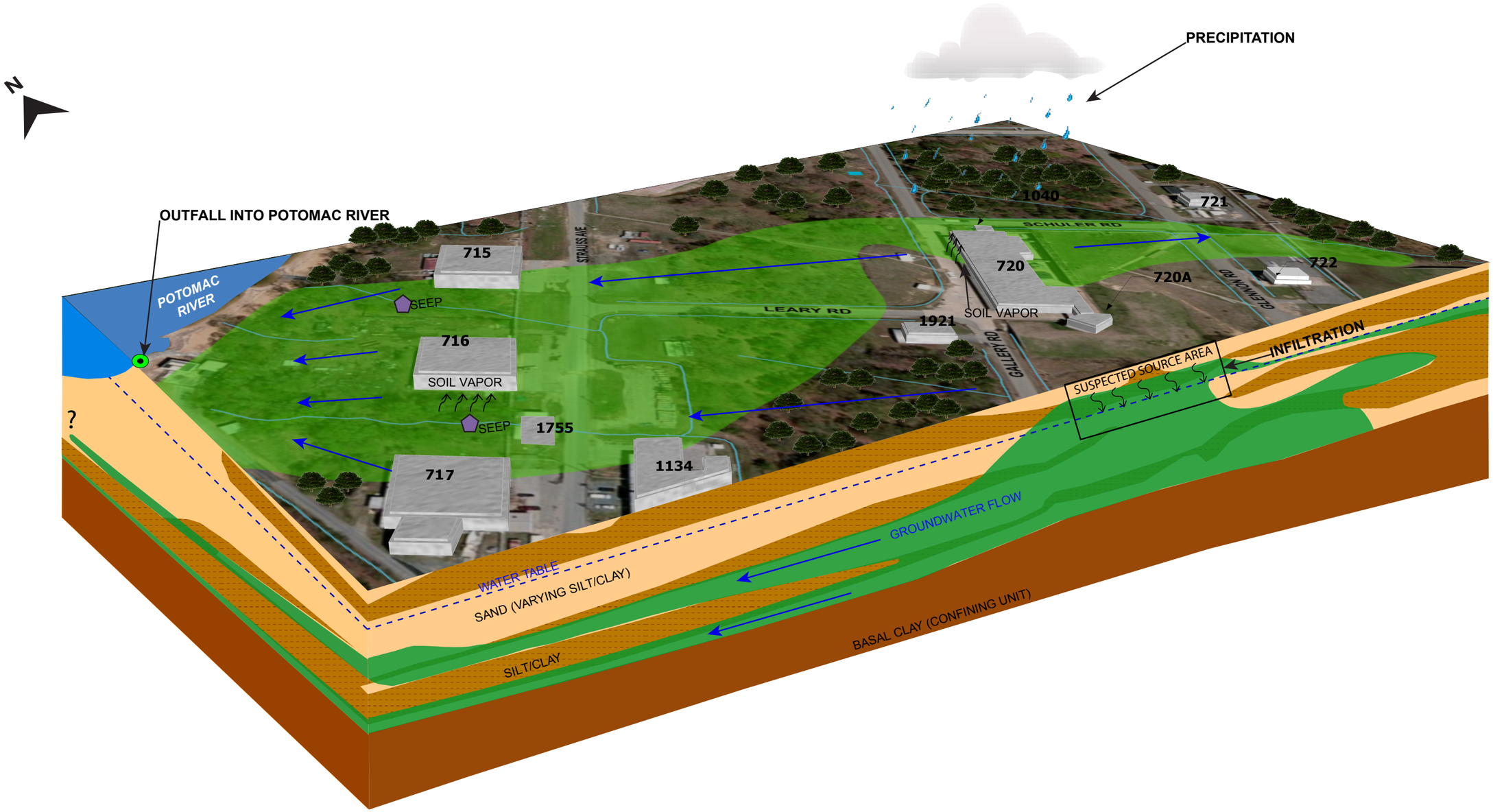
VERTICAL SCALE IN FEET: 0, 10, 20

HORIZONTAL SCALE IN FEET: 0, 100, 200

TETRA TECH

TOTAL CHLORINATED VOC
ISOCONCENTRATION CONTOUR MAP
GEOLOGIC CROSS SECTION E – E'
SITE 43 – TOLUENE DISPOSAL AREA
NAVAL SUPPORT FACILITY INDIAN HEAD
INDIAN HEAD, MARYLAND

FILE 112G01358GS03	SCALE AS NOTED
FIGURE NUMBER FIGURE 4-9	REV 0 / DATE 07/15/13



Legend

- Water Table
- Surface Water Line
- Groundwater Flow
- Groundwater Plume
- Potomac River
- Sand (varying silt/clay)
- Silt/Clay
- Basal Clay Confining Unit
- Road Area
- Building

*Note: Small area of groundwater contamination near Building 1041 (further south along Gallery Rd) not shown.

TETRA TECH

Conceptual Site Model
Site 43 Toluene Disposal Area
Naval Support Facility
Indian Head, Maryland

FILE	112G00771	SCALE	NOTTO SCALE
FIGURE NO.	**FIGURE 4-10**	REV	DATE 2/17/14

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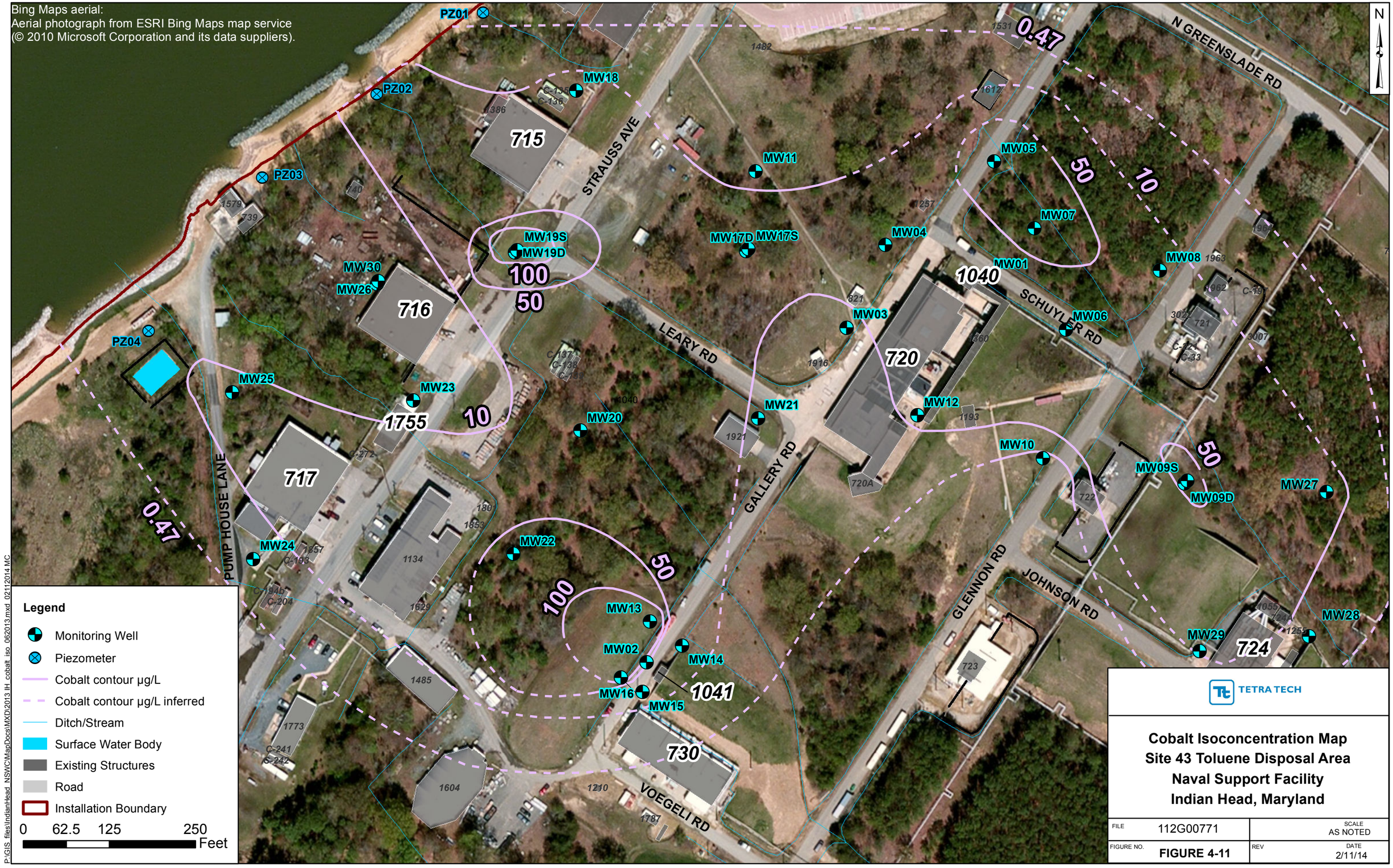
Bing Maps aerial:
Aerial photograph from ESRI Bing Maps map service
(© 2010 Microsoft Corporation and its data suppliers).
N
N GREENSLADE RD
STRAUSS AVE
LEARY RD
SCHUYLER RD
GALLERY RD
PUMP HOUSE LANE
GLENNON RD
JOHNSON RD
VOEGELI RD
PZ01
PZ02
PZ03
PZ04
MW18
MW11
MW05
MW07
MW04
MW08
MW01
MW06
MW03
MW17D
MW17S
MW19S
MW19D
MW30
MW26
MW25
MW23
MW20
MW21
MW12
MW10
MW09S
MW09D
MW27
MW24
MW22
MW13
MW02
MW14
MW16
MW15
MW29
MW28
715
716
717
720
720A
722
723
724
730
1134
1485
1604
1629
1773
1041
1040
1755
0.47
50
10
100
Legend
Monitoring Well
Piezometer
Cobalt contour µg/L
Cobalt contour µg/L inferred
Ditch/Stream
Surface Water Body
Existing Structures
Road
Installation Boundary
0 62.5 125 250
Feet
TETRA TECH
Cobalt Isoconcentration Map
Site 43 Toluene Disposal Area
Naval Support Facility
Indian Head, Maryland
FILE 112G00771
SCALE AS NOTED
FIGURE NO. FIGURE 4-11
REV
DATE 2/11/14
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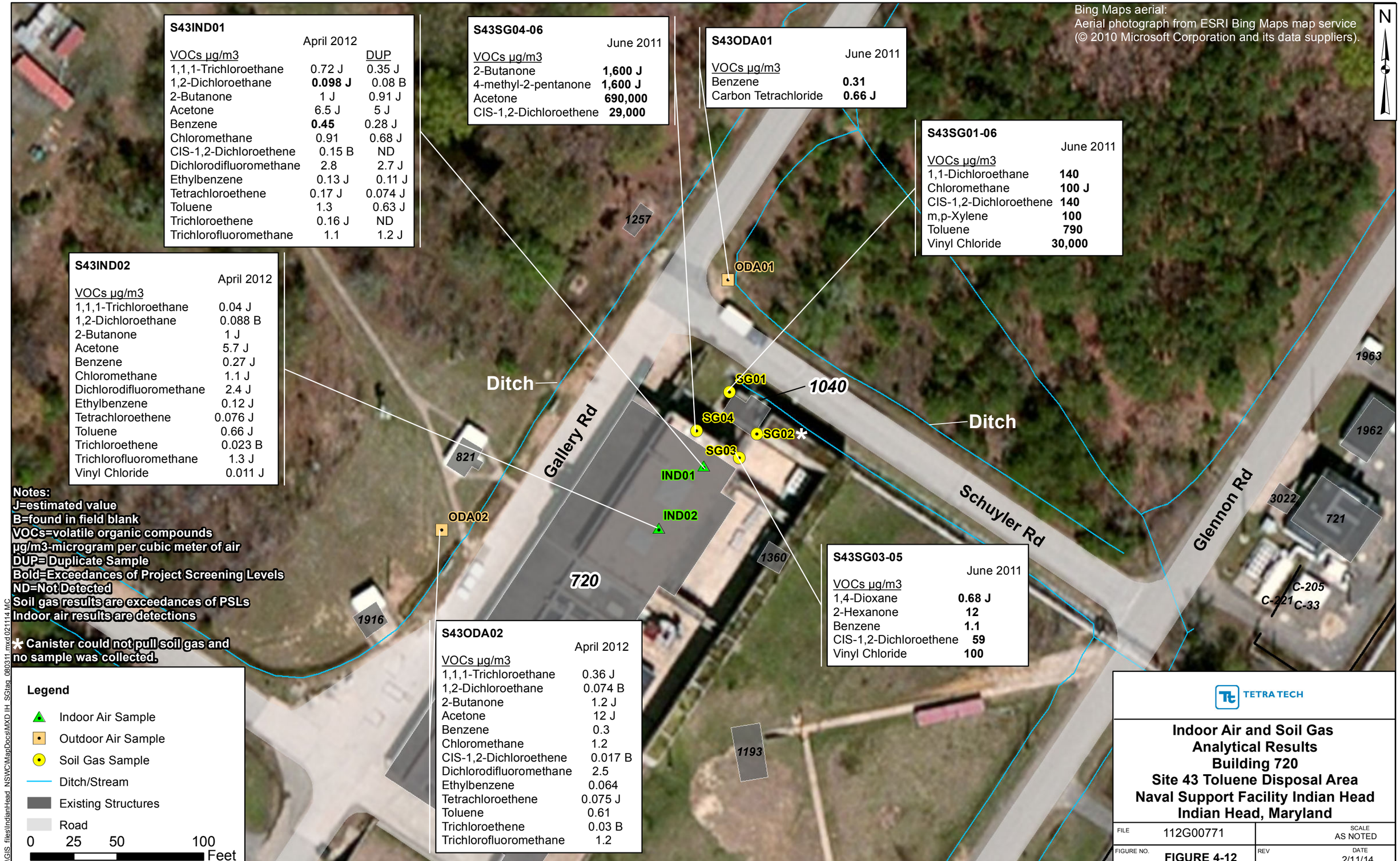

S43IND01

VOCs µg/m3	April 2012	DUP
1,1,1-Trichloroethane	0.72 J	0.35 J
1,2-Dichloroethane	**0.098 J**	0.08 B
2-Butanone	1 J	0.91 J
Acetone	6.5 J	5 J
Benzene	**0.45**	0.28 J
Chloromethane	0.91	0.68 J
CIS-1,2-Dichloroethene	0.15 B	ND
Dichlorodifluoromethane	2.8	2.7 J
Ethylbenzene	0.13 J	0.11 J
Tetrachloroethene	0.17 J	0.074 J
Toluene	1.3	0.63 J
Trichloroethene	0.16 J	ND
Trichlorofluoromethane	1.1	1.2 J

S43IND02

VOCs µg/m3	April 2012
1,1,1-Trichloroethane	0.04 J
1,2-Dichloroethane	0.088 B
2-Butanone	1 J
Acetone	5.7 J
Benzene	0.27 J
Chloromethane	1.1 J
Dichlorodifluoromethane	2.4 J
Ethylbenzene	0.12 J
Tetrachloroethene	0.076 J
Toluene	0.66 J
Trichloroethene	0.023 B
Trichlorofluoromethane	1.3 J
Vinyl Chloride	0.011 J

S43SG04-06

VOCs µg/m3	June 2011
2-Butanone	**1,600 J**
4-methyl-2-pentanone	**1,600 J**
Acetone	**690,000**
CIS-1,2-Dichloroethene	**29,000**

S43ODA01

VOCs µg/m3	June 2011
Benzene	**0.31**
Carbon Tetrachloride	**0.66 J**

S43SG01-06

VOCs µg/m3	June 2011
1,1-Dichloroethane	**140**
Chloromethane	**100 J**
CIS-1,2-Dichloroethene	**140**
m,p-Xylene	**100**
Toluene	**790**
Vinyl Chloride	**30,000**

S43SG03-05

VOCs µg/m3	June 2011
1,4-Dioxane	**0.68 J**
2-Hexanone	**12**
Benzene	**1.1**
CIS-1,2-Dichloroethene	**59**
Vinyl Chloride	**100**

S43ODA02

VOCs µg/m3	April 2012
1,1,1-Trichloroethane	0.36 J
1,2-Dichloroethane	0.074 B
2-Butanone	1.2 J
Acetone	12 J
Benzene	0.3
Chloromethane	1.2
CIS-1,2-Dichloroethene	0.017 B
Dichlorodifluoromethane	2.5
Ethylbenzene	0.064
Tetrachloroethene	0.075 J
Toluene	0.61
Trichloroethene	0.03 B
Trichlorofluoromethane	1.2

Bing Maps aerial:
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N

S43SG08-0708

VOCs µg/m3	May 2013
2-Hexanone	**8.3**
Benzene	**12**
Ethylbenzene	**34**
Trichloroethene	**0.51**

S43-716-ODA01

VOCs µg/m3	July 2013
1,2-Dichloroethane	0.074 B
Methylene Chloride	0.76 J
Tetrachloroethene	0.068 J
Vinyl Chloride	0.05

S43SG05-0708

VOCs µg/m3	May 2013	DUP
2-Hexanone	**9.3**	**12**
Benzene	**6.6**	**7.4**
Ethylbenzene	**15**	**18**
Trichloroethene	**58**	**71**
Vinyl Chloride	**0.25**	**0.29**

S43SG07-1011

VOCs µg/m3	May 2013
1,1-Dichloroethane	**2.7**
1,1-Dichloroethene	**28**
2-Hexanone	**12 J**
Benzene	**11**
CIS-1,2-Dichloroethene	**24**
Ethylbenzene	**29**
Trichloroethene	**1,400**
Vinyl Chloride	**22**

S43-716-IND02

VOCs µg/m3	July 2013	DUP
1,2-Dichloroethane	0.053 B	0.054 B
Methylene Chloride	0.66 J	0.52 J
Tetrachloroethene	0.070 J	0.066 J
Trichloroethene	0.077 J	0.062 J

S43-716-IND01

VOCs µg/m3	July 2013
1,2-Dichloroethane	0.062 B
CIS-1,2-Dichloroethene	0.039 B
Methylene Chloride	0.53 J
Tetrachloroethene	0.081 J
Trichloroethene	0.14 J

S43SG06-0708

VOCs µg/m3	May 2013
1,1-Dichloroethane	**6.7**
Benzene	**13**
Carbon Disulfide	**220**
Chloroform	**19**
Ethylbenzene	**18**
Trichloroethene	**1,200**
Vinyl Chloride	**0.43**

ODA01
SG05
SG08
IND02
IND01
SG06
SG07

715
716
720
1040
1755
1134
1921
1916
1482
1612
1257
1193
1180
714
813
1386
740
821
1801
1853
1857
STRAUSS AVE
LEARY RD
GALLERY RD
LANE
N/A

Notes:
J=estimated value
VOCs=volatile organic compounds
µg/m3-microgram per cubic meter of air
DUP= Duplicate Sample
Bold=Exceedances of Project Screening Levels
ND=Not Detected
Soil gas results are exceedances of PSLs
Indoor air results are detections

Legend
- Indoor Air Sample
- Outdoor Air Sample
- Soil Gas Sample
- Ditch/Stream
- Surface Water Body
- Building
- Road
- Installation Boundary

0 25 50 100 Feet

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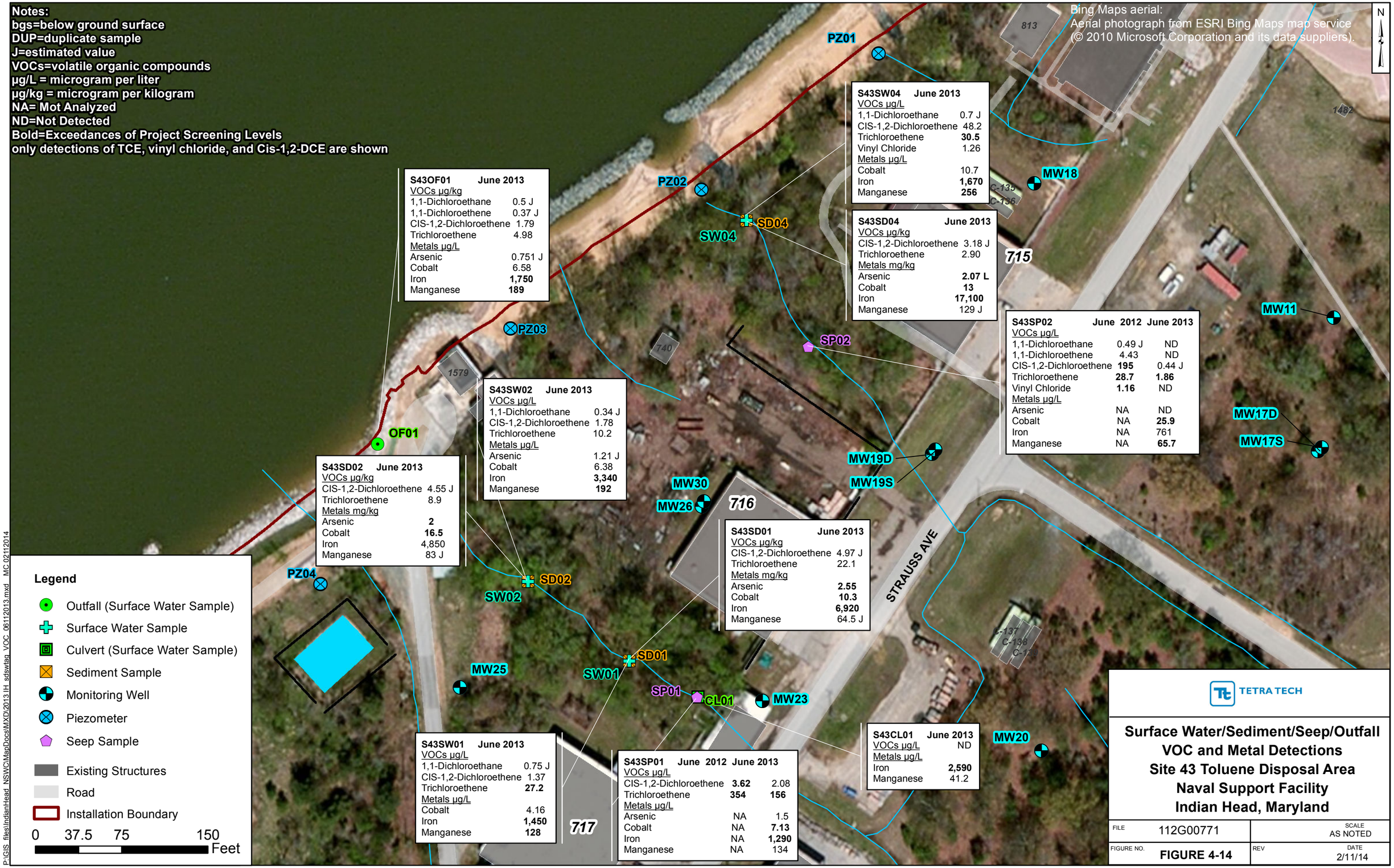
TETRA TECH

Indoor Air and Soil Gas Analytical Results
Building 716
Site 43 Toluene Disposal Area
Naval Support Facility
Indian Head, Maryland

FILE	112G00771	SCALE	AS NOTED
FIGURE NO.	**FIGURE 4-13**	REV	DATE 2/11/14



TETRA TECH

Surface Water/Sediment/Seep/Outfall VOC and Metal Detections
Site 43 Toluene Disposal Area
Naval Support Facility
Indian Head, Maryland

FILE	112G00771	SCALE	AS NOTED
FIGURE NO.	FIGURE 4-14	REV	DATE 2/11/14

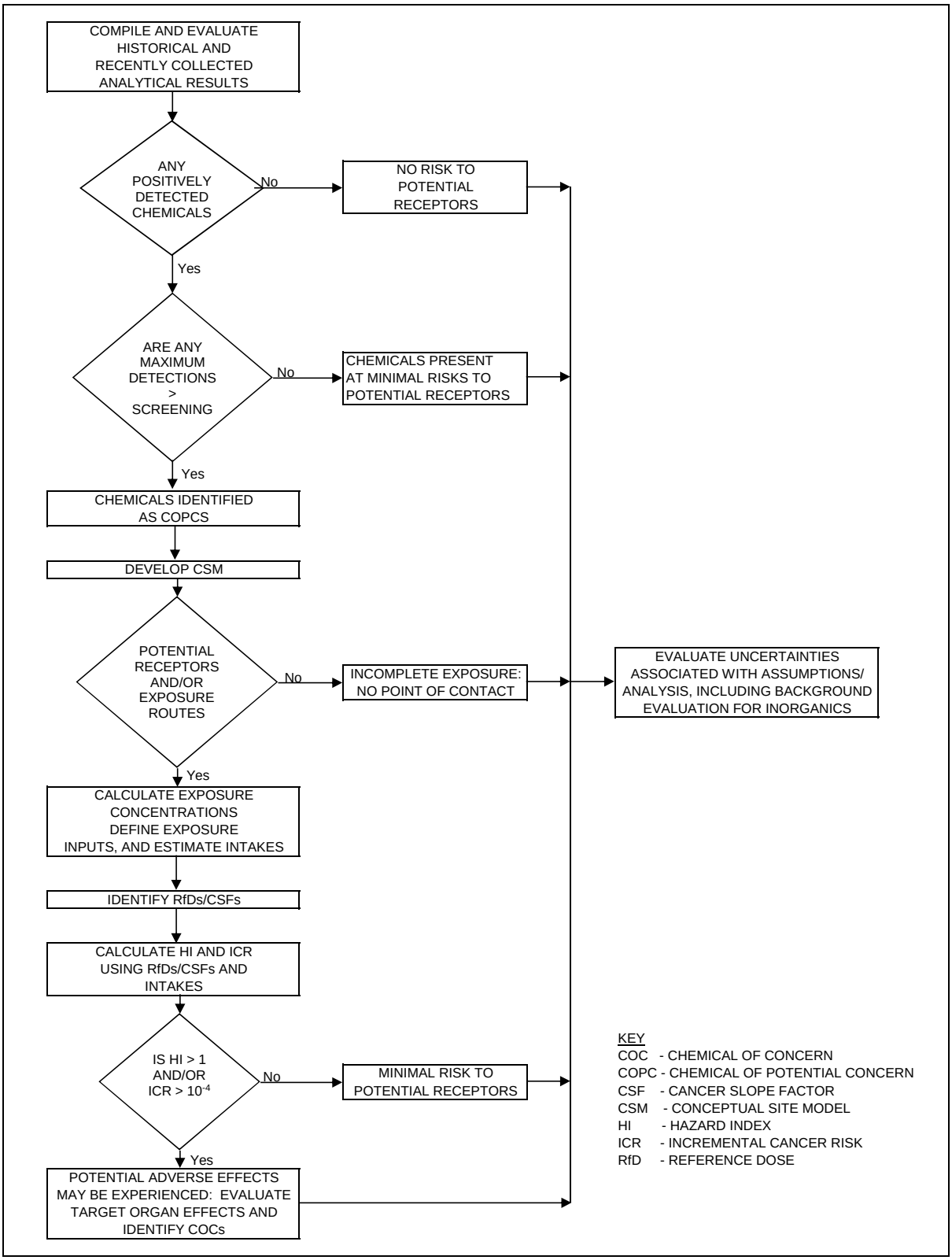
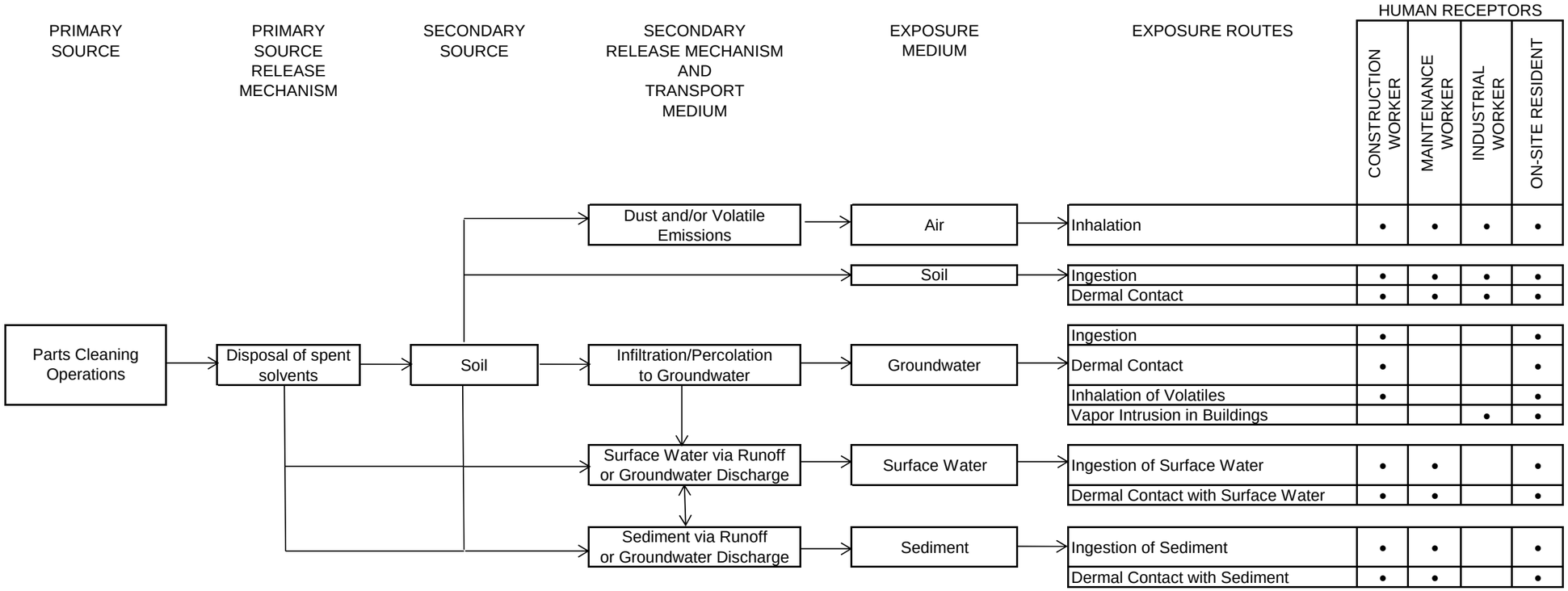


FIGURE 6-1

SUMMARY OF HUMAN HEALTH RISK ASSESSMENT PROCESS
SITE 43 - TOLUENE DISPOSAL
NAVAL SUPPORT FACILITY, INDIAN HEAD
INDIAN HEAD, MARYLAND

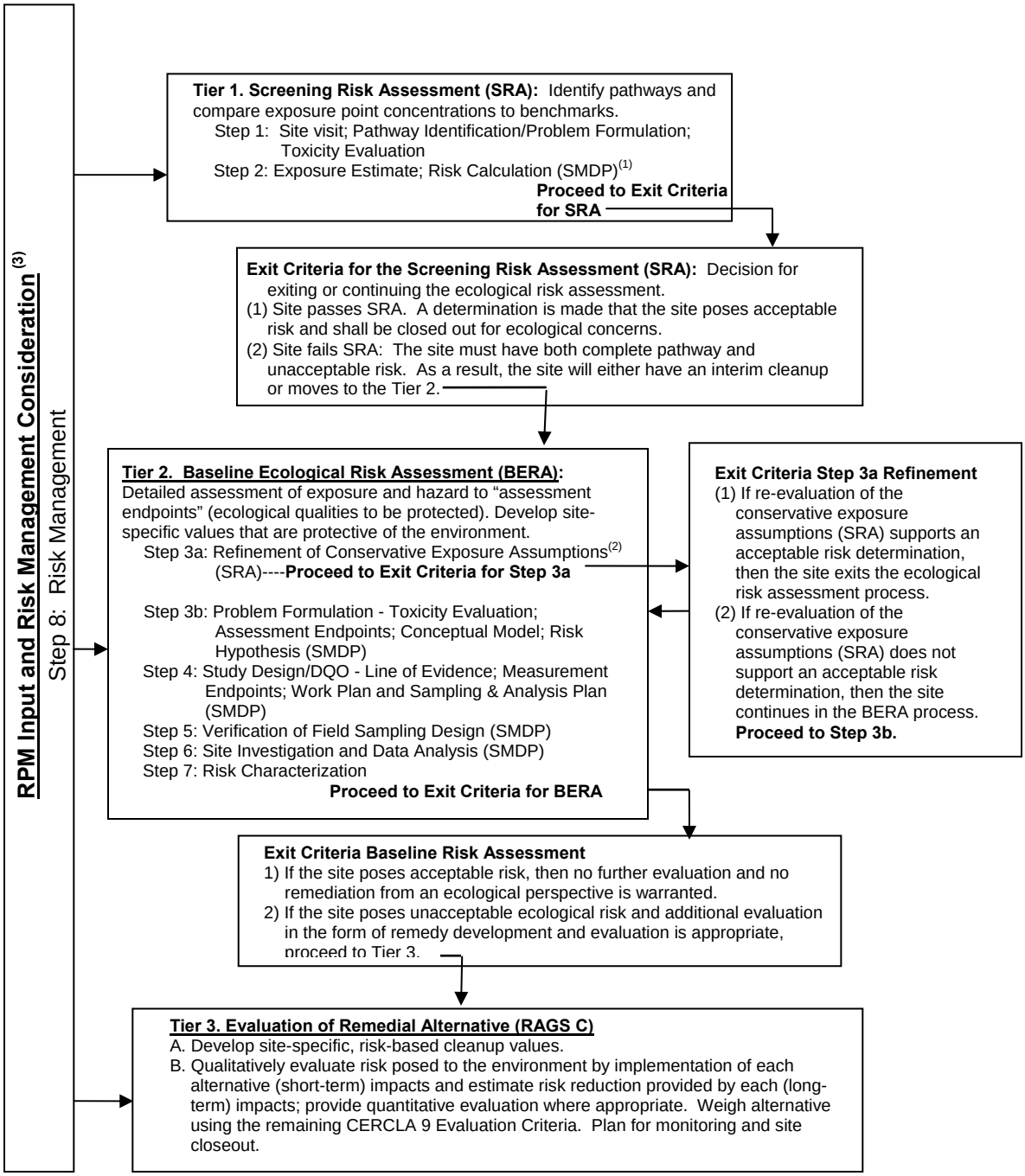
FIGURE 6-2
HUMAN CONCEPTUAL EXPOSURE MODEL DIAGRAM
SITE 43 - TOLUENE DISPOSAL
NAVAL SUPPORT FACILITY, INDIAN HEAD
INDIAN HEAD, MARLYAND



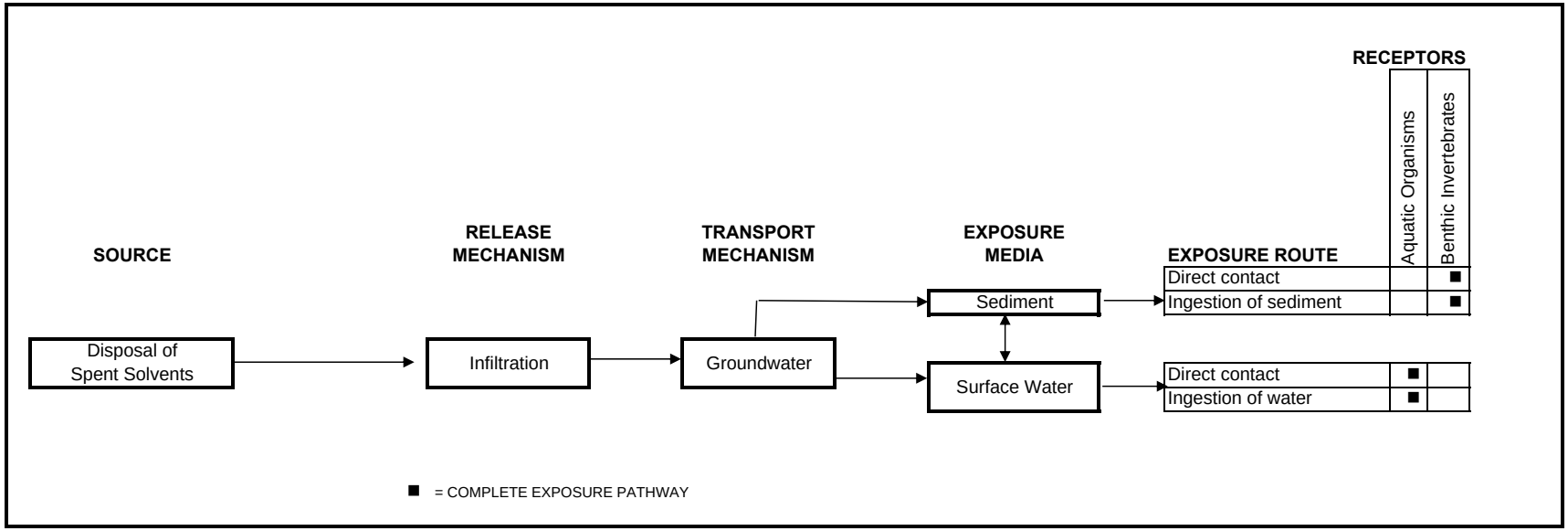
- Indicates receptor for evaluation

FIGURE 7-1

NAVY ECOLOGICAL RISK ASSESSMENT TIERED APPROACH
SITE 43 – TOLUENE DISPOSAL AREA
NAVAL SUPPORT FACILITY INDIAN HEAD
INDIAN HEAD, MARYLAND



Notes: 1 See USEPA's 8 Steps ERA Process for requirements for each Scientific Management Decision Point (SMDP).
2 Refinement includes but is not limited to background, bioavailability, detection frequency, etc.
3 Risk management is incorporated throughout the tiered approach.



Blank space indicates incomplete exposure pathway or relatively insignificant, or not applicable, potential exposure.

FIGURE 7-2

ECOLOGICAL CONCEPTUAL SITE MODEL
SITE 43 - TOLUENE DISPOSAL AREA
NAVAL SUPPORT FACILITY INDIAN HEAD
INDIAN HEAD, MARYLAND

APPENDICES

Appendix A

Phase 1 Archaeological Survey

PHASE 1 ARCHAELOGICAL SURVEY
SITE # 18CH258

NAVAL SUPPORT FACILITY INDIAN HEAD
INDIAN HEAD, MARYLAND

Naval Facilities Engineering Command
Washington

Contract Number N62472-03-D-0057
Contract Task Order 114

July 2012

Phase I Archaeological Survey
Naval Support Facility Indian Head
Indian Head, Maryland

Prepared for:

Naval Facilities Engineering Command Washington
1314 Harwood Street, S.E.
Washington Navy Yard, D.C. 20374-5018

Prepared by:

Tetra Tech, Inc.
661 Andersen Drive
Foster Plaza
Pittsburgh, PA 15220

In Support Of:

CONTRACT NUMBER N62472-03-D-0057
Contract Task Order 114

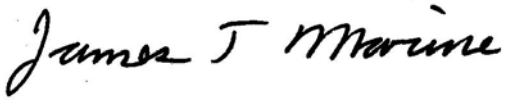
Submitted to:

Maryland Historical Trust
Division of Historical and Cultural Programs
100 Community Place
Crownsville, Maryland 21032

Author:

James T. Marine MS/RPA

Principal Investigator



July 2012

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ABSTRACT

In June, 2012 Tetra Tech Inc. conducted a Phase I archaeological survey at the Indian Head Naval Station Facility (Indian Head) in Charles County, Maryland. Indian Head is located in the Coastal Plain physiographic province in the Riverine Potomac Drainage (Maryland Archaeological Research Unit 11). The survey was conducted in consultation with the Maryland Historic Trust, *Standards and Guidelines for Archaeological Investigations in Maryland* (1994), and in compliance with Indian Head's draft Integrated Cultural Resources Management Plan.

The purpose of the archaeological survey was to survey and test potential access areas and proposed drilling locations needed for an ongoing remedial investigation addressing contaminated groundwater suspected beneath archeological site 18CH258, and to provide an inventory of previously unrecorded historic properties, sites or resources located within the area of potential effect (APE) established for the egress and regress of drilling equipment. Four temporary groundwater monitoring wells would be installed to collect groundwater samples and determine the need for permanent groundwater monitoring wells in this area. The archaeological testing strategy was designed to confirm the presence or absence of site 18CH258 within the project's area of potential effect (APE) as well as identifying any unrecorded historic properties, sites or resources.

Three 15-meter-wide corridors (A, B, and C) were established for drilling access and proposed drilling locations marked within the corridors. Subsurface testing did not confirm the presence of previously recorded prehistoric site 18CH258 within the APE. A total of 14 shovel test pits were excavated during the survey and yielded no prehistoric artifacts. Excavation indicated that disturbed soils were present across most of the APE. The plow zone was deflated and very thin, extending to a maximum depth of 10 centimeters below surface. Heavy disturbance was also apparent in corridor A, most likely due to the placement of storage containers and operations on the western edge of the APE.

Considering the absence of prehistoric artifacts and degree of disturbance noted within the APE, access and installation of the proposed groundwater wells would have no effect on site 18CH258.

Historic artifacts were recovered from four shovel test pits and included a small piece of modern plastic, one flat window glass fragment and curved modern Mason jar glass fragment from the A horizon. The historic artifacts were recovered from disturbed context and the assemblage did not contain artifacts of sufficient antiquity to warrant further investigation of the historic component.

1.0 INTRODUCTION

Tetra Tech has been assisting Naval Facilities Engineering Command (NAVFAC) Washington with environmental investigations and remediation at the Naval Support Facility (NSF) Indian Head (Indian Head) in Charles County, Maryland under the Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract Number N62472-03-D-0057 Contract Task Order (CTO) 114. The current remedial investigation at Site 43 – Toluene Disposal Area is being conducted in accordance with a Federal Facilities Agreement (FFA) between NAVFAC and the United States Environmental Protection Agency (USEPA) and the Maryland Department of Environmental Quality (MDEQ), which requires investigation, and if necessary, remedial actions at Site 43. Indian Head is located in the Coastal Plain physiographic province in the Riverine Potomac Drainage (Maryland Archaeological Research Unit 11) (Figure 1-1).

In June, 2012 Tetra Tech Inc. conducted a Phase I archaeological survey at Indian Head. The survey was conducted in compliance with the Integrated Cultural Resource Management Plan (ICRMP) that was developed according to the guidance found in Department of Navy Instruction 5090.1C and completed in draft form by the Construction Engineering Research Laboratory (CERL) in 2010 (Chawla et al. 2010). The ICRMP is a five year plan that integrates the entirety of the installation's cultural resources program with ongoing mission activities, allowing for ready identification of potential conflicts between the installation's mission and cultural resources. The plan also identifies compliance actions necessary to maintain the availability of mission-essential properties and acreage. The Indian Head ICRMP is currently being updated for 2012-2017.

The primary purpose of the archaeological survey was to survey and test potential access areas and proposed drilling locations needed for an ongoing remedial investigation addressing contaminated groundwater suspected beneath archeological site 18CH258, and to provide an inventory of previously unrecorded historic properties, sites or resources located within the area of potential effect (APE) established for the egress and regress of drilling equipment. Four temporary groundwater monitoring wells would be installed to collect groundwater samples and determine the need for permanent groundwater monitoring wells in this area. The archaeological testing strategy was designed to confirm the presence or absence of site 18CH258 within the project's area of potential effect (APE) as well as identifying any unrecorded historic properties, sites or resources.

Three 15-meter-wide corridors (A, B, and C) were established for access and egress of equipment. These corridors constituted the APE for the project. Corridor A measured 105 meters in length, Corridor B, 90 meters, and Corridor C, 32 meters. Both B and C corridors were perpendicular to Corridor A. The APE encompassed an aerial extent of 0.34 hectares (Figure 1-2).

This report details the methods and results of the Phase I archaeological survey and makes recommendations as to the appropriate treatment of archaeological resources that will assist the Indian Head Cultural Resource Manager and the Maryland Historic Trust (MHT) in their review of the project.

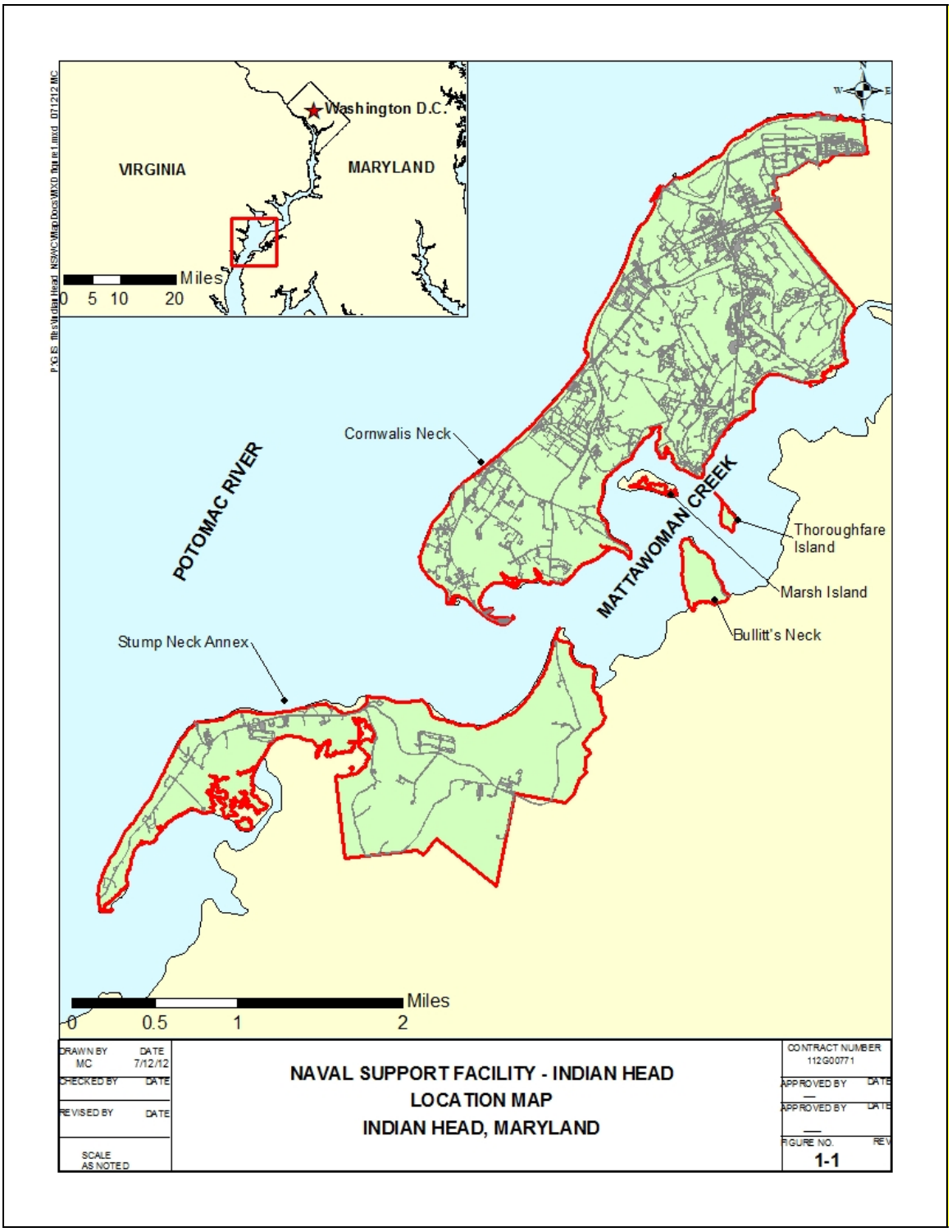

Figure 1-1 Project Location Map

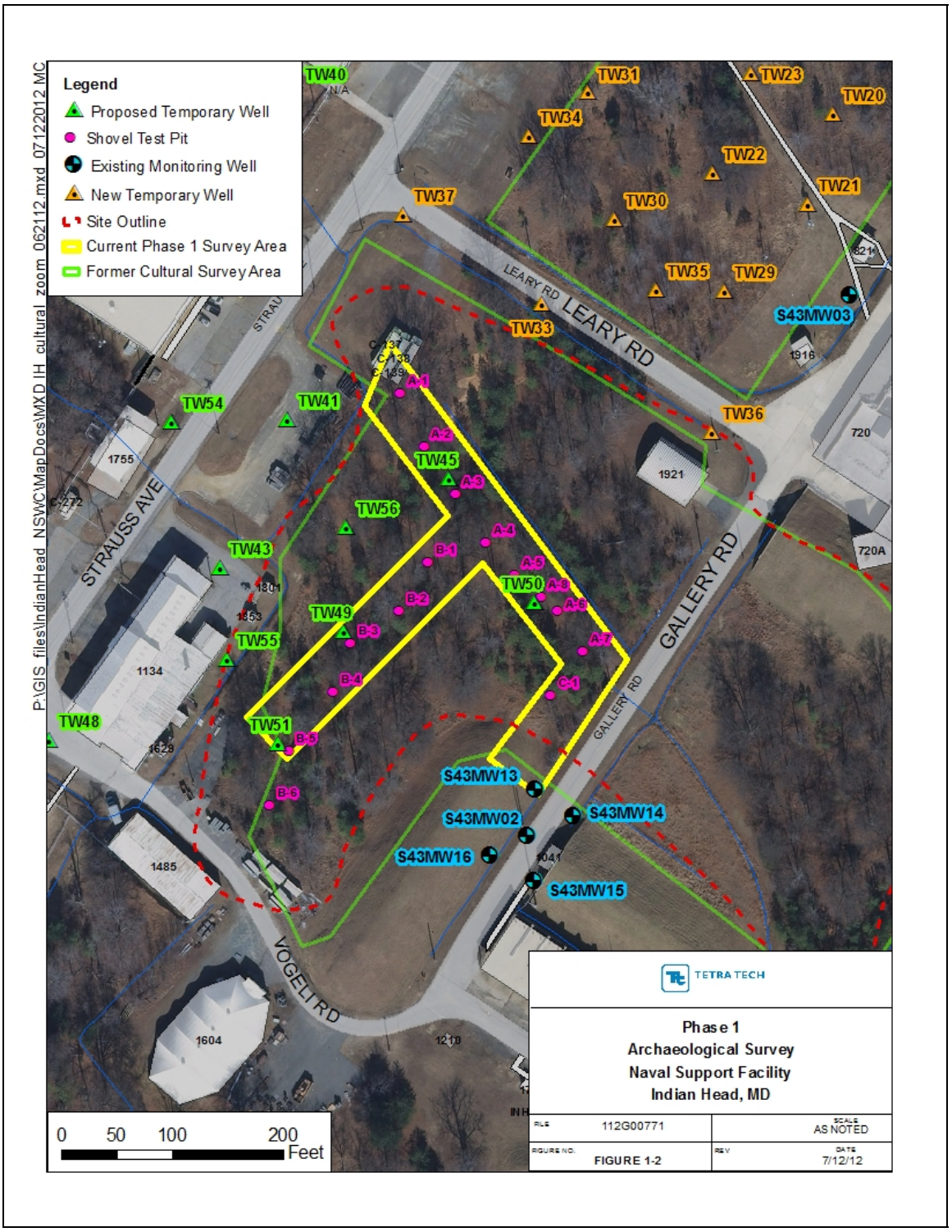

Figure 1-2. APE and Tested Locations

2.0 RESEARCH DESIGN

2.1 Objectives

The objectives of the Phase I archaeological survey were to provide an inventory of historic properties, archaeological sites, or other cultural resources that may be present within the APE established for the project. In the event that such properties are located, additional field and archival research would be directed toward evaluating the eligibility of these resources for listing in the National Register of Historic of Places (NRHP) and or the Maryland Inventory of Historic Places (MIHP) by:

- Defining the horizontal and vertical limits of the site(s).
- Interpreting the site(s) in terms of activities, functions, chronology, and context.
- Investigating research issues that would provide information on the site'(s) regional significance.

2.2 Results of Background and Implications for Testing Strategy

A review of files housed at MHT indicated that one archaeological site was present within the APE. Site 18CH258 was recorded in a relatively flat upland area just off of Strauss Road (Figure 1-2). The site was located during surface reconnaissance of the exposed areas along the roadway. The site is confined to the block of space bounded by Strauss Road to the northwest, Leary Road to the northeast, Voegeli Road to the west and southwest, and Glennon Road to the south and southeast.

The site area was defined by the presence of a very diffuse scatter of lithic debris, with a possible Middle Archaic component suggested by the recovery of a Morrow Mountain projectile point. The material recovered from 18CH258 suggests that the site area sustained only transient occupations, probably related to specialized extractive tasks, e.g. quarrying, or subsistence pursuits. The site is classified as a dispersed occupation, with no clustering of cultural material evident. No subsurface context is thought to be present as the Elkton soil series is deflated, having suffered erosion from previous cultivation.

The site is located on a high alluvial strath terrace situated approximately 13 meters above the pool level of the Potomac River, to the southeast of two small drainage ravines that empty into the Potomac 200 meters to the north, at the head of a small drainage feature, likely a former spring, that drains to the south and southeast. The terrace has not received appreciable alluvial deposits during the Holocene. Thus archaeological deposits if present would be confined to the plow zone and upper levels of the B horizon. Given the geomorphic position and the deflated nature of land form, shovel test pits (STP) constituted an effective testing strategy.

2.3 Shovel Test Pits

STPs were excavated at 15-meter intervals along the center of each corridor. STPs were also located directly at temporary well (TW) site locations, STP A-3 at TW 48, A-8 at TW50, B-3 at TW49, and B-5 at TW51 (Figure 1-2). STPs were excavated at least 20 centimeters into the B horizon.

3.0 ENVIRONMENTAL CONTEXT

Sections 3.0 -5.0 are excerpts from the ICRMP that was developed according to the guidance in DoN Instruction 5090.1C. This study (Chawla et al. 2010), completed in draft form by the Construction Engineering Research Laboratory (CERL) in 2010, has not been made final.

3.1 Physiography

NSF Indian Head is located in Charles County, Maryland, less than 30 miles south of downtown Washington, D.C., on the east bank of the Potomac River (Figure 1-1). The installation occupies an area of approximately 3,314 acres distributed over several non-contiguous areas. Land use in the surrounding area has developed over time from agriculture and forestry to commercial and residential development, although the area has remained largely rural. NSF Indian Head is located in the Coastal Plain physiographic province. This province is bordered to the west by the Piedmont and to the east by the Atlantic Ocean.

3.2 Drainage

The main installation occupies a peninsula known as Cornwallis Neck, formed by the Potomac River and Mattawoman Creek. Stump Neck occupies a peninsula formed by the confluence of Chicamuxen Creek and the Potomac River. The smaller necks and islands (Marsh Island, Bullitt Neck, Thoroughfare Island, and Rum Point) are situated in lower Mattawoman Creek. The topography of Cornwallis Neck consists of gently rolling uplands dissected by deeply incised streams. In Charles County generally, Holocene terraces can be found along the Potomac River at 6.1 meters (20 feet) above mean sea level (amsl) and below, and Upper Pleistocene terraces can be found at 9.1 to 15.2 meters (30 to 50 feet) amsl (United States Department of Agriculture-Soil Conservation Service [USDA-SCS] 1990). Higher elevations at Indian Head (above 15.2 meters [50 feet] amsl) form a dissected upland, described as an isolated exposure of ancient upland sediments (Park Hall Formation) (Reger and Cleaves 2008).

3.3 Geology

Geologically, the Coastal Plain consists of unconsolidated or partially consolidated sediments overlying early Mesozoic-age rocks. In cross section coastal Plain sediments form a wedge that thickens to the east and tapers to the west. Quartzose gravels have been mapped on terrace landforms fronting the Potomac River (Maryland Geological Survey 1968).

3.4 Soils

Charles County is included in the Atlantic slope section of the Oak-Pine Forest region (Vokes and Edwards 1974). The original forest of NSF Indian Head consisted of an oak-hickory hardwood mixture. Much of the present forest cover consists of secondary growth of mixed pine and hardwood. Some areas contain relatively mature hardwood stands of oak, hickory, and beech with an understory of dogwood, holly, and sweetgum (United States Department of Agriculture, Soil Conservation Service [USDA-SCS] 1990). The surface soils generally consist of unconsolidated sediments composed of sands, gravels, and clays of marine or fluvial origin.

4.0 PREHISTORIC CONTEXT

The prehistory of the Middle Atlantic region is commonly divided into three chronological periods: Paleoindian (circa 18,000 to 9500 BC), Archaic (9500 to 1200 BC), and Woodland (1200 BC to AD 1607). These periods are also commonly subdivided into Early, Middle, and Late subperiods: Early Archaic (9500 to 7500 BC), Middle Archaic (7500 to 3000 BC), Late Archaic (3000 to 1200 BC), Early Woodland (1200 to 500 BC), Middle Woodland (500 BC to AD 1000), and Late Woodland (AD 1000 to 1607) periods. The periods mark cultural development from largely nomadic hunter-gatherers during the Paleoindian period to fairly sedentary villagers in the Late Woodland period.

4.1 Paleoindian (18,000 to 9500 BC)

The earliest occupation of the Chesapeake was by Paleoindian groups who may have entered the region around 18,000 BC. The earliest occupation of the area, known as Pre-Clovis, is not well known but has been documented in Maryland at the Miles Point Site in Talbot County (Lowery 2007; Lowery et al. 2010). Pre-Clovis occupation has also been documented in Virginia at the Cactus Hill Site in Sussex County, where there is evidence of the production of blade-like flakes dating to 16,000 to 18,000 BC (McAvoy et al. 1997; Wagner and McAvoy 2004). Evidence from other sites in the Americas suggests that the Pre-Clovis culture featured small group encampments and a high residential mobility (Dillehay 1989, 1997; Waters et al. 2011). Later occupants of the region, known as the Clovis culture, date to around 11,000 BC and are represented by numerous finds in Virginia and Maryland (Dent 1995; Gardner 1974; Lowery 2003). The Clovis culture arrived at a time of abrupt climate change toward the end of the last ice age. With the onset of the Holocene, spruce-dominated boreal vegetation was replaced by the northward expansion of deciduous forests, and large mammals migrated to new ranges or were driven to extinction. The diagnostic artifact of Clovis culture is the basally fluted lanceolate Clovis point; typically associated tools include scrapers and gravers for working hides and bones (Gardner 1974, 1989). The Clovis diet may have included Pleistocene megafauna, such as mastodon and mammoth, but the hunting emphasis was likely on deer, elk, and perhaps caribou. Fish, berries, and fruits were also parts of the Paleoindian diet.

There are more than a thousand Paleoindian point finds from Virginia (Hranicky 2004) and hundreds from Maryland (Lowery 2003). Most of the recovered Paleoindian artifacts from the area have been isolated finds rather than identifiable sites, although it appears that Paleoindians made fairly intensive use of the landscape of Maryland's Eastern Shore (Lowery 2003). Clovis sites appear to have been focused on well-drained landforms near inland swamps and other highly productive habitats, including sources of high-quality stone for tool making (Gardner 1989). A significant Paleoindian site on

the Western Shore Coastal Plain is the Higgins Site in Anne Arundel County, Maryland, where more than 30 Paleoindian stone tools were found (Dent 1995:170-171; Ebright 1992). The Higgins Site also produced turkey fibers from a Paleoindian feature, indicating the consumption of wild fowl (Ebright 653 1992).

With very minimal information currently available on Pre-Clovis sites, it is impossible to discuss likely site locations or site settings. The Cactus Hill Site is located on a high terrace somewhat removed from the Nottoway River. It is on a sandy portion of the Coastal Plain, and cobbles of high-quality stone were reduced at the site (McAvoy et al. 1997). The Miles Point Site was also situated on a sandy, high terrace landform of the Coastal Plain (Lowery et al. 2010). Clovis sites may have been common on the eastern shore of the ancestral Susquehanna River (prior to inundation by the formation of the Chesapeake Bay). There have been no reported Paleoindian sites at NSF Indian Head.

4.2 Early Archaic (9500-7500 BC)

After 9500 BC the lifeways of native people underwent minor changes from the preceding Paleoindian period (Custer 1989). Clovis points disappear from site assemblages of that time, replaced by a diverse set of corner-notched and side-notched point types. Early Archaic sites frequently occur on large river terraces, similar to Paleoindian sites, but Early Archaic sites are more numerous than Paleoindian sites (Johnson 1986). Although high-quality lithic materials were preferred for points and other tools (similar to the preceding Clovis culture), Early Archaic groups also began to exploit lesser-quality local stones. Diagnostic points of the period include corner-notched Palmer points, which are thought to date to circa 9500 to 9000 BC, and corner-notched Amos, Charleston, and Kirk types, dating to about 9000 to 8000 BC. Site 18CH252 (A and B) is the only recorded Early Archaic occupation at NSF Indian Head.

4.3 Middle Archaic (7500 to 3000 BC)

The Middle Archaic cultural period roughly corresponds to the Hypsithermal, a climatic episode marked by rising temperatures, decreasing precipitation, and the development of more seasonally variable climate. The warmest temperatures of the entire Holocene actually occurred at the beginning of this period, around 7500 BC. An oak-hemlock-hickory forest dominated the region, and deer became the dominant large mammal.

The growing population changed its subsistence-settlement patterns. Sites are larger and more numerous, and a more diverse toolkit implies a broader range of subsistence activities than in the Early Archaic. During the Middle Archaic occupations began to appear in locations that had been previously ignored, such as upland swamps and interior ridgetops (Gardner 1987); however, base camps were still located primarily in the floodplains of major drainages. The appearance of new tool types specifically

designed for woodworking, seed grinding, and nut cracking (e.g., axes and adzes, mauls, grinding slabs, and nutting stones) and the location of sites in previously unused areas indicate an increasing reliance on gathered plants for food and other necessities.

Diagnostic points of the period include bifurcate-base point types (LeCroy, St. Albans, Kanawha), which are from the earlier portion of the period, and Kirk Stemmed and Kirk Serrated points. Slightly later points in the period include Brewerton, Guilford, Halifax, Morrow Mountain, Otter Creek, and Stanly. Non-diagnostic triangular points have also been recovered from Middle Archaic contexts. During the Middle Archaic period procurement of high-quality lithic material was no longer an important component of the settlement pattern, as most artifacts were manufactured from locally available lithic materials (Dent 1995:176). Site 18CH258 is the only site recorded at Indian Head with a Middle Archaic occupation.

4.4 Late Archaic (3000-1200 B.C.)

During the Late Archaic period indigenous groups continued the trend from the earlier period of a strong focus on gathered plants, particularly tree mast, for food and other needs. Fish and shellfish were heavily exploited during the later portion of the period. Wetland resources were also commonly exploited (Wanser 1982), and the number of sites and settings for sites continued to expand.

The initial portion of the Late Archaic period (3000 to 1500 BC) is marked by a suite of narrow-bladed projectile points (Bare Island/Lackawaxen, Clagett, Dry Brook, Holmes, Orient, Vernon, and possibly Piscataway types) that accompanied adaptations for exploiting hardwood trees and sylvan resources. Assemblages include a high frequency of grooved axes, adzes, celts, gouges, and grinding stones. According to one analysis, Late Archaic period sites are strongly associated with soils that are well suited to support nut-bearing hardwood trees (Mouer 1991). Sites during this portion of the Late Archaic period tend to be smaller and more diffuse than the sites that came later in the Late Archaic.

A cultural manifestation associated with broad-bladed projectile points appeared during the later portion of the Late Archaic period (2200 to 1200 BC). The broad-bladed point types include Savannah River and Susquehanna types. A major change in settlement pattern is associated with the appearance of these points, with sites focusing on the floodplains of higher-order streams (Mouer 1991). Site size can be quite large, particularly in the Coastal Plain. These large broad-bladed stemmed points are typically made of quartzite or rhyolite. It is not certain if they were used as projectile points or as specialized knives for fish processing or some other task (McLearen 1991). Although broadspear points are sometimes found in ritual mortuary contexts, they were apparently utilitarian objects, as shown by occasional breakage and edge attrition (Custer 1991).

A noteworthy development in the later portion of the Late Archaic period is the use of carved soapstone (steatite) bowls. Soapstone was quarried during this period in the Piedmont of Virginia, Maryland, and Pennsylvania. W.H. Holmes (1897) recorded a number of soapstone quarries in Washington, D.C., and

nearby locales. Vessels were apparently carved at the quarries and transported in finished form, probably by canoe (Dent 1995:182-184). Some soapstone vessels were finished away from quarries at nearby camps (Johnson 2001). Soapstone pots were clearly used for cooking, but it is not yet known what foods they were used to process (fish, meat, seeds, tubers, or nuts).

Throughout most of Maryland and Virginia's Coastal Plain, archaeologists have found broad-bladed points associated with shell heaps (middens) dating to around 2000 BC (Dent 1995; Potter 1982). Intensive oyster collection appears to have begun around that time. In one local study (Wanser 1982) the later portion of the Late Archaic was found to be the first period during which sites become common along tidal creeks and major waterways.

The Late Archaic period is the beginning of widespread prehistoric activity at NSF Indian Head. Barse (1985) recorded five sites dating to this period on Cornwallis Neck (Sites 18CH269, 18CH273, 18CH274, and 18CH275 and 18CH276). These sites are primarily short-term camps or small base camps found at the junction of fresh water streams and brackish waters. Barse suggested that larger base camps are most likely located in the interior areas. Subsequent surveys have not identified additional sites on Cornwallis Neck with Late Archaic components.

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4.5 Early Woodland (1200 B.C.-500 B.C.)

The Early Woodland period began around 1200 BC with the adoption of ceramic technology. The earliest vessels, known as Marcey Creek ware, imitated the form of flat-bottomed soapstone pots, including lug handles, and were tempered with bits of soapstone (Egloff and Potter 1982). Researchers believe that indigenous groups became more sedentary during the Early Woodland, inhabiting sites for longer periods of the year. Larger sites are commonly on tidal creeks that feed into estuaries, with smaller resource extraction sites in a wide variety of environmental settings. Diets were focused on fish, shellfish, and nuts, but deer, turkey, and plant seeds were also important parts of the native diet (Mouer 1991).

Diagnostic ceramic wares include Marcy Creek, mentioned above; Selden Island; and Accokeek. Accokeek pottery is a thin-walled, cordmarked, sand- or grit-tempered ware, with some quartz aplastics, that was conical or round-bottomed (Egloff and Potter 1982). Selden Island vessels, although steatite-tempered like Marcey Creek ware, were conoidal (bag-shaped), cordmarked, and were constructed by coiling rather than from slabs. Marcy Creek and Accokeek are found on both the Eastern and Western Shore physiographic areas; Selden Island is limited to the Western Shore Coastal Plain. Early Woodland sites are often located along the tidal creeks that feed into the Potomac.

Point types associated with the Early Woodland include Calvert, Rossville/Piscataway, and teardrop or Early Woodland occupations at NSF Indian Head include components at Sites 18CH251, 18CH264, 18CH268, 18CH269, 18CH275, and 18CH714. These sites most likely represent smaller, short-term camps associated with larger base camps, which would be located inland along Mattawoman Creek (Barse 1985).

4.6 Middle Woodland (500 B.C. to A.D. 1000)

During the Middle Woodland period the regional population grew as bands became more sedentary and participated in regional exchange networks. There is continuity in site locations between the Early and Middle Woodland periods, implying that earlier subsistence-settlement systems persisted. Middle Woodland groups in the Chesapeake appear to have been mobile, exploiting diverse and dispersed resources but focusing on riparian environments. The fall zone and eastern Piedmont may have been used seasonally as part of the settlement round of groups based in the Western Shore (Johnson 2001; Stewart 783 1992).

Based primarily on ceramic chronology, two phases of the Middle Woodland period have been recognized. The earlier is characterized by Popes Creek and related ceramics (500 BC to AD 300) and the later by Mockley ware (AD 300 to 1000) (Sperling 2008; Stewart 1992). Popes Creek is a thick-bodied ware with sand temper that is usually net-impressed. Popes Creek is distributed on the Western Shore of the Bay but not the Eastern Shore. Mockley ware is shell-tempered and has net impressions as well as other surface treatments. Mockley was distributed on both sides of the Bay. Some Early Woodland wares such as Accokeek are thought to have perhaps persisted into the early Middle Woodland period. The use of net impressions on Middle Woodland ceramics is evidence that net fishing was part of the Middle Woodland lifeway.

Diagnostic Middle Woodland point types include Fox Creek-Selby Bay points, which are often associated with Mockley pottery. Diagnostic points also include Jack's Reef corner-notched. Rossville/Piscataway and Calvert points, which appeared during the Early Woodland period, may have carried over to the materials exploited during the Middle Woodland shifted to higher-quality stone and stone from non-local sources, including rhyolite (Stewart 1989, 1992). This shift in pattern of stone use is seen as evidence of the development of regional trade networks.

Exchange networks and social interaction spheres extended out of the Middle Atlantic region during the Middle Woodland period. In the Ohio Valley the Adena complex (regarded by archaeologists in that area as Early Woodland) flourished between circa 600 and 100 BC. The construction of burial mounds, characteristic of this complex, did not spread to the peoples of the Atlantic coast. Nevertheless, sustained cultural contact with the Adena complex is demonstrated by massive caches of typical Adena artifacts (lobate-stemmed points, tubular pipes made of Ohio fireclay, shale and slate gorgets, etc.)

found in cremation burials on the Delmarva Peninsula and on Maryland's Western Shore. A high percentage of exotic lithic materials, especially Maryland and Pennsylvania rhyolite, are typically found in Middle Woodland assemblages. Middle Woodland sites at NSF Indian Head include Sites 18CH252, 18CH255, 18CH261, 18CH263, and 18CH291.

4.7 Late Woodland (A.D. 1000 to 1607)

At around AD 1000, maize horticulture was adopted by many indigenous groups in the Middle Atlantic region. Reliance on maize varied from group to group; indigenous diets continued to include fish, game, and gathered plants. In some parts of Maryland, principally the Piedmont and Blue Ridge, a dramatic increase in the number of sites coincides with the onset of agriculture. Late Woodland sites include small permanent hamlets and villages of varying sizes, all of which are typically located in floodplains of higher-order streams and adjacent to high-yield agricultural soils. During the Late Woodland period ranked societies emerged, which developed into the complex tribes and chiefdoms encountered by the Europeans in the late sixteenth and early seventeenth centuries (Potter 1993).

Prior to AD 1200/1300, settlements were not stockaded (fortified), suggesting that there were minimal inter- and intra-group hostilities (Stewart 1993). At around AD 1200 to 1300, throughout the Middle Atlantic region, population density increased, nucleated settlements and stockaded villages were established, and there is evidence of population movement and displacement (Stewart 1993). Diagnostic artifacts of the Late Woodland period include Levanna and Madison triangular projectile Ceramics found most commonly along the Potomac River include Townsend ware (also known as Rappahannock) (AD 1000 to 1600), and Potomac Creek ware (AD 1300 to 1600). Townsend pottery is a shell-tempered, fabric-impressed, sometimes incised ware that was common on the Coastal Plain on both the Eastern and Western shores. Potomac Creek ware is from the later portion of the Late Woodland and was limited to the Western Shore and the Piedmont. Less common Late Woodland period ware types include Sullivan Cove (AD 1250 to 1600), Moyaone (AD 1300 to 1600), and Yeocomico (AD 1500 to 1700) (Egloff and Potter 1982). These less common ware types were limited in distribution.

When the English explorer John Smith explored the Chesapeake and the Potomac in 1608, he encountered Indian tribes that were part of the Powhatan confederacy, a political amalgamation of Algonquian-speaking native people who inhabited the Coastal Plain/Tidewater of Virginia and Maryland (Potter 1993). Smith mapped a number of hamlets and villages along the Potomac River; the closest to NAS Indian Head was Cinquaoteck, a village near the headwaters of Mattawoman Creek. John Smith reported digging rocks near the village, for purposes not known. The Indians at Cinquaoteck were known as the Mattawoman.

At that time all of the Native Americans living in southern Maryland and some of those among the Virginia bands were members of the Piscataway/Conoy nation. “The Conoy...consisted of several bands, each led by a chief, while a varying degree of central authority was vested in a paramount leader” (Feest 1978:240). Population estimates for this Algonquian-speaking group include 1,000 in 1608; 2,500 in 1632; 1,665 in 1634; and 265 to 300 in 1697 (Feest 1978:242). The Mattawoman and the Pamunkey were the main tribes in Charles County and part of the Piscataway nation. The Maryland side of the Potomac River was the home of a number of tribes who were part of the Piscataway nation (part of the Powhatan confederacy).Of the Native American inhabitants, Smith (1612:98, 100, 101) noted:

> The land is not populaous, for the men be fewe; their far greater number is of women and children....Their buildings and habitations are for the most part by the rivers and not farre distant from some fresh spring. Their houses are built like our Arbors of small young springs bowed and tyed, and so close covered with mats or the barkes of trees very handsomely, that not withstanding either winde raine or weather, they are as warme as stoves, but very smoaky, yet at the toppe of the house there is a hole made for the smoake to goe into right over the fire....Their houses are in the midsts of their fields or gardens; which are small plots of ground, some 20 [acres], some 40, some 100, some 200, some more, some lesse.

Despite the practice of agriculture, the subsistence and settlement patterns of these Native American groups continued to be affected by seasonal considerations. About their subsistence practices, Smith (1612:97) wrote “for neere 3 parts of the yeare, they only observe times and seasons, and live of what the Country naturally affordeth from hand to mouth & c.”

The indigenous communities were completely disrupted and uprooted in most of the Chesapeake and the Potomac River basin after European colonization began. Diseases brought by the Europeans ravaged Indian settlements. Warfare and eviction from lands destroyed many other Indian communities. The Indian-Colonist relationship ebbed and flowed, with periods of intermittent conflict and warfare. There were major Indian uprisings in 1622 and 1644. The colonists emerged from the uprisings with closer control of the Indian communities (Potter 1973).

Excavations on Cornwallis Neck revealed a small Late Woodland/Contact period hamlet, the Posey Site (18CH281). European artifacts recovered from the site include several triangular and rolled pieces of brass, white clay pipe stems, European flint, and a small number of earthenware sherds (Barse 1985). Barse also recovered Camden ware, a native-made historic-period ceramic. During the 1670s it is thought that a number of Pamunkey and Mattawoman settlements were located on both the Indian Head and Stump Neck peninsulas (Clark and Rountree 1993).

5.0 HISTORIC CONTEXT

5.1 Contact and Settlement Period (A.D. 1570-1750)

For much of the sixteenth century, Spanish and French sailors explored the Middle Atlantic coastline, with the British following suit in the later portion of the 1500s. The Spanish were particularly interested in establishing a foothold in the region. The Spanish Lucas Vasques de Ayllon sponsored three missions894 to North America in the 1520s, exploring the lower Chesapeake Bay in 1524 and establishing a small and short-lived settlement near Jamestown Island in 1525, known as San Miguel de Guandape. Also in 1524, Giovanni da Verrazano explored the Atlantic coastline; he was an Italian by birth but sailed for the French crown. The middle and upper reaches of the Bay were possibly first explored by Europeans in 1588, when Vicente Gonzalez, a Spaniard, reported on the falls of the Susquehanna River.

In 1608 Captain John Smith explored the Chesapeake Bay and the Potomac River, traveling both as far upstream as his craft could navigate. Smith's voyages passed "along the coast, searching every inlet and bay fit for harbours and habitants"; he prepared a written description of his exploration, and produced a map of the rivers and Indian settlements (Smith 1612).

During the two decades following Smith's explorations, contact with the Native Americans along the Chesapeake was generally limited to trading. The primary trade goods were corn and furs, in exchange for which beads, bells, hatchets, knives, broadcloth, coats, shirts, Scottish stockings, and other items were given (Fleet 1632:14-17). These exchanges, however, were not always without conflict (Scharf 1879).

In 1634, 140 Catholic and Protestant settlers from England under the patronage of Cecil Calvert, the second Lord Baltimore, made land at St. Clements Island in the lower reaches of the Potomac River. They then traveled a short distance downriver to Yeocomico, a Piscataway village, and traded with the villagers, exchanging various European items for land. The Piscataway village became the colonists' St. Mary's City and the seat of Maryland's colonial government.

Cecil Calvert intended for his Maryland colony to recreate the traditional landscape of Britain, with large estates owned by a small elite of feudal lords and worked by tenants. He therefore divided much of the new colony into "manors," to which were granted large blocks of land with the idea that the holders of manors would lease the land to small planters. By 1642 there were 16 manors in the Maryland colony, all along the Lower Potomac River, the Lower Patuxent River, and the Chesapeake Bay.

Founded in part as a Catholic refuge and based on a model of aristocratic privilege, Maryland could not

escape being drawn into the Protestant-Catholic battles erupting in England. Maryland's Protestant-Catholic troubles began in 1645, when a ship's captain named Richard Ingle raided the colony, portraying himself as the agent of the Protestant opposition. Ingle targeted Catholics, burning houses and pillaging property. Ingle's was just the first in a series of conflicts between Protestants and Catholics at intervals down to 1689. Maryland's political leadership was upended in 1652 as part of Oliver Cromwell's political maneuvering, and the leadership remained in a state of flux through 1658.

Despite political woes, Maryland continued to thrive and grow. In the 1640s Maryland acquired a reputation as a good place for poor men to settle, and over the next 20 years thousands of men and hundreds of women immigrated to the colony. The economic mainstay of the colony was growing tobacco for export to Europe. Settlement therefore spread out along the coastline, so that each plantation could have its own dock for loading tobacco onto boats that were rowed out to waiting merchant ships. To feed themselves, the colonists grew Indian corn and raised cattle and half-wild pigs. By 1665 there were about 8,000 people in the colony, spread out along both shores of the Chesapeake Bay and the banks of the Potomac and Patuxent rivers (Carr et al. 1991:15). Because land was readily available, most indentured servants were able to lease or even buy their own plantations once their periods of indenture were over.

Charles County was established in 1658. That same year a ferry began operating over the Wicomico River. The county courthouse was situated in the town of Popes Creek, along the Potomac River. Charles County's early population grew steadily—the enumerated population increased from 900 in 1660 to 1,884 in 1675—but the area remained sparsely populated (Pogue and Smolek 1985). The colonial legislature attempted to encourage the economic growth of towns through the establishment of ports of trade. In 1694 the legislature established a tobacco inspection port at Port Tobacco and on Nanjemoy Creek (Klapthor and Brown 1958).

During the seventeenth century the Mattawoman Indians maintained a village on the headwaters of Mattawoman Creek, and had close ties to the Pamunkey tribe, who lived nearby on both sides of the Potomac River. The Mattawoman Indians were generally on good terms with the county's European settlers, with whom they conducted trade. In 1665 the Provincial Council passed legislation that forbade white settlers from living within 3 miles of the Indian village (Cinquaoteck), on Mattawoman Creek (Walsh 1977). European settlers did not obey the council, however. A treaty was established with the Maryland government in 1666, establishing a large Indian reservation spanning the head of Mattawoman Creek and Piscataway Creek (Rice 2009:141-142). The Mattawomans already lived in the area, as did a number of other tribal groups. The Nacotchtanks (Anacostia) moved from the Washington area to the new reservation. While the Mattawomans and the colonists experienced relative

peace during this era, they had a shared enemy in the Susquehannocks, who attempted to dominate the middle and lower Potomac River. In 1681 a war party of Susquehannocks came down the Potomac River and attacked the Mattawomans; much of the village was destroyed and the chief was abducted (Rice 2009:154). The war raid quite nearly destroyed the Mattawoman tribe. Some surviving Mattawoman may have traveled to a fortified Indian village known as Zekiah Fort, located in the interior of Charles County. The fort existed from 1680 to 1692.

A peace treaty was signed in 1692 between the Maryland Government and the remaining tribes. The Mattawoman Indians took part in the 1692 treaty. Relations remained very poor, and the remaining Mattawomans joined other Indian refugee communities upriver on the Potomac. Records indicate that some Mattawomans were living on an island in the upper Potomac River in 1699, alongside Pomonkey Indians (Rice 2009:171-172). They subsequently accepted the offer of the Iroquois and moved to Five Nation lands in New York.

The area within the present boundaries of the NSF Indian Head was part of a 5,000-acre land grant called Mattawoman Neck that was granted to Thomas Cornwallis in 1654. This area was later referred to as Cornwallis Neck. Cornwallis held the parcel until 1688, when it was conveyed to Captain Edward Pye (Barse 1985).

5.2 Rural Agrarian Intensification (1680 to 1815)

The Protestant Revolution of 1688-1692 in Britain, in which the Catholic James II was overthrown and replaced by the Protestant William of Orange, led to further turmoil in Maryland. The Proprietary government was overthrown by a group of Protestant “Associators,” and in 1695 they moved the capital from St. Mary’s City to Annapolis, in an area of Puritan settlement known as Providence. For the next 26 years Maryland was a royal colony headed by a royal governor.

In the late seventeenth century Maryland’s economy and demography changed in important ways, and a new sort of society developed. The population and economy continued to grow and diversify. Since most coastal land had already been taken up, people began to move away from coastal areas, and roads developed to carry tobacco and other products from inland plantations to landings where these products could be placed on ships. Many of these were “rolling roads,” down which tobacco was rolled in casks. Several small port towns developed around the landings. The open social conditions that had allowed many poor men to become well-off planters became more closed and stratified, and class divisions hardened. As word of the declining opportunities in the colonies reached England, fewer people went willingly to the colonies as indentured servants. Labor was now supplied largely by whites born in the colony and by African slaves (Kulikoff 1986).

The spread of African slavery helped the leading planters grow wealthy, and an elite-dominated society developed. By the 1720s the leaders of the colony lived in grand houses with staffs of servants, their estates worked by gangs of slaves. The importation of African slaves first became a large business in the 1680s, and it continued to grow throughout the 1700s. The 1790 census, the first reliable count, set the slave population of southern Maryland at about 45 percent of the area's total population (Fields 1985:10). In this world of great estates and slaves, small planters had a difficult time staying afloat, and many planters' children moved west to newly opening lands.

Tobacco cultivation was highly profitable in the early portion of the eighteenth century, but it suffered as prices dropped at the end of the century. Within the region grain became a supplemental crop to tobacco, and mills were established along interior drainages to process grain for shipment. Bone, paper, saw, and textile mills also arose.

Charles County and southern Maryland were on the periphery of political and military action during the Revolutionary War. Maryland's political leaders were divided over the issue of independence, but Maryland did declare independence from Britain in 1776, and Charles Carroll of Carrollton and Samuel Chase were leading voices for revolution. The British established bases on islands in the Chesapeake Bay, and the lower Potomac River, and from there they plundered and raided nearby plantations. Maryland state vessels and privateers traversed the Chesapeake Bay and Potomac River during the war, patrolling for British ships and combating British loyalists.

During the War of 1812 no major battles were fought in Charles County, although there were skirmishes and 1019 naval engagements. The British again used islands in the Chesapeake Bay and the lower Potomac River as strongholds and again plundered many plantations in the area, burning houses and carrying off livestock and slaves. The war temporarily interrupted the growth and prosperity of Charles County. Economic development and diversification during the period following the War of 1812 was slow as the region began to recover.

5.3 Agricultural-Industrial Transition (1815-1870)

In the early nineteenth century southern Maryland's agricultural economy struggled as Baltimore grew into a major city and central Maryland became a center of agricultural dynamism and growth. The rural nature of the area persisted, with tobacco as the principal crop. Tobacco prices were volatile during this period, and there were problems with the exhaustion of tobacco fields in southern Maryland following decades of intensive planting. As the local farm economy stagnated, many whites moved west following the American frontier, freedmen moved to Washington, D.C., and Baltimore, and the slave population

began to shrink. Comparing the 1790 census with the census of 1850, Charles County's white population shrank by 44 percent and the slave population shrank by 5 percent (Fields 1985:13).

In the period from circa 1815 to 1865 (emancipation), slaves on the larger plantations developed a vibrant culture with their own traditions of music, religion, and social life. They married, raised families, and learned skills. In a stagnant economy that had little need for more workers, many planters saw their growing slave populations as more of a liability than an asset. Many planters therefore began selling "excess" slaves to traders who took them to the newly developing cotton lands in Alabama, Mississippi, and Texas. Thousands of slaves were sent west in this way, and many slave families were broken up (Bancroft 1931; Tadman 1989). Not infrequently planters in southern Maryland chose to emancipate slaves in their wills, particularly household slaves.

Although tobacco remained the most important cash crop, wheat become an important secondary crop, and diversification helped farmers achieve some economic stability. Wheat cultivation surged in the region at the end of the eighteenth century and continued to increase in the nineteenth century. Farming winter wheat was an ideal complement to the tobacco cultivation schedule (Morgan 1998:170-171), as winter wheat was sown in the autumn after tobacco had been harvested. The wheat crop dried in the field and was reaped or mowed in July after tobacco had been transplanted. It was stacked in the field as it was cut, and then brought to the barns. It was typically threshed in the winter. The labor involved in wheat production was comparatively small. The planting and harvesting were not as laborious as for tobacco, and the plants needed no tending while they grew. Cultivating wheat did require plowing, which necessitated horses or oxen. Thus, producing wheat meant that labor was needed to tend to livestock and to grow grains for feed (Morgan 1998:170).

While agriculture in southern Maryland was generally in flux and on unsteady economic footing during the first half of the nineteenth century, the fishing industry, and particularly the oyster industry, experienced dramatic growth. The growth was fueled by a number of technological changes, including the expansion of railroad systems, ship developments (steam vessels and specialized sailboats), and the birth of the canning industry. A railroad, the Southern Maryland Railroad, was built in the 1880s running from Washington, D.C., toward Point Lookout. The Southern Maryland Railroad was never completed to Point Lookout but did extend into Calvert County, eventually connecting (in the early twentieth century) to NSF Indian Head. Railroad lines moved fish, shellfish, and agricultural goods to market, in addition to providing passenger service. Steamboats carrying cargo started working the Potomac River (Washington, D.C., and points south) in the early 1810s (Brown 1961).

Steamboat passenger service started on the Potomac River in 1815. The ship *Washington* traveled from

Washington, D.C. to a landing on Potomac Creek, beginning in 1815. *Camden* traveled the Washington area in 1817, and *Surprise* in 1822 (Holly 2000:21). More general Potomac River steamship travel grew in the 1830s along with steam engine developments. Sometime around 1840 the Washington and Fredericksburg Steam Boat Company was formed, running between Washington, D.C., and Potomac Creek. In 1845 the company became the Potomac Steam Boat Company, and ran to railroad spurs at Aquia Creek (downstream of NSF Indian Head). Steam travel on the Potomac River expanded in the post-bellum period as Washington and Virginia families began vacationing at cottages along the river and on the Chesapeake Bay (Brown 1961).

Oysters have been a mainstay of local foodways and economies going back well into the pre-European era. Oyster consumption has been documented at Indian sites dating back to approximately 4500 BC (Miller n.d.). Europeans marveled at the abundance of oysters in the area during the period of exploration and early settlement. One of the early English settlers, William Strachey, wrote in 1612 that “Oysters there be in whole banks and beds, and those of the best. I have seen some thirteen inches long” (Strachey 1953, in Miller n.d.). In the seventeenth and eighteenth centuries oysters were part of the local diet and harvested by hand or with rakes or small tongs; there was not much of an oyster industry as it was limited to household harvesting and consumption. This began to change early in the nineteenth century. Metropolitan areas, including Baltimore, Washington, and Norfolk, grew during that period, and demand for seafood in the cities was high. Oystermen switched to dredging in the 1810s, an efficient but destructive approach to harvesting (Kennedy 2002).

Oyster packing plants opened in region in the mid-1830s, as the commercial oyster industry began to expand dramatically. Canning technology developed in the 1830s and 1840s helped the growth of the industry (Miller n.d.), although it was severely disrupted during the Civil War. In 1865 Maryland decided to lift most dredging restrictions and to try to license and regulate oystermen. The waters of the Bay became thick with oyster boats, and conflicts abounded. Maryland created the “Oyster Police” in 1868 to enforce regulations and keep the peace on the Bay; from various accounts the policing was not particularly successful. Oyster harvests skyrocketed in the 1870s and 1880s, and then began a precipitous decline that has continued to the present. During the industry’s peak years, oyster harvesting and processing employed large sectors of the population in southern Maryland. Many African-Americans recently freed from slavery took to the Chesapeake Bay and the Lower Potomac River to harvest oysters. Industries related to oystering also flourished during the middle and later portions of the nineteenth century, including shipbuilding. Oysters were far from the only part of the area’s commercial fishery. Other important catch in the nineteenth century were Atlantic sturgeon, eel, finfish, shad, striped bass (rockfish), blue crabs, and clams.

The period between 1854 and 1868 was tumultuous for residents of Charles County as the sectional confrontation over slavery mounted. The county's dependence on tobacco, as well as its sizeable slave labor force, resulted in strong Confederate sympathies. County voters went solidly Democratic in the election of 1860. Many residents enlisted in the Confederate army and illegally transported mail and other information to the troops further south. As a result the county was occupied throughout the war by Union forces that were stationed in camps extending from Mattawoman Creek to Liverpool Point. The Union authorities stationed small bodies of troops in the area throughout the war.

The heaviest occupation of Charles County occurred from October 1861 to April 1862, when Union Gen. Joseph Hooker's division of over 1,000 soldiers was stationed in the county to repel a possible Confederate invasion of the north that was feared by Gen. George McClellan. Hooker's orders were to defend Maryland against possible Confederate attacks across the Potomac River, as well as to prevent smuggling of any goods to the enemy (Newmann 1976). In early October 1861 General Hooker and his division established their headquarters in and around Stump Neck and the lower Mattawoman Creek. He erected earthworks on the Indian Head peninsula and constructed supply depots at Rum Point and Liverpool Point.

Hooker's army saw almost no action in southern Maryland. Time was spent patrolling the area, returning contraband, and visiting local residents. One family the troops were fond of, the Poseys, were actually secessionists, who reportedly passed messages across the Potomac River using signal mirrors from their home a mile south of Stump Neck (Herbert 1944). During the time Hooker was stationed in Charles County, many slaves escaped to Union camps, and in other instances slaves were taken from identified Confederate spies. The Port Tobacco *Times* released an editorial stating that Federal troops were stationed "supposedly to protect citizens, instead negroes are taken with no remuneration, and threats of violence if we seek to recover them" (Klapthor and Brown 1958). The Union army struggled to handle the issue of runaway and emancipated slaves throughout the early years of the Civil War.

Slavery was not abolished in Maryland until the conclusion of the Civil War, and for a time the rural economy was severely disrupted. The loss of slave labor temporarily devastated tobacco production until a system of sharecropping and tenant farming was established (Wesler et al. 1981). Some small-scale farmers were forced to vacate their land, and as a result formerly cultivated land reverted to forest. The rebuilt rural economy in southern Maryland continued to produce tobacco, as well as wheat, but became more diversified in the post-bellum period. The population of farm workers remained relatively high.

5.4 Industrial/Urban Dominance (1870 to 1942)

While industrialization and other forms of modernization greatly changed the region's urban centers,

southern Maryland was much less changed. Population remained relatively constant, at least in rural areas. From 1870 to 1930, the population of Charles County fluctuated between 15,000 and 18,500. Although some African-Americans moved into the cities following emancipation, the number of African-Americans in Charles County remained virtually unchanged between 1860 and 1880. Outside of cities and towns was a low-density rural environment with buildings strung along roadways and small clusters of buildings at crossroads and at navigable inlets.

There were some efforts at economic diversification in Charles County during this period. Many owners of large estates on the Potomac River ventured into commercial fishing. By 1897 the Potomac River supported more commercial fisheries than any other river on the East Coast (Tilp 1978). In other cases land use was shifted from tobacco farming to timber harvesting. Soil that had been exhausted by tobacco monoculture was reforested with pine and gum trees that could tolerate poor soil conditions (Klapthor and Brown 1958). By 1958 timber occupied 70 per cent of the land area of Charles County, and timber products ranked second to tobacco for farm incomes (Klapthor and Brown 1958). Two wharves were built on the northern part of Cornwallis Neck, known as Pye's Wharf and Marbury's Wharf. They were landings for steamboats and other vessels, and were major transportation arteries for Charles County. The area around the wharves was known as Glymont. During the late nineteenth and early twentieth centuries an attempt was made to develop Glymont for recreation. There was a hotel, complete with a grand ballroom, and a small amusement park. The amusement park featured three rides: a carousel, a train ride, and a swing (Poynor 2009). After steamboat travel declined precipitously in the 1930s, the Glymont area went into economic decline.

The Naval Station at Indian Head, established in 1890, was the first major non-agricultural facility to be located in Charles County. The facility was built as a Naval ordnance proving ground for the testing of guns, ammunition, and armor plating for Navy ships. The Naval station had a tremendous impact on the entire county and soon became its largest employer. In 1898 the Indian Head facility expanded to include powder production.

Existing roads were improved within the county during the first decades of the twentieth century to accommodate automobile traffic. The first all-weather road in the county, the Old Livingston Road, extended from the Naval Powder Station at Indian Head to Washington, D.C. This road was not paved until after World War I (Camp 1977). Maryland extended its highway system through Charles County in 1910, and the Crain Highway was extended through the county in 1922, further stimulating the growth of the county (Wesler et al. 1982). Although the road conditions improved, steamboats and ferries continued to provide the primary means of transportation in the county as late as the 1920s.

5.5. Modern Period (1942 to Present)

The population of Charles County remained stagnant throughout the early twentieth century; between 1900 and 1940, the number of residents remained relatively constant between 16,000 and 17,500 (Camp 1977). But the county's rural character and proximity to Washington, D.C. attracted the attention of affluent families seeking a country retreat (Camp 1977). This movement spurred a period of restoration activity in Charles County. Between 1925 and 1945, several properties now in the NRHP were purchased and 1186 rehabilitated.

Twentieth-century transportation improvements also encouraged economic changes in southern Maryland. New transportation networks established a north-south corridor of commercial traffic (Camp 1977). During the late 1930s Charles County was linked with the Virginia shoreline with the construction of a bridge over the Potomac River. These modern transportation improvements along with developments in communication encouraged urban/suburban development in Charles County.

By the end of World War II, Charles County had emerged as a recreational and residential suburb of the Washington, D.C., metropolitan area (Camp 1977). Between 1950 and 1980, the population of the county rose dramatically from 23,415 to 72,751. Today, Charles County is changing rapidly from a rural to suburban environment. Improved transportation routes and proximity to Washington have increased the county's appeal as a bedroom community. Farmers compose only a small minority of the county's population, and relatively few late nineteenth- or early twentieth-century family farmsteads remain intact. NSF Indian Head continues to serve as a major employer of the region and stimulates area commercial development and housing construction. Currently, over 2,500 civilian and military personnel are employed at the Naval facility, which comprises more than 1,600 buildings.

5.6 NSF Indian Head

5.6.1 Naval Proving Ground (1890 to 1921)

Previous to the purchase of land for a proving ground at Indian Head, newly forged guns were ranged from the Proving Ground near the Naval Gun Factory in Annapolis. Testing guns at Annapolis proved difficult because of the heavy boat traffic on the Severn River, which prompted a search for a new proving ground facility. The Bureau of Ordnance petitioned the Secretary of the Navy during the 1880s for funds to purchase land for a new proving ground in a more remote location. In 1890, 473 acres on Cornwallis Neck were purchased to be used as the new proving ground, part of a 659-acre acquisition by the Bureau of Ordnance in 1890 that was authorized by Congress through enabling acts in 1887 and 1889. Cornwallis Neck was an ideal location, as it was a more isolated site only a day's journey on the Potomac from the gun factory at the Navy Yard. The new facility was part of the "New Navy" of the late nineteenth century, a technical revolution to modernize U.S. naval forces. Expansion included

increased training and an emphasis on science and engineering. A new fleet of steel-hulled ships were constructed as part of the New Navy, all of which required modern, reliable guns. The United States was only one of many countries invested in the invention of better, faster-firing artillery, since the country to develop it first would have a clear advantage in battle (Stevens et al. 1995:26).

Ens. Robert Brooke Dashiell was assigned to oversee the construction of the new facility at Indian Head. Boundaries of the area were the Mattawoman Creek to the south, a county road to the north (later called Strauss Avenue), and Benson Road to the east. The proving ground was situated on the north portion of the tract near the Potomac River in a ravine known as the Valley. The topography of the area was ideal for ordnance testing, since the steep walls of the valley could absorb shots or explosions. Marshy land was drained, land cleared, and a dock built.

Early construction at the proving ground included the dock, valley firing positions, semi-underground shelters called gunproofs, and target butts, magazines, and instrument houses. As the proving ground was an isolated, remote location, Dashiell personally designed and supervised the construction of dwellings for employees. Within the first decade the breakwater was constructed on the Potomac to improve problems caused by ice on the river (Tooker et al. 2010:14).

The first shots were fired on January 24, 1890, from a 6-inch breech-loading rifle that was mounted on the south side of the Valley. The gun was fired at a steel plate embedded in the opposite hillside, a technique that allowed naval shells, guns, gun mounts, powder charges, and armor to be tested simultaneously. The Annapolis Proving Ground was closed by the Bureau of Ordnance in 1892 after Indian Head improvements were completed. “The tests Dashiell supervised at Indian Head included types of experiments that in a later era would be conducted at several very different types of facilities…. By modern definitions, the early Proving Ground performed test and evaluation, research and development, prototype design modification, and specification testing. Sometimes several of those various types of experiments would be conducted at the same time” (Carlisle 2002:11).

In 1898 the Proving Ground was supplemented by the powder factory, used for production of the newly 1248 invented smokeless powder. At the same time the powder factory was under construction, the proving grounds were improved with the completion of a sea wall, grading and filling of the Valley bluffs to prevent erosion, improvements to the wharf and landing slip for heavy guns, and a new bombproof (Bureau of Ordnance 1899:62). Soon after, enlarged bombproof facilities were requested, including the still-extant but modified Building 62. Eventually, the Powder Factory took precedence over the Proving Ground, though the latter remained in operation until 1921. The limitations of the Proving Ground grew as river traffic increased on the Potomac and as artillery range increased.

In an attempt to circumvent the problem, the Ordnance purchased additional acres on Stump Neck to add to the Proving Ground. From that location longer-range guns could be fired south across Chicamuxen Creek to the opposite shore. Difficulties continued until in 1915 the Secretary of the Navy wrote that “the work that the proving ground has been continued under the increasingly difficult conditions that have been obtained there for years. The geography of this place is totally unsuited to modern conditions...We are principally hampered in length range, the inability to recover projectiles fired at a distance, and the great difficulty and danger accompanying the tests of high explosive shells” (Bowlin 1988:25). Problems with the proving ground were put on hold during World War I as increased work required additional buildings to be erected in the Valley. The number of batteries was increased from two to four. But soon after the war, a new site was purchased southeast of Indian Head on the opposite side of the Potomac in Virginia. The site was designated as Dahlgren in July 1919; by 1921 all work had been transferred there. The sites were officially separated into two distinct bases in 1932.

5.6.2 Naval Powder Factory (1898 to 1946)

During the late nineteenth century the United States navy was undergoing a revolution, modernizing its forces through construction of new steel-hulled ships that required modern, reliable guns. At the time standard guns required several minutes to reload because of the multiple-step reloading process and the time it took for smoke clouds to dissipate before a clear shot of the target could be sighted. Ens. Robert B. Dashiell, who oversaw the construction of the new proving grounds at Indian Head, was instrumental in 1277 the development of a new mechanism for faster hand-loading guns. His development of the new gun took 1278 place concurrently with the invention of safe smokeless gunpowder; combined, the two would give the 1279 U.S. Navy an advantage over any opponent (Carlisle 2002:2). The new, smokeless powder developed by 1280 the U.S. Navy at Naval Torpedo Station in Newport, Rhode Island, in the late 1890s was both safe and discharged a barely noticeable smoke.

The Navy Bureau of Ordnance tried to encourage private-industry production of the new smokeless gun powder, but industry concerns over low profit margins resulted in government production at the Naval Proving Grounds at Indian Head, since the Newport station had space limitations. On May 4, 1898, a Congressional act authorized and provided funds for the construction of the factory. The Indian Head powder factory was the first chemical factory operated by the Navy, serving to produce powder for the 1287 armed forces and as a benchmark against which other private sector products would be measured.

The site chosen was southeast of the proving grounds, in an S-shaped valley that drained into Mattawoman Creek. A new wharf was built on the creek, and a railroad was built to connect the proving ground to the factory. The original 29 buildings that comprised the factory were designed by Washington, D.C., architect Hunter Jones, and their construction was overseen by Lt. Cdr. Albert R. Couden. When

construction was complete in May 1900, 24 buildings formed the construction line, called the Single Base Line since the powder produced consisted of a single base line, nitrocellulose. Machinery in the factories was, for the most part, shipped from the Naval Torpedo Station in Newport, where it had been designed 1296 by civilian chemist Charles Munroe. The first smokeless powder was produced on June 28, 1900, under the command of Couden's successor, Lt. Joseph Strauss. In its first year in operation, the powder factory produced 250,000 pounds of powder, 181,500 pounds of ether, and 546,000 pounds of nitric acid. By 1902 enough powder had been produced to replace the brown powder in all new Navy vessels and 30 older ships (Stevens et al. 1995:29-30).

A strong navy was a key element of President Theodore Roosevelt's military strategy to "speak softly and carry a big stick." As the United States emerged as a world power after its victory in the Spanish-American War, it was increasingly involved in military intervention in conflicts such as the Boxer Rebellion (1900) in China and the Russo-Japanese War (1904-1905). The generous military budget provided by President Theodore Roosevelt from 1901 to 1909 meant that the powder factory buildings were expanded and new buildings constructed during its first decade in operation. At the end of the first decade of the twentieth century, Congress again approved the expansion of the powder factory because of the increased tensions in Europe. Production increased into the 1910s as the Wilson administration began a national effort to decrease military dependency on private suppliers for resources such as steel and smokeless powder. During the Roosevelt and Taft administrations Indian Head provided guidelines for manufacturers, and its budget was increasingly diverted from research and development to manufacturing the powder. A factory for the production of the highly volatile explosive D was built, producing 41,000 pounds of the explosive in its first year (Stevens et al. 1995:31-32).

World War I demands placed on Indian Head meant yet another expansion, though buildings were hurriedly constructed to facilitate the speedy production of powder. The number of dryhouses increased by 1918 from 17 to 41 with new dryhouses built on land acquired through President Woodrow Wilson's Presidential Proclamation No. 1458 that authorized the immediate possession of the remaining 1,239 acres on Cornwallis Neck for the expansion of the base. By the end of the war, Indian Head had manufactured 10 million pounds of new powder and reworked 800,000 pounds of older powder (Stevens et al. 1995:32).The huge housing shortage at Indian Head during World War I brought the Navy to commission the U.S. Housing Corporation, which was authorized by Congress in 1918 prior to the armistice, to build a number of residences northeast of the existing residential area. This included "100 dwellings, three dormitories for single civilians, and a school for white children" (Stevens et al. 1995: appendix IV, Naval Ordnance Station Nomination, E8). In addition to a housing shortage there was an employee shortage. To attain an appropriate wartime-level work force, a pedestrian bridge was built across Mattawoman Creek in 1917 to provide access to the large African-American population in the

towns of Marbury and Pisgah (Hammer 1990:97).

After the Armistice in 1918, the Indian Head factory continued to meet demand for powder as there were a limited number of other powder plants. However, by the early 1920s activity began to diminish. President Warren G. Harding agreed to dismantle 236 American ships after a meeting with other world powers after his inauguration in 1921. Thereafter, military spending was increasingly cut, and although some factories continued to operate, they did so at decreased capacity. During the decades between the two wars, Indian Head reconditioned old powder and produced approximately 5,000 pounds of new powder a day to maintain stockpiles (Stevens et al. 1995:32-33).

As the U.S. Navy initiated its World War II expansion, Indian Head was one of only two Naval stations that were equipped with facilities for explosives production. As such, Indian Head became an indispensable asset in the war effort. The role of the powder factory was expanded through the addition of Extrusion Plant facilities, which included, in addition to the extrusion plant, rocket propellant production facilities for small rockets and a research and development facility. In all, the new construction included hundreds of new buildings used for the various research and production activities. Powder factory expansion included new distillation, storage, solvent recovery, and magazine buildings. Most construction began in 1941, with Du Pont serving as the major contractor, and was completed in 1942 (Cleven 2005:10).

5.6.3 Cold War Development and Research (1946 to 1989)

The end of World War II brought a temporary slowdown in activities at Indian Head, but worsening relations with the Soviet Union meant that by 1948 the United States was again strengthening its military forces. During the immediate postwar era Indian Head began to switch from the production of smokeless powder to rocket and missile propellants. The Patterson Pilot Plant began operations in the late 1940s, the first research, development, and experimental production facility of solid propellants by the Navy. Concurrent to its construction, the Navy expanded the work of the powder factory to produce propellants. Experimental powders were produced in small batches at the Patterson Pilot Plant. Once powders were successfully tested, they went into full production at the powder factory.

During the 1950s production expanded with the construction of the Cast Propellant Plant, the Biazzi Nitroglycerin Plant, the Nitroguanidine Plant, and the Cordite N Plant. Indian Head supported the Polaris program that began in 1956, the same year that Indian Head produced its last lot of smokeless powder. In 1958 Indian Head's name was changed to "Naval Propellant Plant," indicating the move away from powder production (Cleven 2005:11). In October 1960 Indian Head's responsibility for gun

propellants was extended, giving it wide responsibilities for many different types of propellants. The mission of the Propellant Plant in 1960 read: “To manufacture, inspect, test, and deliver missile propulsion units. Manufacture, load, assemble, rework, inspect, and test propellants and components. Perform production engineering to carry out the above functions. Conduct research and development in the field of chemistry, chemical engineering, chemical process development and pilot plant operation for solid propellants.

Work at the Propellant Plant had been steadily increasing since 1958 when it became even more heavily involved in the missile propellant field. Additional civilian employees were employed by programs such as the Polaris missile program. Expansion of physical facilities included the construction of the Polaris plant, completed in November 1960, at a cost of $3 million. Existing facilities such as the Explosive “D” plant (located south of the power plant area) were converted for use by the Polaris program (U.S. Naval Propellant Plant 1960:4-5).

In late 1961 Indian Head was required to increase the output of propellant grain for the Navy’s conventional weapons. Buildings in and around the former powder factory (Single Base Line) area were converted for manufacturing casting powder and cannon powder (cast propellant indicates that propellant was cast directly into a weapon’s casing). Buildings were converted for uses such as testing rocket grains at extreme temperatures, conversion to be part of the Zuni rocket grain packout facility, testing temperature control on extruded-type propellant grains, a pneumatic transfer system for handling cast powder, and a motor preparations facility (U.S. Naval Propellant Plant 1962:5-9).

In 1966 the emphasis at Indian Head shifted from production of rocket and missile propellants to research and development of propellants, chemicals, and explosives. As a result the station’s name was changed again, becoming the Naval Ordnance Station (Cleven 2005:11). During the 1970s Indian Head diversified its capabilities, beginning with rocket motor construction in 1976, as well as an increased emphasis on the production of specialty chemicals. Indian Head became a Center of Excellence in 1987 with six areas of specialization: (1) Energetic Chemicals; (2) Guns, Rockets, and Missile Propulsion; (3) Ordnance Devices; (4) Explosives; (5) Safety and Environmental Protection; and (6) Simulators and Training Shapes (Stevens et al. 1995:34).

5.6.4 Stump Neck

In 1890 the Bureau of Ordnance acquired 473 acres on Cornwallis Neck to be used as a new proving ground facility that would replace gun testing that had been taking place in Annapolis at the Naval Gun Factory. New facilities were constructed along the Potomac River in an area known as the Valley. In addition to short-range testing within the valley, long-range shots were fired downriver along the

Potomac. Residents of Stump Neck soon complained of shells from the Proving Ground passing overhead. In 1900 and 1901, Lt. Joseph Strauss, in command at Indian Head, recommended the purchase or lease of Stump Neck “to obviate the annoyance to people now residing in the vicinity when shell pass close to this point” (Carlisle 2002:35). As a result over 1,000 acres of land on Stump Neck were acquired from the Gaffield family in 1901.

Marine barracks and a rifle range for station guards were built on the newly acquired property, but the dangers of passing shells required troops to be moved out of the line of fire (Carlisle 2002:35). Private residents and troops barracked at Stump Neck were ordinarily out of the line of fire, but when the path of projectiles was irregular or fell short of the intended target, they could land on Stump Neck or the surrounding inlet. In 1910-1911 Cdr. Volney Chase headed a board to investigate the Stump Neck problem, noting that the officer in charge should be given authority to order the Marines at Stump Neck out of the line of fire, since the Marines did not report directly to Indian Head’s commanding officer. The board recommended the closure of the Marine barracks and the detachment evacuated, but the Marines stayed (Carlisle 2002:47), remaining at Stump Neck at least through 1931, when the Tenth Artillery Regiment, Marine Corps was reported to be encamped there (*Washington Post* 1931:11). The problem of long-range testing over Stump Neck continued until after World War I, when the Navy relocated the proving ground to the Dahlgren site on the Virginia side of the Potomac (Carlisle 2002:47). The rifle range was in use until approximately 1918. It encompassed the area from the causeway west to Building 2105.

During World War I Stump Neck was used to relieve the “unsatisfactory living conditions” at Indian 1427 Head for those who worked at the Powder Factory, when temporary barracks were established near the Marine facility (Carlisle 2002:60). During World War II, in June 1942, the chief of the Bureau of Ordnance authorized the establishment of an Ordnance Investigation Station at Indian Head. The formal name of the new laboratory at Stump Neck was the Explosives Investigation Laboratory (EIL). Stump Neck was ideal for research of explosives since it was an isolated location. Several types of work were given to the EIL, including stripping and disassembling recovered enemy ordnance such as mines, torpedoes, and bombs; researching methods of location, identification, and disposal of enemy and “our own” ordnance; and demonstrating, for instructional purposes, ordnance disposal techniques. The laboratory conducted research only on specific approval of the Bureau to avoid overlap with other research facilities. An Inspector of Ordnance was in charge of the EIL, working out liaisons with the laboratory facilities at the Powder Factory. The unit had three divisions: Research, Investigation, and Operations (Carlisle 2002:114-115).

The new laboratory was at work by the end of 1942. Lt. D. Klein was appointed as officer in charge in August 1942. The staff of approximately 80 incorporated men previously assigned to other units. EIL

staff worked on a variety of projects, from studies of X-ray techniques to the effects of underwater explosions. They worked on thousands of samples of captured Japanese, German, and Italian equipment, disassembling the devices, labeling the parts, and referring the materials to other laboratories to produce reports of their chemical composition. Eventually non-ordnance equipment, such as recording devices, clocks, pistols, tools, and parachutes, were included (Carlisle 2002:115-117). By the end of the war, there were 23 officers, 164 enlisted men, and an unspecified number of Women Accepted for Volunteer 1449 Emergency Service (WAVES) (U.S. Naval Powder Factory 1946:49).

In 1945 the Naval Mine and Bomb Disposal Schools combined and moved to Jackson Road at Indian Head. Various portions of Stump Neck were used as demolition areas from the 1940s through the 1990s to introduce students to live explosives (Malcolm Pirnie 2005). The course was designated as Explosive Ordnance Disposal Unit (EOD). An important part of the schools was the Ordnance Investigation Lab 1455 (OIL), formerly the EIL, at Stump Neck, which developed standardized procedures and tools for EOD professionals. In 1951 the Navy was assigned joint responsibility for EOD research, development, and training of EOD operators in the Army, Navy, Marine Corps, and Air Force. The research and 1458 development tasks were assumed by OIL, which was renamed the Naval Explosive Ordnance Disposal 1459 Technology Center (EODTC) in 1953. At the same time the Ordnance Disposal Unit was renamed the 1460 Naval Ordnance Disposal School (NAVEODTECHDIV 2011).

The EOD School trained students from all branches of the military with courses tailored to the needs of each branch. Students were required to be familiar with weapons ranging from cannon balls to atomic bombs, to recognize, render safe, and dispose of any explosive weapon that has been in the nation's arsenal. Students from each service were given more intensive training on the types of ordnance that were unique to their service. Navy students were given special training on the disposal of mines and other underwater ordnance. All Navy students were trained in diving before attending the school (Evans 1962).

During the 1960s the course was 26 weeks long, beginning with physics and ending with immobilizing 1470 live bombs in a training area. Training at Stump Neck included detonation of charges weighing up to 60 pounds (during advanced training at Elgin Air Force Base, Florida, charges could weigh up to 3,000 pounds). Students learned how to use portable X-ray machines, enabling them to determine what was inside a bomb casing. Other instruction included "access and recovery," or digging out a bomb that has been buried in the earth (Evans 1962). In 1962 EODTC was renamed Naval Explosive Ordnance Disposal Facility (EODF) 1476 (NAVEODTECHDIV 2011). Congress approved new construction for EODF in Fiscal Year 1964, including magazines, a surface ordnance facility, and an underwater weapons facility. EODF's development of rendering safe disarming procedures and disposal methods for conventional and nuclear weapons required storage for a wide variety of explosives and ordnance,

making segregated storage a necessity. As a result five new high explosives magazines were proposed for construction and three existing small keyport magazines were to be relocated and altered (U.S. Congress, Senate 1963:346).

Explosives Ordnance Disposal School and Technical Center operated as independent operations under the same naval officer commanding at the Naval Propellant Plant (Carlisle 2002:166). The EODF was redesignated several times, most recently in 1993 as the Naval Explosive Ordnance Disposal Technology Division.

EOD School left Indian Head in 1999 and relocated to Elgin Air Force Base in Florida (Carlisle 2002:226). The EOD Technology Division remains at Stump Neck, its mission to "...exploit technology and intelligence to develop and deliver EOD information, tools, equipment, and their life cycle support, to meet the needs of Joint Service EOD operating forces and other customers."

Stump Neck was home in the 1950s to passive moon relay research. The project began when Naval Research Laboratory (NRL) radio engineer James Trexler came up with the idea of intercepting Soviet communications using the moon's refractive properties. The project, Passive Moon Relay (PAMOR), began with construction on Stump Neck in 1950. A large, earthen parabola paved with asphalt and covered with metal grids was dug into the ground. A smaller reflector, suspended above the parabola by cables attached to metal towers, intercepted radio waves bounced off the parabola.

Though PAMOR was not a success, the project led to the discovery that the project could facilitate communications with ships on the other side of the earth. The new experiment came to be known as Operation Moon Bounce or the Moon Relay Project. During the substantial periods of time that the Moon's position did not permit intelligence gathering, Navy radio astronomers had access to the facilities for the Communications Moon Relay project (van Keuren 1997). The parabola acted as the transmitter via the moon to a receiver using an array of antennae, including the standard Model SK-2 radar antenna (van Keuren 2001:214). On July 24, 1954, the first sound of a human voice was transmitted beyond the ionosphere and returned to Earth. The first transcontinental relay circuit, between Stump Neck and the Navy Electronics Laboratory in San Diego, California, was successfully sent and received on November 29, 1955. On January 21, 1956, the experimental baseline was extended to Hawaii. SK-2 radar receivers were set up at Wahiawa, Oahu. The system received its first message when Adm. Arleigh Burke, Chief of Naval Operations, sent a congratulatory message to Adm. Felix B. Stump, Commander-in-Chief of the Pacific Fleet. Later in the decade these successful experiments led to the Navy's worldwide artificial satellite communications system (van Keuren 1997).

5.6.5 NSF Indian Head (1989 to Present)

In 1989 the Naval Sea Systems Command reconstituted several previously-acquired agency roles as

“centers of excellence” for the Navy. As a center of excellence, the facility would be treated as the primary collection of experts for six technologies: guns, rockets, and missiles; energetic chemicals; ordnance devices (CAD/PAD); missile weapon simulators; explosive process development engineering; and explosive safety, occupational safety and health, and environmental protection. Commands currently located at NSF Indian Head include the Naval Surface Warfare Center, Indian Head; 1523 NOSSA; NAVEODTECHDIV, Naval Sea Logistics Center, Detachment Indian Head; JITC; and the 1524 Marine Corps CBIRF.

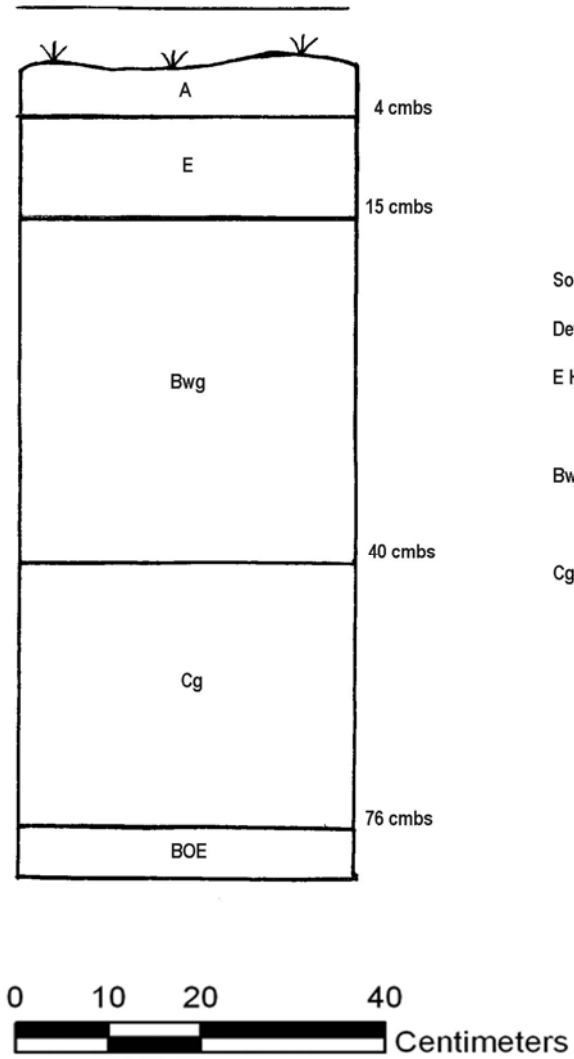
6.0 RESULTS OF FIELD INVESTIGATIONS

A total of 15 STPs were excavated in the APE. Shovel testing did not confirm the presence of previously recorded site 18CH258 within the APE, as no prehistoric artifacts were recovered. Excavation indicated that mixed soils were present across the corridors (Figure 6-1). The plow zone was deflated and very thin, extending to a maximum depth of 10 centimeters below ground surface (Photo 6-1). Heavy disturbance was also apparent in the vicinity of STP A-1, most likely the result of placement of storage containers and construction of an associated parking lot.

Historic artifacts were recovered from four shovel test pits: A-1 (Cinder Slag), B-1 (Plastic), B-2 (Flat Window Glass), and B-6 (Mason Jar Fragment). A small piece of modern plastic was recovered from STP B-1. STP B-2 yielded one flat window glass within the A Horizon. STP B-6 produced a curved modern Mason jar glass fragment from the A horizon (Table 1).

The absence of prehistoric artifacts and the degree of disturbance noted within the APE indicates that the installation of the proposed groundwater wells would have no effect on site 18CH258. The historic artifact assemblage was recovered from disturbed context and does not contain artifacts that would require further investigation of the historic component.

Profile of STP A-5



Soil Descriptions:

Deflated A Horizon: 10 YR 5/1 gray, Silt Loam

E Horizon: 10 YR 7/2 light gray;
mottled with a faint 10 YR 5/6 yellowish brown,
Very Fine Silt Loam

Bwg Horizon: 10 YR 7/2 light gray,
with 50% mottling of 10 YR 5/6 yellowish brown,
Silt Loam. Increasing clay content with depth.

Cg: 10 YR 5/1 gray, with 10% mottling of
10 YR 5/6 yellowish brown, Silty Clay Loam
to a Clay Loam. Becomes more plastic with depth.

Figure 6-1. Representative Positive STP Profile

Photo 6-1. STP A-5, West Wall Profile Demonstrating Deflated Plow Zone

Table 6.1 lists artifacts recovered by STP and by level within excavation unit.

Table 6.1. Distribution of Artifacts by STP and by Level

STP	Site Level	Material	Description	Total
A-1	2 (6-21 cmbgs)	Cinder Slag	Cinder slag discarded	5
B-1	1 (0-5 cmbgs)	Plastic	Small modern plastic fragment discarded	1
B-2	1 (0-3 cmbgs)	Flat Window Glass	Small modern window glass discarded	1
B-6	1 (0-5 cmbgs)	Curved Container Glass	Modern Mason jar body glass discarded	1

6.1 Summary

Although a previous surface reconnaissance revealed the presence of a diffuse lithic scatter with a possible Middle Archaic component, subsurface testing did not confirm the presence of previously recorded prehistoric site 18CH258 within the APE. Considering the absence of prehistoric artifacts and degree of disturbance noted within the APE, Tetra Tech recommends that the installation of the proposed groundwater wells would have no effect on site 18CH258.

The cultural materials were recovered from disturbed context and do not contain artifacts of sufficient antiquity to recommend further investigation of the historic component. No further archaeological investigations are recommended at site 18CH258.

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APPENDIX A

Project Correspondence

From: Carros, Nicholas T CIV NAVFAC Washington, Environmental
[mailto:nicholas.carros@navy.mil]
Sent: Wednesday, May 30, 2012 11:23 AM
To: Sok, Rob
Subject: FW: CERCLA/Arch site soil sampling

Nicholas Carros
Phone:(301)744-2263

WARNING: For Official Use Only (FOUO). This is an official Department of Defense communication.
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containing personally identifiable information are "For Official Use Only - Privacy Sensitive". Any misuse
or unauthorized disclosure can result in both civil and criminal penalties.

DISTRIBUTION STATEMENT: Distribution authorized FOUO to the Department of Defense, U.S. DoD
contractors, and Indian Head Installation Restoration Team only as of origination date. Other requests
shall be referred to author.

-----Original Message-----
From: Wright, Thomas CIV NAVFAC Washington, Environmental
Sent: Wednesday, May 30, 2012 10:17
To: Carros, Nicholas T CIV NAVFAC Washington, Environmental
Cc: Smolek, Michael A Sr. CIV NAVFAC Washington, ENV; Potter, William Y CIV NAVFAC Washington
Subject: FW: CERCLA/Arch site soil sampling

Nick,

The contractor should do 2 things prior to the arrival of the test equipment:

1) Survey the sites intended for either well drilling or DPT via shovel test pit;
2) Clearly mark the ingress/egress between DPT, well drilling and work area. Conduct visual and
STP in all areas.

Since material is visible on the surface, the archeologist should be able to identify preliminary routes
and then conduct STP to verify the routes.

Mike, any other suggestions?

Tommy

-----Original Message-----
From: Beth Cole [mailto:BCole@mdp.state.md.us]
Sent: Wednesday, May 30, 2012 10:10
To: Wright, Thomas CIV NAVFAC Washington, Environmental
Cc: Smolek, Michael A Sr. CIV NAVFAC Washington, ENV
Subject: RE: CERCLA/Arch site soil sampling

If they have pretesting the well and ample sites in advance, the test locations are clearly well marked,
and nothing was found in those locations - then it probably isn't necessary to have the archeologist
present during the DPT or well drilling. However, the archeologist should still be on call in case of any
discoveries. Also, you'll want to have good controls on construction access, etc. - especially if the
ground conditions are wet. According to the site form, this lithic scatter was visible on the ground
surface and has already experienced some erosion impacts. Thanks for asking.

Beth

Beth Cole
Administrator, Project Review & Compliance
Maryland Historical Trust
100 Community Place
Crownsville, MD 21032
410-514-7631
410-987-4071 (fax)
bcole@mdp.state.md.us
http://mht.maryland.gov
Please consider the environment before printing.

-----Original Message-----
From: Wright, Thomas CIV NAVFAC Washington, Environmental
[mailto:thomas.a.wright@navy.mil]
Sent: Wednesday, May 30, 2012 9:57 AM
To: Beth Cole
Cc: Smolek, Michael A Sr. CIV NAVFAC Washington, ENV
Subject: CERCLA/Arch site soil sampling

Morning Beth,

We need to conduct some direct push technology (DPT) soil samples in site 18CH258 as well as install

some 6" water monitoring wells. They will be conducting sampling to determine the extent of TCE.

The DPT rig is on back of a pick-up truck while the well installation (3 of them) will be a normal drilling
rig. The IR program will have an archeologist on site during the well drilling and will screen the site using
shovel test pit sampling prior to drilling the well. If significant material is recovered, they will move the
drill to another location. I am hoping to convince them to go out prior to the arrival of the rig to select
sites. If that is the case, will they need to have an archeologist on site during the DPT or the well
drilling?

As soon as I can get a map, I will forward it to you.

Thanks
Tommy

Thomas A. Wright, CRM
NEPA / Cultural Resources Program Manager
Environmental Division
PWD South Potomac
3972 Ward Road, Suite 101
Indian Head, MD 20640-5157
301-744-2260 (w)
301-904-9450 (c)

APPENDIX B

Qualifications of Principal Investigator

JAMES T. MARINE
CULTURAL RESOURCES SPECIALIST ENVIRONMENTAL SCIENTIST V
(PRINCIPAL INVESTIGATOR / GEOMORPHOLOGIST)
PITTSBURGH, PENNSYLVANIA

EDUCATION:

MS / Geology / University of Pittsburgh 1997

BS / Business Management / University of Pittsburgh 1988

CERTIFICATIONS/ REGISTRATIONS

Registered Professional Archaeologist RPA ID # 15794

TRAINING:

ODOT Section 106	5/12/04 Refresher 7/13/11	
30 Hour OSHA General Construction 7/09		
40 Hour OSHA HAZWOPER	6/26/02	refreshed yearly
Excavation Safety Subpart P	05/21/02	refreshed every 2 years
Permitted Confined Space Entry	04/04/08	refreshed every 2 years

EXPERIENCE SUMMARY:

Mr. Marine is a Registered Professional Archaeologist and accredited geomorphologist with over 20 years of experience, and is a member of the Pennsylvania Archaeological Council. Mr. Marine started the Cultural Resources Program at Tetra Tech in 2009 The Cultural Resources Program now conducts full service archaeological investigations in support of NEPA compliance for clients such as the United States Department of Energy, the United States Coast Guard, the United States Environmental Protection Agency, the Army Corps of Engineers, the Pennsylvania Department of Transportation, the Pennsylvania Turnpike Commission, the Georgia Department of Transportation, the West Virginia Division of Highways, and other public and private clients throughout the mid-Atlantic and southeast. Mr. Marine received his MS in Geology from the University of Pittsburgh in 1997 where he specialized in geomorphology and sedimentology. In addition to his archaeological background, Mr. Marine has investigated several stratified sites in deep alluvial settings including regionally significant prehistoric sites on the Susquehanna and Ohio Rivers.

HIGHLIGHTED PROJECT EXPERIENCE:

Cultural Resources Specialist: Cultural Resource Assessment of Archaeological and Historic Resources for Department of Veterans Affairs (VA) Pittsburgh Healthcare Highland Drive Division Campus. **2012**

Principal Investigator/ Geomorphologist: Phase I and II Archaeological Investigations at the Sherwood Natural Gas Plant. Doddridge County, WV. MarkWest Liberty Midstream Resources LLC. **2012**

Cultural Resources Specialist: Mr. Marine is currently assisting the United States Coast Guard in developing of a Memorandum of Agreement (MOA) with the Maryland Historic Trust and Advisory Council on Historic Preservation for mitigation measures necessary to remove historic structures at The Curtis Bay YARD-Historic District in Anne Arundel County, Maryland. **2012**

Cultural Resources Specialist: Update of the Integrated Cultural Resource Management Plan for Joint Base Lewis McChord, Pierce County, Washington. **2011 in progress.**

Cultural Resources Specialist/Geologist: Authored the Historic Properties and Geologic chapters of an Environmental Assessment (EA) prepared for the United States Coast Guard for proposed New Station Lake Charles, Calcasieu Parish, Louisiana. **2011**

Principal Investigator: Phase I archaeological survey at United States Coast Guard Thunder Bay Island Light Station, Lake Huron, Alpena County, Michigan. **2011.**

Cultural Resources Specialist: Land Use History for Detroit Edison Power. The Land Use History was prepared in association with the proposed construction of an off-site wetland mitigation project as compensation for impacts to wetlands and aquatic resources at the Enrcio Fermi 3 Nuclear Power Plant, Monroe County, Michigan. **2011.**

Principal Investigator/ Geomorphologist: Phase I Archaeological Survey at the Front Street water booster station, Borough of Royalton, Pennsylvania. Prepared for HRG Inc. **2011.**

Principal Investigator: Phase I Archaeological Survey of the Clearview Landfill, City of Philadelphia and Delaware Counties, Pennsylvania. Identification of a Revolutionary War period cemetery United States Environmental Protection Agency Region III. **2010.**

Geomorphologist: Phase IA Geomorphological Reconnaissance for the proposed Lackawanna River Floodwall, Duryea Borough, Luzerne County, Pennsylvania. Pennsylvania Department of Environmental Protection. **2010.**

Principal Investigator: Phase I Archaeological Survey for the 11-acre Wetland Mitigation Site at State Game Lands 232, Blaine Township, Washington County Pennsylvania**.** MarkWest Liberty Midstream LLC, **2010.**

Cultural Resources Specialist: Documentation of the Removal of the Gray's Reef Radio Beacon Tower as specified in the MOA between the Michigan SHPO and the USCG. Emmet, County Michigan, **2010.**

Appendix B

Soil Boring Logs

2011

Soil Boring Logs

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Ground Zero
DRILLING RIG: Geoprobe 6626DT

BORING No.: SB08/MW03
DATE: 6-4-11
GEOLOGIST: J. Birketh
DRILLER: Gene Burke

	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**
1130	S-1			4.75/5		med stiff	Brn	Silt some clay tr. F. sand		moist	0	0	0	0
						↓								
											0	0	0	0
						stiff	Brn gray	Silt and Clay		Moist				
		5									0	0	0	0
1138	S-2			4.5/5		med dense to loose	Brn	F. sand some silt and M. sand		moist	0	0	0	0
							light Brn	Same as above						
					▽		Brn	↓ ↓		1140 *S43SB08-0608 clay stringer 8' bgs	0	0	0	0
										wet				
		10				stiff	Gray	Clay some VF sand		wet	0	0	0	0
1143	S-3			3.5/5				↓ ↓		wet	0	0	0	0
						very stiff	Brn	Clay some silt and F. sand		moist	0	0	0	0
		15				stiff	Brn	VF-F sand some silt tr. M sand		wet	0	0	0	0
1150	S-4			2.5/5		Dense	Brn	F-M sand tr. some clay		Wet	0	0	0	0
						Dense	Brn	F sand some clay and M sand		wet				
								↓ ↓			0	0	0	0
						loose	Brn	F-M sand tr clay						
		20				slightly stiff	Gry Brn	Clay and F-M sand (50/50)		Wet	0	0	0	0
1208	S-5			3/5		loose	Brn	F-M sand tr. silt and clay		very wet sample	0	0	0	0
						loose	Brn Gray	F-C sand some F-M, rock frags tr. silt		very wet	0	0	0	0
		25						↓ ↓			0	0	0	0

* 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: Continuous macrocore (1" Φ in 2 Φ sleeve) to 30' bgs
Discrete soil sampling below 30' w/ control rods and 2" Φ cutting shoe 5' long

Converted to Well: Yes (X) No ~~XX~~ Well I.D. #: S43MW03

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Ground Zero
DRILLING RIG: Geoprobe 6620DT

BORING No.: SB08/MW03
DATE: 6-4-11
GEOLOGIST: Jacob Birkett
DRILLER: Gene Burke

	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
1230	S-6			3.5?/5				F-C sand some F-L Rock frags		very wet sample slot o F slough	0	0	0	0
										recovery hard to determine				
											0	0	0	0
		30				med stiff	Gray	clay tr F sand		Gray clay in shoe	0	0	0	0
1338	S-7			2/5		med dense	Gray	MC sand and F-M pebbles tr. silt and F sand		1305 pull sampler (discrete) but detached from string in hole	0	0	0	0
										Switch to 5' discrete sampler				
											0	0	0	0
	~~S-8~~	35						? ?		not enough recovery				
1410	S-8			1.5/5		stiff	Blk	Organic rich clay tr. silt (fossil grass)		wet	0	0	0	0
											0	0	0	0
								? ?						
		40												
					EOB 40' bgs									

* When rock coring, enter rock brokeness.

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

Remarks: See previous page

Drilling Area Background (ppm): 0

Converted to Well: Yes X No _____ Well I.D. #: S43MW03

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Ground zero
DRILLING RIG: GeoPROBE 6620DT

BORING No.: SB09/MW04
DATE: 6-4-11
GEOLOGIST: J. Birkett
DRILLER: Gene Burke

Time	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**
0905	S-1			3.5/5		Med stiff	Brn Gray	Silt some clay tr. organics		moist	0	0	0	0
						stiff	Dk Gray Brn	Silt some clay tr. VF. sand						
						stiff	Brn Gray	Silt some VF. sand tr. clay		moist	0	0	0	0
						stiff	Gray	" same as above						
		5						↓		moist	0	0	0	0
0910	S-2			4/5		stiff	Gray	Silt some V. F sand tr. clay		0910	0	0	0	0
						Med stiff	Gray	F. sand some clay		S43SB09-0608 Moist to wet				
					▽			F. sand some clay tr. M. sand			0	0	0	0
						Med stiff	Gray Brn	F. sand tr. to some clay		wet				
		10						↓ ↓			0	0	0	0
0915	S-3			5/5		m-stiff	Brn Gray	Same as above		wet	0	0	0	0
						stiff	Gry	Silt some F. sand tr. clay		wet to moist	0	0	0	0
						stiff	Brn	Silt some clay tr. F. sand		tr. Blk stain in g				
		15						F. sand some clay		moist	0	0	0	0
							Brn	Clay some F. sand		wet				
0922	S-4			3/5		↓	↓	↓ ↓		wet	0	0	0	0
						↓	↓	↓ ↓			0	0	0	0
						Med dense	gray	F-M Sand tr. clay and C. sand		wet				
		20				loose	gray	M-C sand tr. silt and pebble		wet	0	0	0	0
0927	S-5			3.5/5				↓ ↓		wet	0	0	0	0
											0	0	0	0
		25						↓ ↓			0	0	0	0

* 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 (X) No ~~XX~~ Well I.D. #: S43MW04

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Ground Zero
DRILLING RIG: Geoprbe

BORING No.: SB09/MW09
DATE: 6-4-11
GEOLOGIST: Jacob Birkett
DRILLER: Gene Burke

	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
0937	S-6			5/5		loose	Gray	M-C sand some pebbles		wet	0	0	0	0
								↓ ↓						
											0	0	0	0
						very stiff	Gray	Clay tr. silt		wet				
		30				loose	Gray	M-C sand tr. pebbles		wet.	0	0	0	0
1050	S-7			1/4		loose	Gray	M-C sand		1025 pullout first attempt but the point did not release	0	0	0	0
								Organic rich clay tr. silt						
						med stiff	Blk			move 1' over wet				
								↓ ↓			0	0	0	0
		35			EOB 34' bgs									

* When rock coring, enter rock brokeness.

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

Remarks: Continuous 1" macrocores in 2" sleeve to 30' bgs
Discrete 4' x 2" macrocores below 30' bgs

Drilling Area Background (ppm): 0

Converted to Well: Yes (X) No ~~X~~ Well I.D. #: S43MW009

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Ground Zero
DRILLING RIG: Geoprobe 7822 DT

BORING No.: SB10 MW05
DATE: 6-3-11
GEOLOGIST: J. Birkett
DRILLER: Gene Burke

	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**
1500	S-1			4.5/5		very loose	light Brn	F sand some M-C sand and silt		dry	5.8	0	0	0
						Med loose	DK Brn	F-C sand some clay and large gravel		damp	0	0	0	0
						med stiff		Rock Fragments and F-C sand and clay			1.3	0	0	0
						very stiff	Brn Gray	Clay some silt tr. F sand		damp				
		5						↓ ↓ ↓ ↓			0	0	0	0
1510	S-2			4/5		Very stiff	Brn Gray	Clay some silt some F sand		moist	0	0	0	0
						Med stiff	Brn Gray	Clay and silt some F. sand		moist to wet	0	0	0	0
					⊠	Med dense	Gray Brn	F-M sand some silt		wet				
		10						↓ ↓ ↓		1510 S43SB010-0709	0	0	0	0
1515	S-3			4/5			Gry Brn	F-M sand some silt tr. pebbles		wet	0	0	0	0
								↓ ↓			0	0	0	0
						very stiff	Gray Brn	Silt some clay tr. F sand		wet				
		15					Brn	Silt some clay			0	0	0	0
1520	S-4			3/5		very stiff	Brn	Silt some clay		wet	0	0	0	0
								↓ ↓			0	0	0	0
						med stiff	Gry Brn	Clay some silt tr. F. sand		wet				
		20				very stiff	Brn	Silt (50/50) and clay			0	0	0	0
1530	S-5			4/5		med stiff	Gry Brn	Clay some silt and F-M sand		wet	0	0	0	0
								↓ ↓			0	0	0	0
								M-C sand tr F. gravel		wet				
		25						↓ ↓			0	0	0	0

* When rock coring, enter rock brokeness.

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

Remarks: Continuous macrocore to 30' bgs (1"ϕ core 2" sleeve)
Discrete macrocores to 40' bgs

Drilling Area Background (ppm): 0

Converted to Well: Yes X No ____ Well I.D. #: S43MW05

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Ground Zero
DRILLING RIG:

BORING No.: SB10 MW05
DATE: 6-3-11
GEOLOGIST: Jacob Birkett
DRILLER: 6-4-11 Corey Gamwell

	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
Time 1540	S-6			3/5		loose	Gray	M-C sand tr. F. gravel		wet	0	0	0	0
											0	0	0	0
RESTART 6-4-11 0900		30				stiff	Gray	Silt some clay / M-C sand tr. F. gravel		wet	0	0	0	0
	S-7			1/5	EOB KS 30' bgs	~~MED STIFF~~ MED DENSE	~~DARK~~ GRAY	COARSE/MED SAND LT GRAY TR FINE SAND	SW		0	0	0	0
		35				MED STIFF	DARK GRAY	CLAY SOME SILT TR F SAND			0	0	0	0
0920	S8			2.5/5										
		40									0	0	0	0
								TD 40' BGS						

* When rock coring, enter rock brokeness.

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

Remarks: 0-30' BGS 6-3-11 JB
30-40' BGS 6-4-11 KS

Drilling Area Background (ppm): 0

Converted to Well: Yes X No _____ Well I.D. #: S43 MW05

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Ground zero
DRILLING RIG: Geoprobe 6620DT

BORING No.: SB 11 /MW06
DATE: 6-4-11
GEOLOGIST: J. Birkett
DRILLER: Gene Burke

	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**
1522	S-1			4/5		Very loose	light Brn	VF-C sand some large pebbles		dry	0	0	0	0
						loose	Brn	VF-F sand some M pebbles tr. clay		moist				
						very stiff	Brn DK Gray	Silt some clay tr. F. sand		damp	0	0	0	0
						↓	↓							
		5				dense	Gray	F. sand some clay ~~Clay some silt tr. F. sand~~		damp	0	0	0	0
1526	S-2			4/5		mi dense	Gray	F. sand some clay		moist	0	0	0	0
						stiff	~~Brn~~	Clay some F. sand		moist				
						dense	Brn	F. sand some clay	X	Collect (1526) S43SB011-0709 and Duplicate	1.4	0	0	0
						↓	Brn Gry	↓						
		10				↓	Gry	↓			8.2	0	0	0
1531	S-3			3/5		m. stiff	Gry Brn	F. sand and clay (50/50)		wet	18	0	0	0
						loose	DK Brn Brn	F-M sand tr. silt						
						slightly stiff	Brn	clayey (40/60) F. sand tr. M sand		wet	0.3	0	0	0
								↓ ↓						
		15				loose	Brn	F-M sand some C. sand tr. silt		wet	1.3	0	0	0
1545	S-4			3/5		loose	Brn Gry	M sand some C. sand tr. silt		wet	1.9	0	0	0
							Gry	F-C sand some pea pebbles tr. silt						
								↓ ↓			1.3	0	0	0
		20				very stiff	Gry	Clay tr. VF sand		wet	0	0	0	0
1557	S-5			4.5/5		very stiff	Gry	Clay tr. VF. sand		wet	0.8	0	0	0
											1.4	0	0	0
		25				loose	Gray	M-C sand tr. silt		wet	0	0	0	0

* 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: Continuous macrocore to 30' bgs (1" ϕ core in 2" sleeve)

Converted to Well: Yes X No ____ Well I.D. #: S43MW06

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Ground Zero
DRILLING RIG: Geoprobe 6620DT

BORING No.: SB 11/MW06
DATE: 6-4-11 and 6-12-11
GEOLOGIST: Jacob Birkett
DRILLER: Gene Burke

	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
6-12-11 1425	S-6			2.5/4		M. dense	Gry	F-C sand some F-M pebbles tr. silt		wet	0	0	0	0
											0	0	0	0
		30												
				8		M. dense	Gray	F-C sand some F-M pebbles tr. silt		wet				
											0	0	0	0
1455	S-7			3/4										
		35				Stiff	DK Gray	organic rich clay		Shelby Tube (1510) S43SB011-3335	0	0	0	0
					EOB 36' bgs									

* When rock coring, enter rock brokeness.

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

Remarks: Discrete soil sampling (macrocores 2"x4') from 28-36' bgs

Drilling Area Background (ppm): 0

Converted to Well: Yes X No _____ Well I.D. #: S43MW06

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Ground Zero
DRILLING RIG:

BORING No.: SB12/TW06
DATE: 6-11-11
GEOLOGIST: J. Birkett
DRILLER: George Sarta

	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**
1050	S-1			3/5		Med St. Ff	Brn/Gray	Clay some silt and F sand tr. C. sand		Moist to wet	0	0	0	0
						Very stiff	Gray/Brn	Silt tr. to some F. sand		Hit rock that				
										prevent full recovery at ~1' bgs	0	0	0	0
										moist to dry				
		5									0	0	0	0
1053	S-2			4.5/5		Stiff	Gray Brn	F. sand some silt tr. clay		Moist (105)	0	0	0	0
					▽					543 SB012-0507				
						Dense	Gray Brn	F. sand tr. to some silt		wet	0	0	0	0
		10									0	0	0	0
~~1104~~	S							Skip over 10-28' bgs interval						
								No sampling						
		15												
		20												
		25												

* When rock coring, enter rock brokeness.

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

Remarks: Continuous (5'x2") macrocore to 10' bgs
Discrete (4'x2") macrocore below 28' bgs

Drilling Area Background (ppm): 0

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Ground Zero
DRILLING RIG:

BORING No.: SB12/TW06
DATE: 6-11-11
GEOLOGIST: Jacob Birkett
DRILLER: George Sorta

	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
								No sampling till 28'bgs						
1109	S-3			4.5/5		Dense	Gray	M-C sand tr. silt		wet	0	0	0	0
		30												
										wet	0	0	0	0
		32				Stiff	DKGray	Organic rich clay						
					EOB 32'bgs									
		35												

* When rock coring, enter rock brokeness.

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

Remarks: See previous page

Drilling Area Background (ppm): 0

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Ground Zero
DRILLING RIG: Geoprobe 7822 DT

BORING No.: SB13 / TW07
DATE: 6-3-11
GEOLOGIST: J. Birkett
DRILLER: Corey Gammel

Time	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**
1110	S-1			5/5		Loose	Blk	Crushed asphalt			0	0	0	0
						Stiff	Dk gray	Silt (50%) and clay tr. F. sand		moist mottled				
							to Brn				0	0	0	0
		5				Stiff		Silt and clay some F. sand		Moist to wet	0	0	0	0
1115	S-2			3/5	▽			Silt and clay some F. sand		S43SB0130608				
										wet (Time 1120)	0	0	0	0
						Stiff								
						M. Dense	Gry	F-M sand some clay		Wet	0	0	0	0
		10				M. Dense	Gray and Brn	F-M sand tr. clay						
1120	S-3			5/5		Stiff	Brn Org	F sand some clay		Moist	0	0	0	0
						Stiff	Gray Org	~~Silt~~ Clay some silt and F. sand		wet				
						Med Stiff	Gray	F. sand some clay		wet	0	0	0	0
						Stiff	Gray Org	Clay some silt and F. sand						
		15				Loose	Gray	F-M sand some clay tr. F-M gravel		wet	0	0	0	0
1125	S-4			2/5		loose	Gray Brown	M-C sand some M gravel tr. clay		wet				
						Stiff	Brn	Clay some F-M sand			0	0	0	0
								M-C sand?		loss sample				
											0	0	0	0
		20								wet				
1130	S-5			4/5	X	Very loose	Brn	M-C sand and gravel tr. clay		wet	0	0	0	0
											0	0	0	0
						loose/Med Stiff	Brn	F-C sand some clay		wet				
		25				very loose	Gray	M-C sand and F-M gravel			0	0	0	0

* 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: 5' macro sample w/ 1" sample taken within 2 in macro core liner not discrete

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Ground zero
DRILLING RIG: Geoprobe 7822DT

BORING No.: SB13/TW07
DATE: 6-3-11
GEOLOGIST: Jacob Birkett
DRILLER: Corey Gammel

Time	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
1040	S-6			4.5/5		loose	Gray	F-M sand tr. clay and F. gravel		wet	0	0	0	0
											0	0	0	0
						Med Stiff	Gray	Clay some silt		wet				
		30									0	0	0	0
					EOB 30' bgs									
		35												

* 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 X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Ground zero
DRILLING RIG: Geoprob 6620DT

BORING No.: SB14 / TW 8
DATE: ~~4-6-11~~ 6-4-11
GEOLOGIST: J. Birkett
DRILLER: Gene Burke

	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**
1715	S-1			4/5		loose	Blk Brn	Crushed Rock and F(sand/silt)		moist	0.7	0	0	0
						med stiff	Brn Gray	Clay tr. silt and F. sand						
						Stiff	Blk	↓ ↓			36.4	0	0	0
						↓	Gray	Silt some clay and F. sand		moist (odor)				
		5				↓	↓				52.4	0	0	0
1720	S-2			5/5		↓	↓	Silt some clay and F. sand		moist	80	0	0	0
						stiff	Gray							
						m. dense	Brn Gray	clayey (40/60) F. sand tr. silt		moist to wet	31	0	0	0
					▽			↓ ↓		S435SB014-0709 w/MS/MSD				
		10						↓ ↓		wet	36	0	0	0
								Push down with						
								discrete sampler to						
								28-32' interval						
		15												
								↓						
		20												
		25												

* 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: Continuous soil core to 10' bgs
Discret soil sampler from 28' bgs to 7

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Ground Zero
DRILLING RIG: Geoprobe 6620 DT

BORING No.: S14 / TW 8
DATE: 6-4-11
GEOLOGIST: Jacob Birkett
DRILLER: Gene Burke

	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
1750	S-3	28		2.5/4		M dense	gray	F-C sand some pebble tr. silt		liner crushed in extruder wet	0.4	0	0	0
		30								clay stringer at 30.5' bgs	0	0	0	0
		32									0	0	0	0
1820				2.5/4		stiff	dk gray	organic rich clay tr. F sand		wet	0	0	0	0
		35									0	0	0	0
		36												
					EOB 36' bgs					set TW8 From 28-30' bgs				

* 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: See previous page

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

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Ground Zero
DRILLING RIG: Geoprobe 7822 DT

BORING No.: SB 15 /TWO
DATE: 6-3-11
GEOLOGIST: J. Birkett
DRILLER: Gene Burke

Time	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**
1253	S-1			4/5		loose	Blk	Crushed asphalt			2.4	0	0	0
						loose	Blk	F-C sand some F-M gravel		moist				
						loose	Brn	F-C sand some round pebble		moist to wet	0.4	0	0	0
						very Stiff	Blk Gray	Clay some silt		dk blk organic rich layer (organics)				
		5				very stiff	Gray Brn	Clay tr. silt		moist	0.0	0	0	0
1300	S-2			3/5		very stiff	Gray Brn	Silt tr. clay and F. sand		2ft slough	9.8	0	0	0
					▽	stiff	Gray Brn	Silt some F. sand and clay		Fuel/solvent odor	6.3	0	0	0
						↓	↓	↓		S43 SB15-0810				
		10								moist to wet time 1305				
1305	S-3			3/5		med dense	Brn Gray	F. sand some clay		wet				
											3.5	1.3	0	0
						very Stiff	Brn Gray	Clay some silt		wet				
											1.5	0.7	0	0
		15				med dense	Gray Blk	F-M sand tr. silt		wet				
1315	S-4			2/5		very loose	Brn	F-C sand some F-L gravel		wet				
										large gravel 1.5" ϕ	17	0	0	0
											25	0.6	0	0
		20				loose		F-C sand tr. small gravel		wet				
1317	S-5			2.5/5		very loose	Gray	M-C sand		wet	0	0	0	0
											0.3	0	0	0
		25								clay in shoe	0	0	0	0

* 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): 0-0.6

Remarks: Continuous macrocores 28' bgs (1" ϕ cutting shoe with 2" ϕ x 5' macrocore sleeve

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Ground Zero
DRILLING RIG: Geoprobe 7822 DT

BORING No.: SB15/TW09
DATE: 6-3-11
GEOLOGIST: Jacob Birkett
DRILLER: Cory Gammel

Time	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
1323	S-6			0.5/3		Stiff	Gray	Silt (50/50) and Clay			1.3	0	0	0
											0	0	0	0
					EOB 28' bgs									
		30												
		35												

* 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:

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Ground Zero
DRILLING RIG: Geoprobe 6620DT

BORING No.: SB16/TW10
DATE: 6-5-11
GEOLOGIST: Jacob Birkelt
DRILLER: Tom

	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
1000	S-1			5/5		loose	DK Brn	Top soil w/organics		moist	0	0	0	0
						Stiff	Brn Gray	Silt some F. sand and clay		dry				
											0.2	0	0	0
						Stiff	DK Gray	Clay some silt		moist				
		5				Stiff	Gray	Clay some silt and F sand			0.2	0	0	0
1011	S-2			5/5				↓ ↓		Moist	0.1	0	0	0
					▽	Stiff	Gray	Silt some clay and F. sand		moist to wet S43SB016-0608	0.1	0	0	0
										VOC From JB ~~5-7~~ 7-7.5'				
		10					Gray	~~F. sand some clay~~ clayey F. sand (40/60) JB		wet	0.1	0	0	0
1018	S-3			3/5				↓ ↓		wet	0.1	0	0	0
						Dense	Gray Brn	F. sand some clay tr. pebbles						
										wet	0.1	0	0	0
1						Stiff	light Brn	Clay some silt tr. F. sand						
		15				Stiff	Gry to DK Gray	Clay some organics tr. F. sand		wet (wood fragments)	0.1	0	0	0
1022	S-4			4/5		med stiff	Gry	Clay some F. sand		wet	0.1	0	0	0
						med stiff	Gray	Clay some F-M sand		wet	0.1	0	0	0
		20						↓ ↓		wet	0.1	0	0	0
1031				4/5		med. stiff	Gray	Clay tr. to some F sand			0.1	0	0	0
								↓ ↓		wet	0.2	0	0	0
						M. dense	gray	M-C sand and clay some m. gravel		wet				
		25				very stiff	gray	Silt some clay and F. sand		moist wet	0.1	0	0	0

* 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): 0.1

Remarks: Continuous 1" Φ macrocore in 2" Φ x 5' sleeve to 30' bgs
Discrete from 30 soil sample

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Ground Zero
DRILLING RIG: Geoprobe 6620DT

BORING No.: SB 16/TW 10
DATE: 6-5-11
GEOLOGIST: Jacob Birkett
DRILLER: Tom

	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
1040	S-6			3/5		stiff	Grav	Clay tr to some F sand		wet	0.2	0	0	0
										wet	0.1	0	0	0
						dense	Gray	M-C sand tr. F. sand and silt						
		30								wet	0.1	0	0	0
					No Sample									
								JB 6-5-11 ~~M-C sand tr. F sand and silt~~		wet				
1155	S-7	32		3/4		dense	grav	M-C sand tr. F. sand and gravel			0.1	0	0	0
		35				stiff		organic rich clay tr. F. Sand		wet	0.1	0	0	0
		36												
					EOB 36' bgs									
								Set TW10 from 29-33' bgs						

* When rock coring, enter rock brokeness.

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

Remarks: See previous page

Drilling Area Background (ppm): 0.1

Converted to Well: Yes _____ No X Well I.D. #: _____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Ground Zero
DRILLING RIG: Geoprobe 7822 DT

BORING No.: SB17/TW11
DATE: 6-10-11
GEOLOGIST: J. Birkett
DRILLER: Gene Burke

Time	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**
1006	S-1			4/5		loose	Brn	M sand some gravel tr. clay		moist	0.3	0	0	0
						loose	tan	rock Frag S and F-M sand						
						very stiff	Brn/Gray	Clay tr. to some silt		moist	1.2	0	0	0
						m. dense/stiff	Brn gr	Clay some F. Sand		Moist				
		5				m. dense	Gray	F. sand some clay ~~F. sand some clay~~ JB		moist to wet	1.7	0	0	0
1010	S-2			4/5		m. stiff	Gray Brn	Clay some F. sand			13.5	0	0	0
										1010 S435B017-0608				
					▽	m dense		F. sand tr. clay		moist to wet	12.7	0	0	0
						stiff	Gray	Clay some F. sand		wet				
		10				sl. dense	Gray/Brn	F. sand tr. to some clay		wet	13.5	0	0	0
1014	S-3			4/5		↓	Brn/Gray	↓		wet	25.7	0	0	0
						m. stiff	Brn	F. sand some clay						
							Brn	Silt some F. sand tr. silt			5.7	0	0	0
						stiff		↓						
		15				m. dense	Brn	M-C sand tr. silt		wet				
1020	S-4			1.5/5		m. dense	Brn	M-C sand tr. silt and pebbles		wet	5.2	0	0	0
										Grain size S435B017-1517				
											3.1	0	0	0
		20												
1033	S-5			0.5/5		very loose	Gray	Sand (could be mostly slough)		wet Poor recovery all sample came out of sleeve				
						stiff	Gray	Clay (at very bottom)		wet				
		25												

* 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: Continuous macrocore (4" x 5' sleeve w/ 1" core inside to 25' bgs)
Discrete sampler after 25' bgs (4" x 2" cores

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Ground Zero
DRILLING RIG: Geoprobe 7822DT

BORING No.: SB17/TW11
DATE: 6-10-11
GEOLOGIST: Jacob Birkett
DRILLER: Gene Burke

	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**
1057	S6	25		3.5/4		M stiff	Gray			Gene mentioned point might not have relaxed	0	0	0	0
						Dense	Gray	F-C sand tr. silt and pebbles		at 25' bgs wet				
											0	0	0	0
		30									0	0	0	0
1125										Wet	0	0	0	0
		32			?—									
	S7			3/4	Contact	very stiff	Blk/DK Gry	Organic Rich Clay		Fossil leaves	0	0	0	0
										Set TW 11 From 30-34				
		35								Drillers notes	0	0	0	0
		36								point didn't release until ~35' bgs				
		37									0	0	0	0
					EOB 37' bgs									

* 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: See previous page

Converted to Well: Yes _____ No X Well I.D. #: _____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Groundzero
DRILLING RIG: Geoprobe 7822DT

BORING No.: SB18/TW12
DATE: 6-10-11
GEOLOGIST: Jacob Birkeff
DRILLER: Gene Burke

Time	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**
1328	S-1			3/5		loose	Blk	Crushed asphalt		moist	12.7	0	0	0
						loose	blk	F-M Sand tr. gravel		moist				
						loose	Brn	Crushed rock and F-M sand some silt		Moist rock core	0	0	0	0
						very stiff	Gray/Brn	Silt some clay tr. F. sand		Moist				
		5				↓		↓		(1338) S435B018-0507	0	0	0	0
1332	S-2			3/5		m.dense	Gry/Brn	F. sand some silt		moist to wet	0	0	0	0
					S2					wet				
	S-										0	0	0	0
										pebble				
		10									0	0	0	0
	~~S-3~~							No samples until 28-32' interval						
		15												
	~~S-4~~													
		20												
	~~S-5~~													
		25												

* When rock coring, enter rock brokeness.

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

Remarks: Continuous macrocore to 10' bgs (5'x2" sleeves)
Discrete soil sampling starting at 28' bgs

Drilling Area Background (ppm): 0

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Ground zero
DRILLING RIG: Geoprobe 7822DT

BORING No.: SB 13 / TW 12
DATE: 6-10-11
GEOLOGIST: Jacob Birkett
DRILLER: Gene Burke

	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	S-6							No soil cores until 22' bgs						
								↓ ↓						
1500	S3			0/4				No recovery		point didn't				
		30								release (S.C. Sand?)				
								↓ ↓			0	0	0	0
										(1600) Grain Size 34358018-3234				
1600	S-4			4/4		dense	gray	M sand Som C. sand tr. silt		wet	0	0	0	0
								↓ ↓						
		35				very stiff	dk gray Blk	Organic rich clay		wet	0	0	0	0
					TD 36' bgs									

* When rock coring, enter rock brokeness.

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

Remarks: See previous page

Drilling Area Background (ppm): 0

Converted to Well: Yes _____ No X Well I.D. #: _____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Ground Zero
DRILLING RIG: Geoprobe 7822DT

BORING No.: SB 19 / SG01
DATE: 6-11-11
GEOLOGIST: J. Birkett
DRILLER: George

Time	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
0940	S-1			2/5		loose/M.dense	Brn	Top soil and organics some clay		Moist	0.6	0	0	0
						stiff	Brn/Gray	Silt some clay tr. F. sand and pebbles		Moist				
											0.3	0	0	0
										moist to wet				
		5				Med stiff	Brn	Clay some silt tr. F. sand		charcoal piece	0.5	0	0	0
0943	S-2			4.5/5						moist	0.3	0	0	0
					▽	very stiff	Gray	F. sand some silt tr. clay		0945 S435B019-0607				
										moist to wet	0.9	0	0	0
						M. dense	Gray	F. sand tr. silt		wet				
		10									0.5	0	0	0
0950	S-3			4/5		dense	Red Brn	F sand some M sand tr. silt			27.6	0	0	0
											44.6	0	0	0
						stiff	Brn	Silt some F. sand and clay			37.3	0	0	0
						No lithology logged				0953 S435B019 Insd. 2-13.5				
		15												
					EOB 15' bgs									
		20												
		25												

* When rock coring, enter rock brokeness.

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

Remarks: Continuous Macrocore (5' x 2")

Drilling Area Background (ppm): 0

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Ground Zero
DRILLING RIG: Geoprobe 7822DT

BORING No.: SB22/SG04
DATE: 6-11-11
GEOLOGIST: J. Birkett
DRILLER: George Sorto

Time	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**
0857	S-1			2/5		loose	Blk	Crushed asphalt		dry	2.7	0	0	0
						dense		F sand and gravel some M-C sand						
											5.0	0	0	0
						very stiff	gray	Silt trace to some F sand		moist				
		5									33.5	0	0	0
0900	S-2			4/5						odor				
						stiff	gray Brn	Silt some F. sand		0902 S4BSB022-0708	65.3	0	0	0
					▽					moist to wet				
								Silt and F. sand somewhat		wet	93.1	0	0	0
		10												
0907	S-3			3/5							63.5	0	0	0
										0908 S4BSB022-Inside-63.5				
										Bottom 2 feet cut for sample not logged				
		15												
					EOB 15' bgs									
		20												
		25												

Sample not logged

* When rock coring, enter rock brokeness.

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

Remarks: Continuous macrocore (5' x 2" sleeve) to TD

Drilling Area Background (ppm): 0

Converted to Well: Yes ____ No X Well I.D. #: ____

2012

Soil Boring Logs

Tetra Tech, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 610

BORING No.: TW13
DATE: 4-20-12
GEOLOGIST: Jacob Birkett
DRILLER: Austin Hittinger

Time	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
0945	S-1	1		5/5		loose	Brn	Top Soil w/ grass		dry w/grass roots	0	0	0	0
		2				m.dense	light Brn	Silt some VF sand and roots		dry to moist				
		3						↓ ↓			0	0	0	0
		4				dense	light Brn	Clay some silt		moist				
		5					Gray	↓ ↓			0	0	0	0
1005	S-2	6		4/5		m.dense	Brn/Gray	Clay some silt tr. F sand		moist	0	0	0	0
		7						↓ ↓						
		8			▽			↓ ↓			0	0	0	0
		9				Stiff	Gray some	Clayey F. sand		wet				
		10					Brn	↓ ↓			0	0	0	0
1015	S-3	11		3.75/5		m.stiff	Gray/Brn	Clayey F. sand		wet	0	0	0	0
		12				m.dense	Gray	VF-F sand some clay		wet				
		13					Brn	↓ ↓			0	0	0	0
		14				dense	Brn	VF-F sand some clay and some M gravel		wet				
		15				stiff stiff	Brn DKGray	Clay tr. silt Clay tr. silt and F. organics		wet	0	0	0	0
1025	S-4	16		4/5		stiff	DKGray	Clay some organics tr. silt and F. sand		wet grass/wood	0	0	0	0
		17						↓ ↓						
		18				stiff	Gray	Clay some F. sand and silt		moist to wet	0	0	0	0
		19						↓ ↓						
		20				soft	Gray	Clayey F.-M sand		wet	0	0	0	0
1032	S-5	21		3.75/5		soft	Gray	Clayey F-M sand tr. sm. gravel		wet	0	0	0	0
		22						↓ ↓						
		23						↓ ↓			0	0		
		24				stiff	Gray	Clay some silt tr. F. sand		moist to wet				
		25						↓ ↓						

* 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): 0.0

Remarks: Hand clear to 5'
Dual Tubing setup w/ 1 1/4" OD Inner Rods and 2 1/4" OD Outer Rods
Soil Sleeve is 1 1/4" x 5'

Converted to Well: Yes 1" No X Well I.D. #: -

Tetra Tech, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6610

BORING No.: TW13
DATE: 4-20-12
GEOLOGIST: Jacob Birkett
DRILLER: A. Hillinger

	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
1043	S-6	26		4.5/5		stiff	Gray	Clay some silt and F. sand		moist to wet	0	0	0	0
		27				soft	Brn/Gray	F. sand some clay and M sand tr. pebbles		wet				
		28						↓			0	0	0	0
		29				soft	Brn/Gray	F sand some clay tr. M. sand		wet				
		30						↓			0	0	0	0
1055	S-7	31		3/5		loose	Gray	F-C sand tr. silt		wet	0	0	0	0
		32						↓						
		33						↓			0	0	0	0
		34				stiff	DK Gray	Organic rich clay		wet				
		35						↓			0	0	0	0
		36			EOB 35' bgs									
		37												
		38												
		39												
		40												
		41												
		42												
		43												
		44												
		45												
		46												
		47												
		48												
		49												
		50												

* When rock coring, enter rock brokeness.

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

Remarks: See first page for details

Drilling Area Background (ppm): 0.0

Converted to Well: Yes _____ No X Well I.D. #: _____

Tetra Tech, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6610

BORING No.: TW14
DATE: 4-20-12
GEOLOGIST: Jacob Birkett
DRILLER: A. Hillinger

Time	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**
1210	S-1	1		5/5		M. dense	Brn	Top Soil		Dry FILL	0	0	0	0
		2				M. dense	Brn	Silt, Sand, and Gravel						
		3								Dry	0	0	0	0
		4				stiff	Brn/Gray	Clay some silt						
		5								Moist	0	0	0	0
1222	S-2	6		3/5		M. dense	Brn/Gray	F Sand some clay and silt		moist to wet	0	0	0	0
		7												
		8								wet	0	0	0	0
		9			▽		Org/Brn							
		10				very stiff	gray/Brn	Silt some F, Sand		Moist to wet	0	0	0	0
1228	S-3	11		4/5		very stiff	gray/Brn	Silt some F, Sand		moist	0	0	0	0
		12												
		13								moist	0	0	0	0
		14						M-C sand tr. silt						
		15				loose	gray/Brn			wet	0	0	0	0
		16												
		17				No samples collected								
		18												
		19				from 15-30' bgs								
		20												
		21												
		22												
		23												
		24												
		25												

* 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): 0.0

Remarks: Hand clear to 4' bgs
Dual tube setup w/ 1¼" OD Inner Rods and 2¼" OD Outter Rods
Acetate sleeve is ~~¼~~ 1" x 5'

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 610

BORING No.: TW14
DATE: 4-20-12
GEOLOGIST: Jacob Birkett
DRILLER: A. Hittinger

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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	26												
	27				No	Sample	attempted						
	28												
	29						Push to 30'bgs						
Time	30												
S-5	31		0/5				Flowing C sand in						
	32						outter casing						
	33						Most likely C sand						
	34						until you get to ~33' where you hit						
	35						basal clay						
	36												
	37												
	38												
	39												
	40												
	41												
	42												
	43												
	44												
	45												
	46												
	47												
	48												
	49												
	50												

* When rock coring, enter rock brokeness.

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

Remarks: See first page

Drilling Area Background (ppm): 0.0

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 610

BORING No.: TW15
DATE: 4-20-12 - 4-22-12
GEOLOGIST: Jacob Birkett
DRILLER: A. Hittinger

Time	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
1300	S-1	1		5/5		M. dense	brn	Top Soil						
						M. dense	brn	Silt sand and gravel		dry	0	0	0	0
		2												
		3				Stiff	brn/gray	Clay some silt and VF sand		dry	0	0	0	0
		4												
		5								dry	0	0	0	0
1315	S-2	6		38/60"		very stiff	brn/gray	Silt and F sand tr. clay		moist	0	0	0	0
		7				M. dense	brn/gray	VF-F sand tr to some clay and silt						
		8								moist	0	0	0	0
		9			▽	M. dense	brn/gray	VF-F sand tr. silt						
		10								wet	0	0	0	0
1322	S-3	11		40/60"		loose	brn	F-M sand tr. silt		wet	0	0	0	0
		12				stiff	brn	Clay some silt tr. VF sand		wet				
		13									0	0	0	0
		14				soft	brn red			wet				
		15				Very stiff / soft	Brn / Gray	Silt / Clayey F-M sand		wet	0	0	0	0
1326	S-4	16		42/60"		loose	Gray	M-C sand tr. silt		wet	0	0	0	0
		17												
		18								wet	0	0	0	0
		19												
4-20-12		20								wet	0	0	0	0
4-22-12 0900	S-5	21		35/60"		loose	Gray	M-C sand tr. silt and pebbles		Flowing sands on first attempt	0	0	0	0
		22				very stiff	Gray	Clay tr. VF sand		wet				
		23									0	0	0	0
		24								wet				
		25									0	0	0	0

* 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): 0.0

Remarks: Hand clear to 5' bgs
Dual Tube Setup w/ 1 1/4" OD inner rods and 2 1/4" Outer Rods to 20' bgs
Acetate sleeve 1" by 5'

Converted to Well: Yes ____ No X Well I.D. #: ____

Discrete macrocore from 20'-TD (2" x 5')

Tetra Tech, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 610

BORING No.: TW15
DATE: 4-22-12
GEOLOGIST: Jacob Birkett
DRILLER: A. Hiffinger

Time	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
0930	S-6	26		40/60"		Very stiff	Green	Clay tr. VF sand		wet	0	0	0	0
		27				↓		↓			0	0	0	0
		28				↓		↓		wet	0	0	0	0
		29				dense	Gray	M-C sand some sm. pebbles						
		30						tr. F sand, silt, M pebbles		wet	0	0	0	0
1005	S-7	31		30/60"		M. dense	Green	M-C sand some pebbles		wet	0	0	0	0
		32				↓		tr. F. sand and silt						
		33				↓		↓		wet	0	0	0	0
		34				Stiff	DK Gray	Organic rich clay						
		35						↓		wet	0	0	0	0
		36			EOB 35' bgs									
		37												
		38												
		39												
		40												
		41												
		42												
		43												
		44												
		45												
		46												
		47												
		48												
		49												
		50												

* 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): 0.0

Remarks: See first page

Converted to Well: Yes _____ No X Well I.D. #: _____

Tetra Tech, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Virenex
DRILLING RIG: Geoprobe 6610

BORING No.: 543TW20
DATE: 4-21-12
GEOLOGIST: Jacob Birkett
DRILLER: A. Hittinger

Time	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
0840	S-1	1		60/60"		loose	brn	Top Soil and Forest debris		moist	0	0	0	0
		2				m. dense	brn	VF sandy silt tr. F sand		moist				
		3						↓ ↓			0	0	0	0
		4				stiff	brn gry	silty clay tr F. sand		moist				
		5						↓ ↓		mottled	0	0	0	0
0910	S-2	6		60/60		stiff	brn gry	Silty clay tr. F sand		moist	0	0	0	0
		7						↓ ↓		mottled	0	0	0	0
		8				dense	brn gry	VF sandy silt tr. F sand		moist	0.7	0	0	0
		9			▽			↓ ↓		water table 8.5'	0.5	0	0	0
		10				m. dense	brn gry	VF sand some clay tr. F sand		wet	0.5	0	0	0
0922	S-3	11		44/60"		loose	brn gray	VF sand some clay tr. F sand		Slough in top 6" (excluded from log)	1.5	0	0	0
		12				↓	↓	↓ ↓		wet	26	0	0	0
		13				very stiff	Brn Gray	Silty Clay tr. VF sand			0	0	0	0
		14				↓	Gray	↓ ↓		moist to wet				
		15				↓	Brn	↓ ↓		mottled	0	0	0	0
0945	S-4	16		30/60"		v. stiff	Brn Gray	Silty Clay tr. VF sand		wet	0	0	0	0
		17				↓	↓	↓ ↓						
		18				↓	↓	↓ ↓			0	0	0	0
		19												
		20				loose	Gray	F-C sand some sm. pebbles tr. silt		wet	0.2	0	0	0
1007	S-5	21		26/60"		loose	Gray	F-C sand some sm. pebbles tr. silt		wet	0	0	0	0
		22				↓	↓	↓ ↓						
		23				↓	↓	↓ ↓		wet	0.2	0	0	0
		24				↓	↓	↓ ↓						
		25				↓	↓	↓ ↓		wet	0	0	0	0

* 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): 0.0

Remarks: Hand clear to 5' bgs
Continuous macrocore (2" x 5') to 15' in acetate sleeve w/ 1 3/4" cutting shoe
Discrete macrocore (2" x 5') below 15' to TD w/ 1 3/4" cutting shoe

Converted to Well: Yes _____ No X Well I.D. #: _____

Tetra Tech, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 610

BORING No.: S43TW20
DATE: 4-21-12
GEOLOGIST: Jacob Birkett
DRILLER: A. Hittinger

Time	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
1030	S-6	26		24"/60"		loose	Gray	M-C sand some sm. (round) pebbles		wet	0	0	0	0
		27						tr. lg gravel angular and silt						
		28								wet	0	0	0	0
		29												
		30								wet	0.2	0	0	0
1110	S-7	31		35/60"		loose	Gray	M-C sand some (round) sm. pebbles		wet	0	0	0	0
		32						tr. silt very few M. gravel						
		33								wet	0	0	0	0
		34				~~Dk Gray~~ JB Very Stiff	Dk Gray	Organic rich clay			0	0	0	0
		35			X	No Recovery								
		36			EOB 35' bgs									
		37												
		38												
		39												
		40												
		41												
		42												
		43												
		44												
		45												
		46												
		47												
		48												
		49												
		50												

* When rock coring, enter rock brokeness.

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

Remarks: See first page for details

Drilling Area Background (ppm): 0.0

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620DT

BORING No.: S43TW23
DATE: 4-27-12
GEOLOGIST: Jacob Birkett
DRILLER: A. Hittinger

Time	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**
0908	S-1	1		5/5		m. dense	Brn	Top Soil and grass roots		moist	0	0	0	0
		2				stiff	Brn/Gray	Clayey Silt tr. F. sand		Moist				
		3						↓ ↓			0	0	0	0
		4				m. dense	Brn	F sand tr. to some clay		Moist				
		5						↓ ↓			0	0	0	0
0913	S-2	6		47/60"		m. dense	Brn	F sand tr. to some clay tr. rock frag		Moist	0	0	0	0
		7						↓ ↓						
		8						↓ ↓		moist	0	0	0	0
		9			0000	m. dense	Brn	F. sand tr. to some clay and small pebbles						
		10			SL	m. dense	light Brn	Gray VF sand tr. clay and F. sand		wet	0	0	0	0
0936	S-3	11		49/60"		m. dense	Gray Brn	F sand tr. to some clay		Slough in top foot (not included)	0.1	0	0	0
		12				↓	↓	↓ tr. M sand very few sm. pebbles ↓		wet				
		13				↓	↓	↓ ↓		alternating brn and gray layers (3")	0	0	0	0
		14				very stiff	Gray	Clay tr. silt		wet				
		15				↓	Gray Brn	↓ ↓		mottled	0	0	0	0
0950	S-4	16		27/60"		very stiff	Gray Brn	Clay tr. silt		mottled wet	0	0	0	0
		17				↓		↓ ↓						
		18				↓		↓ ↓		wet	0	0	0	0
		19				↓		↓ ↓						
		20				m. dense	Gray	Clayey F-M sand		wet	0	0	0	0
1015	S-5	21		34/60"		m. dense	Gray	Clayey F-M sand			0	0	0	0
		22				loose	Gray	M-VC sand and sm-med round pebbles						
		23				↓		↓ ↓		rust layer (2") @ 23' bgs	0.5	0	0	0
		24												
		25				↓		↓ ↓			0.4	0	0	0

* 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): 0.0

Remarks: Continuous macrocore in 2"x5' acetate sleeve from 0-15'
Discrete macrocore from 15' to TD

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620DT

BORING No.: S43TW23
DATE: 4-27-12
GEOLOGIST: Jacob Birkett
DRILLER: A. Hittinger

Time	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
1045	S-6	26		40/60"		loose	Gray	M-VC Sand and sm. to med round		wet	0.1	0	0	0
		27												
		28								wet	0.1	0	0	0
		29												
		30					Gray/Grn Gray	Fissil unconsolidated silty Clay M-VC Sand and pebbles		(1" thick clay layer/nodule) wet	0	0	0	0
1110	S-7	31		27/60"		loose	Gray	M-C sand and sm. pebbles			0.2	0	0	0
		32												
		33									0.5	0	0	0
		34												
		35									0.3	0	0	0
1143	S-8	36		24/60"		loose	Gray	M-C sand and sm. pebbles		wet	0	0	0	0
		37				stiff	DK Gray	Organic Rich Clay		decayed grass remnants				
		38								wet	0	0	0	0
		39												
		40								wet	0	0	0	0
		41			EOB 40' bgs									
		42												
		43												
		44												
		45												
		46												
		47												
		48												
		49												
		50												

* When rock coring, enter rock brokeness.

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

Remarks: See First page for details

Drilling Area Background (ppm): 0.0

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: 6610 DT

BORING No.: TW 26
DATE: 5/5/12
GEOLOGIST: ~~Jacob Birkett~~ Robert Sok
DRILLER: William Jacks

	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**
		1						HAND AUGER						
		2						Cleared to 4.5'						
		3												
		4									0.2	0	0	0
0935	S-1	5		0.5/0.5				Gravel & clay in 4.5-5.0'			0.4	0	0	0
		6				Very Dense	Grey/Brn	Clay, mottled, some silt, plastic, trace VF Sand						
		7									0.1	0	0	0
	S-2	8		5/5										
		9					Gray	mostly gray, less mottled increase in VF Sand & Clay			0.1	0	0	0
0938		10						@ 9.5'						
		11			▽			Wet @ 10'						
		12				loose & soft		F. Sand, some silt, trace Clay, Wet/Saturated Zone			0.2	0	0	0
	S-3	13		5/5										
		14				Med Dense		Clay, plastic, some silt, trace VF Sand, iron staining			0.2	0	0	0
0946		15						Damp to Moist						
		16												
		17						Same Clay, slightly mottled		Poor recovery				
	S-4	18		2.2/5				18.5-19.5' Dense & Wet			0.2	0	0	0
		19												
0954		20				loose & soft	lt BRN	> F. Sand & saturated in shoe			0.3	0	0	0
		21						SAME						
		22						Wet						
	S-5	23		2.7/5		soft	Dk Gray	Clay, some silt, soft, moist plastic						
		24												
1002		25				Dense	grey	Silty Clay, some silt, little VF Sand moist, slight plastic						

* 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): 0.1

Remarks: Continuous macrocore (2"x5' sleeve) from 5-20' bgs
Discrete macrocore from 20'-40' bgs

Converted to Well: Yes X No _____ Well I.D. #: 543-MW10

Tetra Tech, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: 6610 OT

BORING No.: TW26
DATE: 5/5/12
GEOLOGIST: ~~Jacob Birkett~~ Robert Suk
DRILLER: William Jacks

	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
		26								liner jammed				
		27								poor recovery				
	S-6	28		?1.5/5				DK grey to Blk clay, soft, very plastic						
		29						Trace Qtz frags + ? shells						
1017		30					lt grey	Bottom of Core SAME AS 24-25 loss			0.1	0	0	0
		31												
		32					DK grey	Interbedded DK grey clays + 1-2 inch sandy zones, Wet						
	S-7	33		4.3/5							0.2	0	0	0
		34					Hvey	Sandy clay, little sand, trace gravel + cobble size frags						
1036		35					↓	Gravel Zone last 0.5 ft		Cobbles, Rounded Qtz	0.2	0	0	0
		36					DK grey	Clay in shoe, DK grey						
		37					HBRN	Intermixed Clay + Sand trace gravel, Saturated Zone			0.2	0	0	0
	S-8	38		2.5/5										
		39									0.3	0	0	0
1054		40					Blk	Decayed wood + clay in tip						
		41			EOH									
		42												
		43												
		44												
		45												
		46												
		47												
		48												
		49												
		50												

* When rock coring, enter rock brokeness.

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

Remarks: See first page

Drilling Area Background (ppm): 0.1

Converted to Well: Yes X No _____ Well I.D. #: S43-MW10

Tetra Tech, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Viranex
DRILLING RIG: 6610 DT

BORING No.: TW 27
DATE: 5/5/12
GEOLOGIST: ~~Jacob Birkett~~ Robert S.K
DRILLER: William Jacks

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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	1			0.5	loose	OR Brn	Topsoil			0.1	0	0	0
	2				Dense	lt Brown	F. Sand, some clay, little gravel						
S-1	3		4.7/5.0	2.3	Dense	ORG BRN	Silty Clay, some silt, trace			0.6	0	0	0
	4						VF sand, mottled, saw plastic +						
	5						plastic @ 3.5'			1.7	0	0	0
	6						Mottled org, grey + Brn clay						
	7												
S-2	8		5.0/5.0				@ 8.5' lense dense and damp			0.1	0	0	0
	9			? ▽			down to 13.0'						
	10												
	11												
	12						Same						
S-3	13		4.3/5							0.1	0	0	0
	14						Density increase @ 13.5'						
	15												
	16					lt BRN	Sandy Clay ~~zone~~ some VF sand, some silt, wet						
	17						(Saturated, some)			0.1	0	0	0
S-4	18		4.3/5	17.3		OR gray	Clay, some silt,						
	19									0.1	0	0	0
	20												
	21			EOH									
	22												
	23												
	24												
	25												

* 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): 0.1

Remarks: Continuous macrocore from 0-15'bgs
Discrete macrocore from 15-20'bgs

Converted to Well: Yes _____ No X Well I.D. #: _____

Tetra Tech

BORING LOG

PROJECT NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620DT

BORING No.: S43TW36
DATE: 6-1-12
GEOLOGIST: J. Birkett
DRILLER: J. Haldiman

Time	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**
0855	S-1 1			60/60"		m. dense	Brn	Top soil and gravel		moist Hand cleared to 5' bgs	0.3	0	0	0
	2					stiff	Gray/Brn	Silty clay tr. F. sand						
	3									moist, mottled	0.3	0	0	0
	4													
	5					loose	Brn	F. sand some silt		moist to wet	0.3	0	0	0
0902	S-2 6			40/60"		loose	Brn	F. sand some silt very few med pebbles		moist to wet	0.4	0	0	0
	7													
	8				▽					wet	0.4	0	0	0
	9					m. dense	light Brn	Silty F. sand tr. clay						
	10						Gray			wet	0.4	0	0	0
0906	S-3 11			48/60"		m. dense	light Brn/Gray	Silty F. sand tr. clay		wet	0.4	0	0	0
	12					loose	Brn	F. sand tr. silt some black thin layers		large round gravel at 11' bgs 2" ϕ				
	13					soft	Brn	Clayey F. sand		wet	0.4	0	0	0
	14					soft	Gray	Clay		wet				
	15					loose / loose	brown / light Brn	F. sand some silt / F-M sand tr. silt		wet	0.4	0	0	0
0910	S-4 16			40/60"		loose	light Brn	F-M sand tr. silt		wet	0.4	0	0	0
	17					m. dense	Orgish Brn	F-C sand some sm. to large pebbles						
	18									wet	0.4	0	0	0
	19													
	20									wet	0.4	0	0	0
0919	S-5 21			40/60"		m. dense	Orgish Brn	F-C sand some sm to lrg pebbe		wet	0.3	0	0	0
	22													
	23							sm to med		wet	0	0	0	0
	24					m. dense	Gray	F-C sand some pebbles						
	25					very stiff	Gray	Clay some silt		wet	0	0	0	0

* 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): 0.3

Remarks: Continuous macrocore (2" x 5' sleeve) to 25' bgs w/ 1.5" cutting shoe
Discrete macrocore from 25'-TD

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

Tetra Tech

BORING LOG

PROJECT NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620 DT

BORING No.: S43TW36
DATE: 6-1-12
GEOLOGIST: J. Birkett
DRILLER: J. Haldiman

Time	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
0935	S-26			52/60"		stiff / m. stiff	Gray	Clay some silt / Silty Clay tr. VF sand		Mois to wet	0	0	0	0
	27					stiff		Clay some silt						
	28					m. stiff		Silty Clay		Moist to wet	0	0	0	0
	29					dense		Silty VF-F sand some med sand gravel						
	30					m. dense				Wet thin C. sand (1") at 28.5' bgs	0	0	0	0
0949	S-31			23/60"		m. dense	Gray	M-C sand some sm to med pebbles		wet	0	0	0	0
	32													
	33									wet	0	0	0	0
	34					stiff	DK Gray	Organic rich clay						
	35						Blk	some plant debris		wet	0	0	0	0
1003	S-36			54/60"		Stiff	DK Gray	Organic rich clay		wet	0	0	0	0
	37						Blk	some plant debris						
	38									wet	0	0	0	0
	39													
	S-40									wet	0	0	0	0
1020	41			60/60"		Stiff	DK Gray	Organic rich clay		wet	0	0	0	0
	42						Blk	some plant debris						
	43									wet	0	0	0	0
	44													
	45									wet	0	0	0	0
1037	S-46			48/60"		Stiff	Blk	Organic rich clay		wet	0	0	0	0
	47							some plant debris						
	48									wet	0	0	0	0
	49													
	50									wet	0	0	0	0

* 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): 0.0

Remarks: See first page for details

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

Tetra Tech

BORING LOG

PROJECT NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620DT

BORING No.: S43 TW37
DATE: 6-1-12
GEOLOGIST: J. Birkett
DRILLER: J. Haldiman

Time	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**
1200	S-1 1			60/60"		loose	Brn	Top Soil, sand, gravel		Moist	0	0	0	0
	2					stiff	Brn gray	Silty Clay some F sand						
	3					↓		↓ ↓		moist	0	0	0	0
	4													
	5					m.dense	light gray brn	VF-F sand some silt		moist	0	0	0	0
1212	S-2 6			43/60"		m. dense	light gray brn	VF-F sand some silt		moist	0	0	0	0
	7					m.dense	light brn	F sand some silt						
	8				▽	m.dense	Brn	Silty VF sand		moist to wet	0	0	0	0
	9					m.dense	Brn tan	VF-F sand some clay		wet				
	10					stiff m.dense	gray light brn	Clay VF sand some silt		wet	0	0	0	0
1218	S-3 11			48/60"		m.dense	gray light brn	VF sand some silt		wet	0	0	0	0
	12					↓	↓	↓ ↓						
	13									some thin blk (<0.25")	0	0	0	0
	14					m.dense loose	gray/lt brn light brn	Silty VF sand F-M sand tr. silt		staining from 12-14' mottled				
	15					m.stiff loose dense	brn brn brn	Silty Clay some F. sand F-M sand Silty VF sand some clay		wet	0	0	0	0
1224	S-4 16			40/60"		loose	brn	F-M sand tr. silt		wet	0	0	0	0
	17					↓	↓	↓ ↓						
	18					stiff	red brn	Clay some silt		wet	0	0	0	0
	19					m.dense v.stiff	brn red brn	F-M sand tr. silt Clay some silt		mottled				
	20					dense	gray red brn	Silty F sand		wet	0	0	0	0
1236	S-5 21			31/60"		m.dense	tan	Gravel F-C sand		gravel up to 0.75" ϕ	0	0	0	0
	22					↓		↓ ↓		wet				
	23										0	0	0	0
	24					↓	gray	↓ ↓		some pink coloration				
	25					stiff	gray	Clay some silt		wet	0	0	0	0

* 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): 0.0

Remarks: Hand auger to 5' bgs
Continuous macrocore (2" x 5' sleeve) from 0-20' bgs
Discrete macrocore from 20' to TD

Converted to Well: Yes _____ No X Well I.D. #: _____

Tetra Tech

BORING LOG

PROJECT NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620DT

BORING No.: S43TW37
DATE: 6-1-12
GEOLOGIST: J. Birkett
DRILLER: J. Haldiman

Time	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**
1250	6-26			52/60"		stiff to m. stiff	Gray	Clay some silt tr. VF-F Sand		JB 6-1-12 ~~Moist to~~ wet	0	0	0	0
	27													
	28									wet	0	0	0	0
	29													
	30									wet	0	0	0	0
1306	6-31			46/60"		stiff	Gray	Clay some silt tr. F Sand		Color is getting darker w/depth	0	0	0	0
	32									wet				
	33										0	0	0	0
	34					dense	DK Gray Gray	Gravely F-C sand		wet				
	35						to DK Gray			gravel 0.5" Φ	0	0	0	0
1320	36			45/60"		m. dense stiff	Gray DK Gray	Gravely F-C sand Organic rich clay		wet	0	0	0	0
	37													
	38									wet	0	0	0	0
	39													
	~~4030~~									wet	0	0	0	0
	41				EOB 40' bgs									
	42													
	43													
	44													
	45													
	46													
	47													
	48													
	49													
	50													

* When rock coring, enter rock brokeness.

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

Remarks: See first page for details

Drilling Area Background (ppm): 0.0

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech

BORING LOG

PROJECT NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620DT

BORING No.: S43TW41
DATE: 6-18-12
GEOLOGIST: J. Birkett
DRILLER: J. Haldiman

	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**
0835	S-1 1			60/60"		broken dense	blk brn	asphalt sand and gravel		moist	0	0	0	0
	2					m. stiff	gray	Silty clay tr. gravel		moist				
	3					↓	↓	↓ ↓			0	0	0	0
	4					m. dense	gray brn	Silty F sand tr. clay		moist				
	5					↓	↓	↓ ↓			0	0	0	0
0840	S-2 6			60/60"		m. dense	gry brn	Silty F. sand tr. clay		moist	0	0	0	0
	7													
	8					stiff	gr V	Sandy Silt		moist	0	0	0	0
	9				- 5' -	dense m. dense	brn gray	Silty F. sand tr. clay F. sand some silt		moist wet				
	10					m. stiff m. dense	gray brn brn	Sandy Clay F. sand some clay		thin sandy clay layer at 9.5'	0	0	0	0
0846	S-3 11			50/60"		m. dense	brn	Silty F. sand tr. sm. to med pebbles		wet	0	0	0	0
	12					↓	↓	↓ ↓		accidentally used 4' sleeve				
	13									wet	0	0	0	0
	14					↓	↓	↓ ↓						
	15					m. dense m. stiff m. dense	light brn brn brn	M-C Sand tr. Silt Silty Sand M sand		wet	0	0	0	0
0853	S-4 16			60/60"		m. dense	light brn	F-M sand tr. C. sand very few sm. pebbles		wet	0	0	0	0
	17					↓	↓	↓ ↓						
	18					↓	↓	↓ ↓			0	0	0	0
	19				- - -	m. dense	org brn	M-C sand and sm. pebbles		wet				
	20					↓	↓	some F sand and M-L pebbles tr. to round gravel	and	silt	0	0	0	0
0904	S-5 21			23/60"	- - -	m. dense m. dense	organ gray	F-C sand and sm. pebbles F-M sand tr. C. sand		wet	0	0	0	0
	22					↓	↓	↓ ↓		wet	1.0	0	0	0
	23				- - -	stiff m. stiff	light gray light gray	Clay tr. silt to some Silty clay tr. F. sand		wet	0	0	0	0
	24					↓	↓	↓ ↓						
	25									wet	0	0	0	0

* When rock coring, enter rock brokeness.

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

Remarks: Continuous macrocore (2" x 5' sleeve) 0-20' bgs
Discrete macrocore from 20' bgs to TD

Drilling Area Background (ppm): 0.0

Converted to Well: Yes _____ No X Well I.D. #: _____

Tetra Tech

BORING LOG

PROJECT NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620DT

BORING No.: S43TW41
DATE: 6-18-12
GEOLOGIST: J. Birkett
DRILLER: J. Haldiman

Time	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
0915	S26			52/60"		m. stiff to soft	gray	Silty Clay		wet	0	0	0	0
	27							very few m. pebbles						
	28									wet	0	0	0	0
	29													
	30					a. stiff	gray	Clay Silt some VF sand		wet	0	0	0	0
0925	S31			42/60		m. dense / m. stiff	dk gray	Silt some clay and VF sand		wet	0	0	0	0
	32													
	33									wet	0	0	0	0
	34													
	35					soft	dk gray	Clay some silt		wet	0	0	0	0
0936	S36					soft a. dense	dk gray gray	Clay some silt F-C sand some sm. pebbles		wet wet	0	0	0	0
	37					m. stiff	dk gray	Organic rich clay plant debris		wet				
	38										0	0	0	0
	39													
	40 ~~30~~					m. dens	blk	wood and plant debris		wet	0	0	0	0
	41				EOB 40' bgs									
	42													
	43													
	44													
	45													
	46													
	47													
	48													
	49													
	50													

* 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): 0.0

Remarks: See first page for details

Converted to Well: Yes _____ No X Well I.D. #: _____

Tetra Tech

BORING LOG

PROJECT NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620DT

BORING No.: S43TW43
DATE: 6-18-12
GEOLOGIST: J. Birkett
DRILLER: J. Haldiman

Time	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**
1537	S-1 1					Asphalt	Blk	Asphalt		moist	37	0	0	0
	2					dense	Blk Brn	Gravel and sand			40	0	0	0
	3					stiff	Dk Gray Brn	Silty Clay		moist	8.3	0	0	0
	4					dense	Gray Brn	Silty VF sand			0	0	0	0
	5					↓		↓ ↓		moist	0	0	0	0
	6							No macrocores taken						
	7							from 5-15' bgs						
	8													
	9													
	10													
	11													
	12													
	13													
	14													
	15													
1551	S-2 16			41/60"		Mdense	Org Brn	F-C sand some sm to med pebbles tr. large gravel		wet	0	0	0	0
	17													
	18									wet	0	0	0	0
	19													
	20					very stiff	Brn	Clay tr. silt		wet	0	0	0	0
1600	S-3 21			54/60"		Very stiff	Brn Gray	Clay tr. silt		wet	0	0	0	0
	22													
	23					extremely stiff	Brn Gray Red	Clay tr. silt		wet	0	0	0	0
	24													
	25					extremely stiff	Gray	Clay tr. silt		wet	0	0	0	0

* 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): 0.0

Remarks: Hand auger to 5' bgs
Discrete macrocore from 15' to TD

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech

BORING LOG

PROJECT NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620 DT

BORING No.: S43TW43
DATE: 6-18-12 and 6-19-12
GEOLOGIST: J. Birkett
DRILLER: J. Haldiman

Time	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**
1626	S-426			Did not Retrieve				Did not retrieve		Expanding Clays	–	–	–	–
	27							25-28' interval but		Liner Stuck Full recovery				
	28							likely Silt/Clay			–	–	–	–
	29			24/24		very	Gray	Silt some clay tr. VF sand		moist	0	0	0	0
	30					Stiff	↓	↓ ↓		moist	0	0	0	0
1704	S-531			58/60		↓	↓	↓ ↓		Expanding Clay	–	–	–	–
	32					extremely dense	Gray Green	VF sandy silt some M. sand tr. clay		Liner stuck				
	33					↓	↓	↓ ↓			–	–	–	–
	34							↓ ↓			0	0	0	0
6-18-12	35					↓	↓	VF sandy silt some M. sand		moist	0	0	0	0
6-19-12 0815	S-636			Did not Retrieve						Liner stuck	–	–	–	–
	37							Likely Silt		Expanding Clay Full recovery				
	38										–	–	–	–
	39							Silt some VF-F sand and clay tr. M. sand		in shoe moist	0	0	0	0
	40 ~~30~~				EOB 39' bgs									
	41													
	42													
	43													
	44													
	45													
	46													
	47													
	48													
	49													
	50													

* When rock coring, enter rock brokeness.

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

Remarks: See First page for details

Drilling Area Background (ppm): 0.0

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech

BORING LOG

PROJECT NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620DT

BORING No.: S43 TW44
DATE: 6-19-12
GEOLOGIST: J. Birkett
DRILLER: J. Haldiman

Time	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**
~~0950~~ 1050	S-1 1			60/60		dense	Brn	Sand and Gravel some slag		Fill	0	0	0	0
	2					very stiff	Gray	Silt some clay		moist				
	3					↓	↓	↓			0	0	0	0
	4					↓	↓	↓		moist				
	5					med. dense	org Brn	Silt and F. sand			0	0	0	0
1101	S2 6			60/60"		M. dense	Brn tan	VF-F sand some silt		Moist	0	0	0	0
	7					↓	↓	↓						
	8					↓	↓	↓		Moist	0	0	0	0
	9					M. dense very	tan	F sand tr. silt Clay tr. silt						
	10					stiff stiff	brn/tan brn/tan	clay some silt tr. VF sand		Moist	0	0	0	0
1110	S3 11			39/60"	▽	M. stiff M. dense	brn tan brn	Clay some silt tr. VF sand F sand some M. sand tr. silt and sm. pebbles		moist to wet	0	0	0	0
	12					soft	gray brn	Clay some F sand		wet				
	13				○○○○	m. stiff	brn	Clay and large gravel 2"Φ		wet	0	0	0	0
	14					dense	brn	F-M sand some C. sand		wet				
	15					↓	↓	tr. silt and sm.-med pebbles		wet	0	0	0	0
1125	S4 16			53/60"		M. dense	light brn	F-C sand some sm-med pebbles		some blk staining at 16.5' bgs	0	0	0	0
	17					↓	↓	↓		wet				
	18					extremly stiff	Gray Brn	Clay some silt		mottled	0	0	0	0
	19					↓	↓	↓		wet				
	20					↓	↓	↓			0	0	0	0
	21				EOB 20' bgs									
	22													
	23													
	24													
	25													

* When rock coring, enter rock brokeness.

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

Remarks: Continuous Soil Macrocore From 0-20' bgs

Drilling Area Background (ppm): 0.0

Converted to Well: Yes _____ No X Well I.D. #: _____

Tetra Tech

BORING LOG

PROJECT NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620 DT

BORING No.: S43TW45
DATE: 6-21-12
GEOLOGIST: J. Birkett
DRILLER: J. Haldiman

Time	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
0815	S-1 1			60/60"		loose very stiff	light Brn tan	Top Soil Silty Clay		dry dry	0	0	0	0
	2						Gray Brn			moist				
	3										0	0	0	0
	4									moist				
	5					dense	tan	Silty VF sand		moist to wet	0	0	0	0
0821	S-2 6			52/60		m. dense	brn	Silty VF-F sand		moist to wet	0	0	0	0
	7													
	8				▽					moist to wet	0	0	0	0
	9					m. dense dense	brn brn	Silty VF sand and grave Silty VF sand some clay		wet				
	10					soft	gray/brn	~~Clay~~ JB 6-21-12 VF sandy Clay		wet	0	0	0	0
0824	S-3 11			44/60"		soft	gry/brn	VF sandy Clay		wet	0	0	0	0
	12					loose	brn	VF-F sand some clay						
	13					m. dense	brn	VF-F sand some clay and gravel (crushed)		wet	0	0	0	0
	14					m. dense	brn	F-M sand some C sand tr. sm. pebbles						
	15					m. dense	tan brn	F-C sand some sm.-med pebbles		wet	0	0	0	0
0840	S-4 16			31/60		m. dense	org brn	F-C sand some tr. sm. gravel sm.-med pebbles		wet	0	0	0	0
	17							tr. sm. gravel						
	18									wet	0	0	0	0
	19													
	20									wet	0	0	0	0
0849	S-5 21			35/60		soft	light gray	Clayey Gravel 2" Φ and some F-C sand		wet	0	0	0	0
	22					m. dense	Blk	Organic rich clay						
	23					loose	Blk	Organics ~~some~~ and clay JB 6-21-12		Wood (root) at	0	0	0	0
	24							(layered) 3/4" thick		8.5' and 9.5' bgs				
	25										0	0	0	0

* When rock coring, enter rock brokeness.

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

Remarks: Continuous macrocore (2" x 5' sleeve) from 0-15' bgs
Discrete macrocore from 15-TD

Drilling Area Background (ppm): 0.0

Converted to Well: Yes _____ No X Well I.D. #: _____

Tetra Tech

BORING LOG

PROJECT NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620DT

BORING No.: S43TW45
DATE: 6-21-17
GEOLOGIST: J. Birkett
DRILLER: J. Haldiman

Time	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
0905	S-26			33/60"		M. dense	Gray	F-C sand ~~gravel~~ JB 6-21-17 some gravel		wet	0	0	0	0
	27					M. stiff	Gray	Clay some med gravel						
	28					stiff	Gray	Clay, tr. silt		wet	0	0	0	0
	29					↓	↓	↓						
	30					↓	↓	↓		wet	0	0	0	0
0919	S-31			45/60"		extremely stiff	Gray	Likely Clay		Liner stuck in macrocore	–	–	–	–
	32					↓		↓		Expanding Clay				
	33										–	–	–	–
	34							↓						
	35					↓		Clay in shoe		moist Discontinue boring	0	0	0	0
	S-36				EOB 35' bgs									
	37													
	38													
	39													
	30													
	41													
	42													
	43													
	44													
	45													
	46													
	47													
	48													
	49													
	50													

* When rock coring, enter rock brokeness.

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

Remarks: See first page for details

Drilling Area Background (ppm): 0.0

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech

BORING LOG

PROJECT NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620DT

BORING No.: S43TW46
DATE: 6-21-12
GEOLOGIST: J. Birkett
DRILLER: J. Haldiman

Time	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**
1327	S1 1			60/60		Hard	Brn	Gravel and sand		Hard Clear to 3.5'	0	0	0	0
	2					dense	brn	Sand, clay some gravel		moist				
	3					very stiff	Brn/Gray	Silty Clay			0	0	0	0
	4				▽	↓	↓	↓ ↓		moist to wet				
	5					M. dense	light Brn	Silty VF sand tr. clay		wet	0	0	0	0
1331	S2 6			42/60		m dense	light Brn	↓ ↓		wet	0	0	0	0
	7					dense	light Brn	F-M sand and med pebbles some gravel		large crushed rock at 6'				
	8					↓	↓	↓ ↓		wet	0	0	0	0
	9					m dense	org Brn	Silty F-M sand some gravel						
	10					↓	↓	↓ tr. clay		moist to wet	0	0	0	0
1336	S3 11			43/60"		↓	↓	↓ ↓		moist to wet	0	0	0	0
	12					dense	Brn	Gravel and sand tr. clay		moist to wet				
	13					↓	↓	↓ ↓			0	0	0	0
	14					↓	↓	↓ ↓						
	15					very stiff	brn gray	Clay tr. silt		moist to wet	0	0	0	0
1346	16			42/60		very stiff	Gray	Clay tr. silt		moist to wet	0	0	0	0
	17					↓	little red	↓ ↓		↓				
	18					↓	↓	↓ ↓		↓	0	0	0	0
	19					↓	↓	↓ ↓		↓				
	20					↓	Gray Olive	↓ ↓		↓	0	0	0	0
	21													
	22													
	23													
	24													
	25													

* 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): 0.0

Remarks: Continuous macrocore from 3.5-10' bgs
Discrete from 10-20' bgs

Converted to Well: Yes _____ No X Well I.D. #: _____

Tetra Tech

BORING LOG

PROJECT NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620DT

BORING No.: S43 TW47
DATE: 6-20-12
GEOLOGIST: J. Birkett
DRILLER: J. Haldiman

Time	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**
1430	S-1 1			55/60"		m. dense	Brn	Top soil and grass		grass roots dry	0	0	0	0
	2					loose	light Brn	F sand some silt and gravel		dry				
	3					↓	↓	↓ ↓			0	0	0	0
	4					stiff	brn gray	Silty Clay tr. F-M sand		dry				
	5					↓	↓	↓ ↓		moist	0	0	0	0
1435	S-2 6			56/60"	2000	stiff	brn gray	Silty Clay tr. F-M sand		Crushed rock Gravel layer at 6'	0	0	0	0
	7					very stiff	brn	Clay tr. silt		moist to wet				
	8				0@7.0	soft	brn gray	Silty clay tr. F sand		wet 1" ø large pebble	0	0	0	0
	9					very stiff				expanding clay				
	10									moist	0	0	0	0
1441	S-3 11			60/60		stiff	Gray Brn	Silty clay			0	0	0	0
	12													
	13					dense	JB 6-20-12 ~~Gray~~	Silty VF sand tr. clay		moist	0	0	0	0
	14						tan brn							
	15							↓ ↓			0	0	0	0
1510	S-4 16			48/60		dense	Gray	Silty VF sand tr. clay		moist to wet	0	0	0	0
	17					dense	Gray	Clayey VF sand some F sand						
	18					stiff	Gray	Clay			0	0	0	0
	19					extremely		↓						
	20					stiff	Gray	Clay		↓	0	0	0	0
1530	S-5 21			40/12		↓	Gray	Clay		Expanding Clay	0	0	0	0
	22				EOB 21' bgs									
	23													
	24													
	25													

* 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): 0.0

Remarks: Continuous macro core 0-15' w/ 1.5" cutting shoe
Continuous macro core 15-21' w/ reduced cutting shoe

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech

BORING LOG

PROJECT NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620 DT

BORING No.: S43TW48
DATE: 6-20-12
GEOLOGIST: J. Birkett
DRILLER: J. Haldiman

Time	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**
1005	S-1 1			60/60		hard dense	Grax Brn	Asphalt Sand and gravel		dry	0	0	0	0
	2					↓	↓	↓ ↓						
	3					extremely stiff	Brn light Brn	Clay some silt		dry	0	0	0	0
	4					↓	↓	↓ ↓						
	5					very stiff	Gray	Clay some silt and VF-F sand		dry	0	0	0	0
1010	S-2 6			60/60"		m. dense	light Gray	VF sand		moist	0	0	0	0
	7					m. dense	light Brn	VF sand tr. silt						
	8					↓	↓			moist	0	0	0	0
	9					dense	Brn	VF sand and gravel		moist				
	10				▽	stiff very stiff	Gray Brn Gray	Clay some VF sand and gravel Clay some silt tr. gravel		wet	0	0	0	0
1017	S-3 11			54/60"		loose	light tan	Gravel and crushed rock tr sand		dry gravel >2" ⌀	0	0	0	0
	12					↓	↓	↓ ↓						
	13					↓	↓	↓ ↓			0	0	0	0
	14					m. dense	brn	Clay F-M sand and gravel						
	15					↓	↓	↓ ↓			0	0	0	0
1028	S-4 16			60/60"		stiff	brn	Clay some gravel		pockets of loose dk brn crumbly material wet	0	0	0	0
	17					very stiff	brn	Clay tr. silt						
	18					↓	↓	↓ ↓		moist to wet	0	0	0	0
	19					m. dense	Dk Brn	Silty F sand tr. M sand		moist to wet				
	20					very stiff	Gray	Clay tr. silt		moist to wet	0	0	0	0
1044	S-5 21			42/60		very stiff	Gray	Clay tr. silt		a lot of slough went into rods	0	0	0	0
	22					↓	↓	↓ ↓						
	23						Same red mottling			moist to wet	0	0	0	0
	24									↓				
	25					↓	↓	↓ ↓			0	0	0	0

* 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): 0.0

Remarks: Continuous macrocore (2"x5' sleeve) from 0-25'
From 20-25' used cutting shoe w/ half opening covered
Discrete macrocore from 25-TD

Converted to Well: Yes _____ No X Well I.D. #: _____

Tetra Tech

BORING LOG

PROJECT NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620DT

BORING No.: S43 TW48
DATE: 6-20-12
GEOLOGIST: J. Birkett
DRILLER: J. Haldiman

Time	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
1114	S-26			48/48				Silty Clay likely		Macrocore liner stuck in sampler				
	27							stuck in sampler			Ø	0	0	0
	28													
	29					extremely STIFF	Gray	(In Shoe) Silty clay fr. VF sand		Moist	0	0	0	0
	30				EOB -29' bgs									
	31							Discontinue boring						
	32							at 29' bgs due to expanding clays						
	33													
	34													
	35													
	36													
	37													
	38													
	39													
	30													
	41													
	42													
	43													
	44													
	45													
	46													
	47													
	48													
	49													
	50													

* When rock coring, enter rock brokeness.

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

Remarks: See first page for details

Drilling Area Background (ppm): 0.0

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech

BORING LOG

PROJECT NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620DT

BORING No.: S43TW51
DATE: 6-21-12
GEOLOGIST: J. Birkett
DRILLER: J. Haldeman

Time	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
1107	S-1 1			60/60"		loose	light Brn	top soil		Hand clear to 3' bgs Clay griping auger	0	0	0	0
	2					very stiff	Gray Brn	Clay some silt tr VF sand						
	3					very stiff	Gray Brn	Clay some silt		dry	0	0	0	0
	4									dry				
	5									moist	0	0	0	0
1112	S-2 6			60/60"		very stiff	Gray Brn	Clay some silt		Moist	0	0	0	0
	7					stiff	Gry Brn	Silt some VF sand tr. F sand						
	8				▽	m. dense	Gry Brn	Silty VF sand		Moist to wet	0	0	0	0
	9									wet				
	10					stiff stiff	Brn Gray	Clay VF sandy clay		Moist	0	0	0	0
1117	S-3 11			55/60"		m. stiff	Gray	VF sandy clay silty VF-F sand tr. clay		Moist	0	0	0	0
	12					dense	Brn							
	13									wet	0	0	0	0
	14					m. dense	light Brn	F-M sand tr. C sand and sm. pebbles						
	15									wet	0	0	0	0
1122	S-4 16			60/60"		m. dense	light Brn	F-M sand tr. C. sand and sm. large pebbles		wet	0	0	0	0
	17									pebbles <1" ϕ				
	18									wet	0	0	0	0
	19													
	20									wet	0	0	0	0
1135	S-5 21			60/60"		extremely stiff	Gray Brn	Clay tr. silt		moist	0	0	0	0
	22						Gry Brn Red	Clay		expanding clay discontinue boring				
	23						Gray Red			moist	0	0	0	0
	24						Olive Gray							
	25				EOB					moist	0	0	0	0

* When rock coring, enter rock brokeness. 25' bgs

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

Remarks: Continuous macrocore (2"x5' sleeve) From 0-15' bgs
Discrete macrocore from

Drilling Area Background (ppm): 0.0

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech

BORING LOG

PROJECT NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620DT

BORING No.: S43TW52
DATE: 6-21-12
GEOLOGIST: J. Birkett
DRILLER: J. Haldiman

Time	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**
1512	S-1 1			49/60"		loose	light gray	Sand+Gravel (road)		dry	0	0	0	0
	2					dense	brn	Silty VF sand some clay		dry				
	3					m.dense	blk	Sand and gravel brittle w/ black shiny pieces, asphalt dried tar?		dry	0	0	0	0
	4					↓	↓			large gravel 1" OD				
	5				S2	m.dense	dk gray brn	Clayey VF sand		Moist to wet at 4'	0	0	0	0
1517	S-2 6			30/60"		↓	↓	↓		wet	0	0	0	0
	7					↓	↓	↓						
	8					soft	blk	organic material (loose)		peat 3" thick	0	0	0	0
	9					m.dense	brn	Silty VF sand		wet				
	10					↓	↓	↓			0	0	0	0
1527	S-3 11			47/60"		loose	dk gray brn	Silty VF sand tr. M sand very few gravel		wet	0	0	0	0
	12					↓	↓	↓						
	13					↓	↓	↓		wet	0	0	0	0
	14					↓	↓	↓						
	15					m. stiff	Green Gray	Clay tr. silt		wet	0	0	0	0
1529	S-4 16			50/60		↓	↓	↓		wet	0	0	0	0
	17					↓	↓	↓						
	18					↓	brn	Clay		moist to wet	0	0	0	0
	19					stiff		↓						
	20					very stiff	light gray	↓		moist	0	0	0	0
	21				EOB 20' bgs					potential expanding clays				
	22									discontinue boring				
	23													
	24													
	25													

* When rock coring, enter rock brokeness.

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

Remarks: Continuous macrocore from 0-15' bgs
Discrete macrocore from 15-20' bgs

Drilling Area Background (ppm): 0.0

Converted to Well: Yes _____ No X Well I.D. #: _____

Tetra Tech

BORING LOG

PROJECT NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620DT

BORING No.: S43TW52
DATE: 7-10-12
GEOLOGIST: J. Birkett
DRILLER: J. Holdiman

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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	1						No macrocores taken						
	2						From 0-20' bgs, see						
	3						boring log From 6-21-12						
	4						For details						
	5												
	6												
	7												
	8												
	9												
	10												
	11												
	12												
	13												
	14												
	15												
	16												
	17												
	18												
	19												
	20												
Time 0822 S-1	21		38/60		Very stiff	Gray Green	Clay tr. silt		Wet	0	0	0	0
	22					Brn			Moist to wet				
	23				m. stiff very stiff	Brn Gray/ /Green	Clayey silt some F. Sand Clay tr. silt		Moist	0	0	0	0
	24												
	25				extreme stiff	lt brn	Silt Some F. Sand ~~Sand~~ tr. clay		Moist	0	0	0	0

7-10-12

* 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): 0.0

Remarks: ~~Continuous macrocore (2" X 5' sleeve) from~~
Discrete macrocore from 20-29' bgs
Continuous macrocore w/ 2 1/4" rods and 1" cutting shoe

Converted to Well: Yes _____ No X Well I.D. #: _____

Tetra Tech

BORING LOG

PROJECT NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620DT

BORING No.: S43TW52
DATE: 7-10-12
GEOLOGIST: J. Birkett
DRILLER: J. Haldiman

Time	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**
0835	S2	26		3/48				Expanding Clays		liner jammed in				
		27								macrocore				
		28												
		29				extremely stiff	Brn/red	Clayey silt		moist clayey silt in shoe	0	0	0	0
0855	S-3	30		16/24						mottled				
		31								moist	0	0	0	0
0930	S-4	32		34/48		very stiff	Gray/red	Clayey silt						
		33								moist mottled	0	0	0	0
		34												
		35			EOB 34' bgs refusal									
		36												
		37												
		38												
		39												
		40												
		41												
		42												
		43												
		44												
		45												
		46												
		47												
		48												
		49												
		50												

* When rock coring, enter rock brokeness.

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

Remarks: See first page for details

Drilling Area Background (ppm): 0.0

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112600771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620DT

BORING No.: S43TW53
DATE: 6-22-12
GEOLOGIST: J. Birkett
DRILLER: J. Haldiman

Time	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
		0												
0748	S-1			60/60		m. dense	light brn	Top Soil		dry	0	0	0	0
						very dense?	light gray	Silty clay						
						↓	light brn	↓		dry	0	0	0	0
						↓	↓	↓						
		5				very dense	light brn gray	Silty VF sand		dry to moist	0	0	0	0
0752	S-2			54/60		m. dense	brn	Silty VF sand		moist	0	0	0	0
						↓	↓	↓						
						m. dense	brn/tan	Silty VF sand tr. clay		moist to wet	0	0	0	0
					V	↓		↓						
		10				m. dense	brn/tan	Silty VF sand tr. to some clay		wet	0	0	0	0
0750	S-3			53/60		m. dense	brn/gray	Silty VF sand tr. clay and F-M sand		wet	0	0	0	0
						↓	↓	↓						
										wet	0	0	0	0
		15				↓	↓	↓		wet	0	0	0	0
0804	S-4			38/60"		dense	dkgrn Brn	Silty VF sand tr. clay		wet	0	0	0	0
						↓	↓	↓						
						m. stiff	gray	Clay		wet	0	0	0	0
						↓	↓	↓						
		20				stiff	gray	Clay some silt tr. VF sand		moist	0	0	0	0
0816	S-5			37/60"		stiff	gray	Silty Clay some VF sand		moist	0	0	0	0
						↓	↓	↓		moist to wet				
						m. dense	gray	F-M sand some silt tr. sm-med pebbles and gravel		wet	0	0	0	0
						↓	↓	↓						
		25								wet	0	0	0	0

* When rock coring, enter rock brokeness.

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

Remarks: Continuous macrocore 2" x 5' sleeve From 3-15' bgs Hand clear 0-3 refusal
Discrete macrocore From 15-TD

Drilling Area Background (ppm): 0.0

Converted to Well: Yes X No _____ Well I.D. #: _____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: NSF-Indian Head Site43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620DT

BORING No.: S43TW53
DATE: 6-22-12
GEOLOGIST: J. Birkett
DRILLER: J. Haldiman

Time	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
		25												
0825	S-6			28/60		m. dense	Gray	Gr F-C Sand some pebbles		Gravel 1" ϕ	0	0	0	0
								and gravel tr. silt		wet				
											0	0	0	0
						m. stiff	Gray	Silty Clay tr. VF sand		wet				
		30									0	0	0	0
0839	S-7			20/60		soft	DK Gray	Clay some silt		wet	0	0	0	0
										wet	0	0	0	0
		35								wet	0	0	0	0
0854	S-8			30/60"		soft	DK Gray Blk	Organic rich clay		wet	0	0	0	0
								18 6-22-12 ~~Some~~ little plant debris						
										wet	0	0	0	0
		40								wet	0	0	0	0
					EOB 40' bgs									

* When rock coring, enter rock brokeness.

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

Remarks: See first page for details

Drilling Area Background (ppm): 0.0

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech

BORING LOG

PROJECT NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620DT

BORING No.: S43TW57
DATE: 7-12-12
GEOLOGIST: J. Birkett
DRILLER: J. Haldiman

Time	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
1415	S-1	1		60/60"		loose	Brn	Top soil		dry	0	0	0	0
		2				Very stiff	brn to	Silty Clay						
		3				↓	lt brn	↓		dry	0	0	0	0
		4				↓	↓	↓						
		5				Very dense	light brn	Clayey VF sand		moist	0	0	0	0
1418	S-2	6		60/60"		very stiff	lt brn	Clay some VF sand		moist	0	0	0	0
		7				m. dense	brn/gray	VF-F sand tr. clay		moist to wet				
		8				Very stiff m. dense	brn/gray brn	Silty Clay VF-F sand tr. silt		wet	0	0	0	0
		9				dense	brn	VF-F sand some clay						
		10				stiff	brn	Clay tr. VF sand		wet	0	0	0	0
1424	S-3	11		56/60"		m. dense	brn	VF-F sand some clay		wet	0	0	0	0
		12				m. dense	brn/gray	Clayey VF sand		wet				
		13				m. dense	brn	VF-F sand some clay			0	0	0	0
		14				m. dense	gray	VF-F sand		wet				
		15				m. dense	brn	VF-F sand tr. silt			0	0	0	0
1434	S-4	16		40/60		m. dense	gray	Silty VF sand some clay		wet	0	0	0	0
		17				dense	↓	F-M sand tr. C sand and clay						
		18				m. dense dense	↓	F sand some silt tr. clay F-C sand some sm. pebbles tr. clay		wet	0	0	0	0
		19				stiff	Gray	Clay		tan/orange layer at 19'				
		20				m. dense	Gray	F-M sand some C. sand and pebbles tr. clay		wet	0	0	0	0
1442	S-5	21		40/60		dense m. dense	Gray Gray	Clayey F-C sand tr. pebbles F-C sand some clay		wet	0	0	0	0
		22				dense	Gray	M-C sand and pebbles (SM)						
		23				m. stiff stiff	Brn Gray	Clay some sand tr. pebbles Clay tr. silt		wet	0	0	0	0
		24				↓	↓	↓						
		25				↓	↓	↓		wet	0	0	0	0

* 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): 0.0

Remarks: Continuous macrocore (2" X 5' sleeve) from 0-15' bgs
Discrete macrocore from 15' -

Converted to Well: Yes X No _____ Well I.D. #: S43MW26

Tetra Tech

BORING LOG

PROJECT NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620DT

BORING No.: S43 TW57
DATE: 7-12-12
GEOLOGIST: J. Birkett
DRILLER: J. Haldiman

Time	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
1459	S-6	26		47/60		Stiff	Gray	Clayey Silt tr. VF sand		wet	0	0	0	0
		27												
		28								wet	0	0	0	0
		29					DK Gray							
		30								wet	0	0	0	0
1509	S-7	31		37/60		midense	ltgray	F-M sand some C sand and sm-lg gravel		1" Φ gravel wet	0	0	0	0
		32								wet				
		33				stiff	DK Gray	~~Dk gr~~ Organic Rich clay JB 7.12.12			0	0	0	0
		34					Blk			wet				
		35									0	0	0	0
		36			EOB 35' bgs									
		37												
		38												
		39												
		40												
		41												
		42												
		43												
		44												
		45												
		46												
		47												
		48												
		49												
		50												

* When rock coring, enter rock brokeness.

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

Remarks: See first page for details

Drilling Area Background (ppm): 0.0

Converted to Well: Yes X No _____ Well I.D. #: S43MW26

Tetra Tech, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG:

BORING No.: S435B023
DATE: 5-13-12
GEOLOGIST: Jacob Birkett
DRILLER: W. Jacks

Time	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks (1110)	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
1015	S-1	1		52/60"		dense	brn	Top soil and gravel		S435B023-0001 and duplicate	0.3	0	0	0
		2					tan	crushed rock		in ditch 1111	8.4			
		3				stiff	dk gray	Clay		moist	11.1	0	0	0
		4				v. stiff	brn gray	Silty Clay tr. F. sand		mottled	38.3			
		5				v. stiff	↓	↓ ↓		moist	41	0.2	0	0
1022	S-2	6		56"/60"		dense	gray	Silty F sand tr. clay		moist	84	0.2	0	0
		7			▽		little brn			1123 S435B023-0607	109			
		8								on slope	73	0.2	0	0
		9								wet	47.4			
		10								wet	23	0	0	0
		11			EOB 10' bgs									
		12												
		13												
		14												
		15												
		16												
		17												
		18												
		19												
		20												
		21												
		22												
		23												
		24												
		25												

* 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): 0.2

Remarks: Continuous macrocore (2" x 5' sleeve) w/ 1 1/3" cutting shoe
S435B023-0001 collect via hand auger in ditch
S435B023-0607 collected via DPT on slope of hill

Converted to Well: Yes _____ No X Well I.D. #: _____

Tetra Tech, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620DT

BORING No.: 5435B024
DATE: 5-13-12
GEOLOGIST: Jacob Birkett
DRILLER: W. Jacks

Time	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks 1023	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
1025	S-1	1		55"/60"		loose	Brn tan	top soil, gravel, crushed rock		5435B024-0001 in ditch	0.1	0	0	0
		2				very stiff	Brn gray	Silty clay						
		3				↓	↓	↓		moist	2.1	0	0	0
		4				↓	↓	↓						
		5				very stiff	gray	Silty Clay tr. F sand		moist	1.8	0	0	0
1032	S-2	6		60/60"		dense	brn gray	Silty VF Sand tr. gravel SM-med		moist 1041	3.3	0	0	0
		7			▽	↓	↓	↓		5435B240607 and Dup	4.4			
		8				↓	↓	↓		on slope wet 1042	3.0	0	0	0
		9				very stiff	brn gry	Silty Clay tr. F sand		moist	2.8			
		10				very stiff	brn	Clay		moist	1.4	0	0	0
		11			EOB 10' bgs									
		12												
		13												
		14												
		15												
		16												
		17												
		18												
		19												
		20												
		21												
		22												
		23												
		24												
		25												

* 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): 0.1

Remarks: Continuous Macrocore (2" x 5' sleeve) w/ 1½" cutting shoe
5435B024-0001 collected via hand auger in ditch
5435B024-0607 collected via DPT on slope of hill

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: ~~Slam bar~~ Geoprobe 6620DT

BORING No.: 5435B025
DATE: 5-12-12 and 5-13-12
GEOLOGIST: Jacob Birkett
DRILLER: W. Jacks

Time	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks 0945	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
0950	S-1	1		47/60"	Moist	m.dense	Brn	Top soil and grass		5435B025-0001 in ditch	0.2	0	0	0
		2				dense very stiff	Gray Brn Gray	Crushed rock		moist				
		3				↓	↓	Silty Clay			1.7	0	0	0
		4				↓	↓	↓ ↓		moist				
		5				very stiff	Brn Gray	Silty Clay tr. F. sand			3.3	0	0	0
0955	S-2	6		32/60"		very stiff	Brn Gray	Silty Clay tr. F. sand		moist 0952	4.4	0	0	0
		7			↓	m dense	Brn Gray	Silty F. sand tr. gravel		5435B025-0607 on slope	5.1			
		8				m. dense	Gray	Silty F. sand some clay		wet	3.0	0	0	0
		9				m. dense	Brn	Silty F. sand			4.8			
		10				↓	Gray	↓ ↓		moist	2.7	0	0	0
		11			EOB 10' bgs									
		12												
		13												
		14												
		15												
		16												
		17												
		18												
		19												
		20												
		21												
		22												
		23												
		24												
		25												

* 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): 0.1

Remarks: 5-12-12 2 attempts w/ slam bar no recovery switch to hand auger and rip
5-13-12 Continuous Macrocore (2"x5' sleeve) w/ 1 1/2" cutting shoe
5435B025-0001 collect via hand auger in ditch, 5435B016-0607 collected via DPT on slope of hill

Converted to Well: Yes _____ No X Well I.D. #: _____

Tetra Tech, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620DT

BORING No.: 5435B026
DATE: 5-13-12
GEOLOGIST: Jacob Birkett
DRILLER: W. Jacks

Time	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks 0910	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
0908	S-1	1		40/60"		m.dense	DKBrn	Top soil and gravel		5435B026-0001 in ditch	1.7	0	0	0
		2				very stiff	Brn Gray	Silty Clay		large crushed rock at 1'	0.8			
		3				↓	↓	↓		moist	3.1	0	0	0
		4				↓	↓	↓			5.0			
		5				stiff	Brn Gray	Silty Clay tr. F. sand		moist to wet	7.4	0	0	0
0916	S-2	6		50/60"	▽	m.dense	Brn Gray	Silty F. sand some clay		5435B026-0506 wet 0920	4.8	0	0	0
		7				↓	↓	↓						
		8				↓	↓	↓			4.6	0	0	0
		9				↓	↓	↓						
		10				m.dense	Brn gray	Silty F. sand tr. clay			4.4	0	0	0
		11			EOB 10'									
		12												
		13												
		14												
		15												
		16												
		17												
		18												
		19												
		20												
		21												
		22												
		23												
		24												
		25												

* 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): 0.1

Remarks: Continuous macrocore (2"x5' sleeve) to TD w/ 1½" shoe
5435B026-0001 collect via hand auger in ditch
5435B026-0506 collected via DPT on slope of hill

Converted to Well: Yes _____ No X Well I.D. #: -

Tetra Tech, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620DT

BORING No.: 5435B027
DATE: 5-13-12
GEOLOGIST: Jacob Birkett
DRILLER: W. Jacks

Time	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**
0835	S-1	1		54/60"		m.dense m.dense?	PK Brn Brn	top soil and gravel / silty gravel (fill)		0825 5435B027-0001 @ collected via hand auger in ditch	0.3	0	0	0
		2				very stiff	Gray Brn	Silty clay		moist	0.9			
		3				↓	↓	↓			1.0	0	0	0
		4								moist	1.2			
		5				very stiff	Gray Brn	Silty clay tr. F sand			0.9	0	0	0
0840	S-2	6		44/60"		dense	Brn Gray	Silty sand some clay		moist	2.1	0	0	0
		7				↓	↓	↓		0850	15.4			
		8			▽					5435B027-0708 on top of slope	21.7	0	0	0
		9				↓	↓	↓		wet	10.4			
		10						Silty VF sand tr. clay			5.1	0	0	0
		11			EOB 10' bgs									
		12												
		13												
		14												
		15												
		16												
		17												
		18												
		19												
		20												
		21												
		22												
		23												
		24												
		25												

* 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): 0.1

Remarks: Continuous macrocore (2"x5' sleeve) to TD w/ 1½" cutting
5435B027-0001 collect via hand auger in ditch
5435B027-0708 collected via DPT on slope of hill

Converted to Well: Yes _____ No X Well I.D. #: _____

Tetra Tech, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620 DT

BORING No.: 5435B028
DATE: 5-13-12
GEOLOGIST: Jacob Birkett
DRILLER: W. Jacks

Time	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
1159	S-1	1 26		60/60"		soft	Dk Brn Org	Clayey organic matter F-M sand some silt		1203 5435B028-0001	3.3	0	0	0
		2 27				m. dense	Brn	Clay		Moist	1.7			
		3 28				~~silt~~ m. dense	~~Gray~~ Gray	~~F-M sand some silt~~			0	0	0	0
		4 29									0			
		5 30			▽					Wet 1215 5435B028-0405	0	0	0	0
		31			EOB 5'					MSMD				
		32												
		33												
		34												
		35												
		36												
		37												
		38												
		39												
		40												
		41												
		42												
		43												
		44												
		45												
		46												
		47												
		48												
		49												
		50												

* When rock coring, enter rock brokeness.

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

Remarks: Handauger for both samples

Drilling Area Background (ppm): 0.0

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech

BORING LOG

PROJECT NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620DT

BORING No.: S43SB29
DATE: 6-2-12
GEOLOGIST: J. Birkett
DRILLER: J. Haldiman

Time	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
0845	S-1 1			60/60"		m.dense	Brn	Top Soil and grass roots		Hand auger to 5' bgs	0	0	0	0
	2					stiff	Brn/Gry	Silty Clay tr. to some F. Sand		moist				
	3					↓	↓	↓			0	0	0	0
	4									moist				
	5					↓	↓	↓			0	0	0	0
0900	S-2 6			55/60"		stiff	Brn Gray	Silty Clay some F. sand		moist	0	0	0	0
	7					dense	Brn	Silty F sand tr. clay			0.1			
	8				▽			↓		moist to wet	0	0	0	0
	9					M.dense	tanish Brn	VF-F sand some silt		wet				
	10					↓	↓	↓		wet	0	0	0	0
0907	S311			45/60"		M.dense	Gray	VF-F sand some silt		wet	0	0	0	0
	12					↓	↓	↓						
	13					Dense very stiff	DK Brn Gray	Gravely F sand ~~Silty Clay~~ Clay some silt		wet	0	0	0	0
	14						/Brn	JB 6-3-12		mottled				
	15					↓	↓	↓		wet	0	0	0	0
0914	S416			60/60"		stiff	Gray/Brn	~~Silt~~ JB Clay some silt		wet	0	0	0	0
	17					↓	↓	↓						
	18					↓	↓	↓		wet	0	0	0	0
	19					Dense	Gray	Silty VF sand						
	20					↓		↓		wet	0	0	0	0
0922	S521			36/60"		m.dense	Gray	F-M sand tr. sm pebble and silt		wet	0			
	22					m. stiff	Gray	Clay some silt						
	23					m.dense	Gray some	F-C sand some sm.-med pebble		wet				
	24					↓	light Brn	↓						
	25					m.dense	↓	Gravely sand (M-C)		Gravel as large as 2" φ wet				

* 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): 0.0

Remarks: Continuous macrocore from 0-10' bgs (5'x2" sleeves
Discrete macrocore fom 10-TD

Converted to Well: Yes _____ No X Well I.D. #: _____

Tetra Tech

BORING LOG

PROJECT NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620DT

BORING No.: S43 SB 29
DATE: 6-3-12
GEOLOGIST: J. Birkett
DRILLER: J. Haldiman

Time	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
0935	S626			30/60"		m. dense	Gray	F-M sand some C. sand and sm.-med pebbles		wet	0	0	0	0
	27					↓	↓	↓						
	28					↓	↓	↓		wet	0	0	0	0
	29					m. stiff	Gray	Clay some silt						
	30					m. stiff	DKGray	Organic rich clay		wet some plant debris	0	0	0	0
0950	S731			53/60"		stiff	Blk	Organic rich clay		some plant debris	0	0	0	0
	32					↓	↓	↓		wet				
	33						↓				0	0	0	0
	34						dk Gray			wet				
	35					↓	to Blk ↓	↓			0	0	0	0
1007	S836			36/60"		m. stiff	dk Gray to Blk	Organic rich clay		wet	0	0	0	0
	37					↓	↓	↓						
	38									wet	0	0	0	0
	39													
	40					↓	↓	↓		wet	0	0	0	0
1026	S941			12/60"		m. stiff	DK Gray	Organic rich clay		wet	0	0	0	0
	42					↓	↓	↓						
	43									wet	0	0	0	0
	44													
	45					↓	↓	↓		wet	0	0	0	0
	S1046				EOB 45' bgs									
	47													
	48													
	49													
	50													

* When rock coring, enter rock brokeness.

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

Remarks: See first page for details

Drilling Area Background (ppm): 0.0

Converted to Well: Yes _____ No X Well I.D. #: _____

Tetra Tech

BORING LOG

PROJECT NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620 DT

BORING No.: S43 MW09
DATE: 6-1-12
GEOLOGIST: J. Birkett
DRILLER: J. Haldiman

Time	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
1453	S-1 1					loose	Brn	Top Soil		moist	0	0	0	0
	2					dense	Brn/Gry	VF-F sand and silt		dry mottled				
	3					stiff	Brn/Gry	Silty Clay tr. F. sand		moist	0	0	0	0
	4					↓	↓	↓						
	5					↓	↓	↓		moist to wet	0	0	0	0
1458	S-2 6				R	very stiff	Brn/Gry	Silty Clay tr. F. sand		mottled moist to wet	0	0	0	0
	7					m. dense	Gray	VF-F sand tr. silt						
	8					stiff	Brn/Gray	VF sandy silt		wet	0	0	0	0
	9					↓	↓	↓						
	10					↓	↓	↓		wet	0	0	0	0
1508	S-3 11					very stiff	Brn/Gray	VF sandy silt		wet	0	0	0	0
	12					m. stiff	Gray	Clay tr. silt						
	13					↓	↓	↓		wet	0	0	0	0
	14					↓	↓	↓						
	15					stiff	DK Gry	Organic rich clay some plant debris		wet	0	0	0	0
1519	S-4 16					stiff	DK Gry	Organic rich clay		wet	0	0	0	0
	17					↓	↓	some plant debris						
	18					↓	↓	↓		wet	0	0	0	0
	19					↓	↓	↓						
	20					stiff	Gray	Clay some F. sand		wet	0	0	0	0
1529	S-5 21					Soft	Gray	Clay some F. sand		wet no organics	0	0	0	0
	22					↓	↓	↓						
	23					soft	Gray	F. Sandy Clay		wet	0	0	0	0
	24					↓	↓	↓						
	25					↓	↓	↓		wet	0	0	0	0

* 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): 0.0

Remarks: Continuous Macrocore (2"x5' sleeve) w/ 1.5" cutting shoe 0-15' bgs
Discrete Macrocore from 15'-TD

Converted to Well: Yes X No _____ Well I.D. #: S43MW09

Tetra Tech

BORING LOG

PROJECT NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620 DT

BORING No.: S43 MW09
DATE: 6-1-12 and 6-2-12
GEOLOGIST: J. Birkett
DRILLER: J. Haldiman

	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**
1540	S-26			44/60"		dense	Gray	Clayey F-M sand		wet	0	0	0	0
	27					soft		F-M Sandy Clay tr. sm gravel						
	28					stiff		Clay tr. F-M sand		wet	0	0	0	0
	29					↓		↓ ↓						
6-1-12	30					dense	↓	F-C sand tr. sm. pebbles		wet	0	0	0	0
6-2-12 1617	S-31			52/60"		m.dense	Gray	F-C sand tr. sm pebbles and silt		wet	0.4	0	0	0
	32					↓	↓	↓ ↓		Note: Not dk gray clay	0.5			
	33					stiff	Gray	Clay tr. silt		wet	0.8 0	0	0	0
	34					↓	↓	↓ ↓		few organics not organic rich	0			
	35					↓	↓	↓ ↓		like seen elsewhere wet	0	0	0	0
1630	S-36			30/60"		m. stiff	Gray	Clay tr. silt		wet	0	0	0	0
	37					very stiff	DK Gray	Organic rich clay						
	38					↓	↓	↓ ↓		wet	0.2	0	0	0
	39													
	40 30					↓	↓	↓ ↓		wet	0	0	0	0
1650	S-41			46/60"		stiff	DK Gray	Organic rich clay		wet	0	0	0	0
	42					↓	↓	↓ ↓		lots of woodland plant debris				
	43					↓	Blk	↓ ↓		wet	0	0	0	0
	44					↓	↓	↓ ↓						
	45					↓	↓	↓ ↓		wet	0	0	0	0
1707	S-46			36/60"		v. stiff	Gray w/ some brn layers	Clay tr. silt		wet	0	0	0	0
	47					↓	↓	↓ few wood pieces ↓						
	48					↓	↓	↓ ↓		wet	0	0	0	0
	49					↓	↓	↓ ↓						
	50				EOB 50'	↓	↓	↓ ↓		wet	0	0	0	0

* When rock coring, enter rock brokeness.

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

Remarks: See first page for details

Drilling Area Background (ppm): 0.0

Converted to Well: Yes X No _____ Well I.D. #: S43MW09S S43MW09D

Tetra Tech

BORING LOG

PROJECT NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620DT

BORING No.: S43MW12
DATE: 6-2-12
GEOLOGIST: J. Birkett
DRILLER: J. Haldiman

Time	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**
0946	S-1 1			60/60"		Solid	Gray	Concrete w/ 1" steel rebar		add water w/ corer	0	0	0	0
	2					Dense	Gray Brn	Gravely Sand						
	3					Stiff	Gray Brn	Silty Clay some Gravel		moist	0	0	0	0
	4					↓	↓	↓ ↓						
	5					m. dense	Gray Brn	VF-F sand some silt		moist	0	0	0	0
0951	S-2 6			60/60"		m. dense	Brn	VF-F sand some silt		moist	0	0	0	0
	7													
	8				I	m. dense	Brn/Gray	Silty VF sand		wet	0	0	0	0
	9					m. dense	Gray	~~Clayey~~ VF sand some clay / Clayey VF sand						
	10					m. stiff m. dense	Gry/Brn	VF sand some silt tr. clay		wet	0	0	0	0
0957	S-3 11			51/60"		m. dense	Gray Brn	VF sand some silt + clay		thinly laminated clay stringers wet	0.0	0	0	0
	12					m. dense	Purplish Brn	F-M sand some silt		wet	0.4			
	13					m. stiff	Purplish Brn	Clayey silt some F. sand		wet	0.0	0	0	0
	14					m. dense	Brn	F-M sand tr. silt and C. sand		very thin black layers at 13' bgs wet	0.7			
	15					↓	↓	↓ ↓			0.3	0	0	0
1005	S-4 16			60/60"		m. dense	Brn	F-M sand tr. silt and C. sand		wet	0	0	0	0
	17					↓	light Brn	↓ ↓						
	18						Brn			wet	0	0	0	0
	19					↓	↓			very thin blk layer at 18.5' bgs				
	20					m. dense	tan Gray	↓ ↓		wet	0	0	0	0
1017	S-5 21			41/60"		m. dense	tan Gray	F-M sand tr to some sm. pebbles		wet	0	0	0	0
	22					↓	↓	↓ tr silt F-M sand some round sm. gravel		wet				
	23					Very stiff	Gray Brn	Clay tr. silt		wet alternating colored clay layers	0	0	0	0
	24					stiff	Gry/	Clay some silt		wet				
	25					↓	↓	↓ ↓			0	0	0	0

* 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: Concret 4" OD corer and hand auger to 5' bgs
Continuous macrocore (2"x5' sleeve w/ 1½" shoe) from 0-20' bgs
Discrete macrocore from 20' bgs to TD

Converted to Well: Yes X No _____ Well I.D. #: S43MW12

Tetra Tech

BORING LOG

PROJECT NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620DT

BORING No.: S43 MW12
DATE: 6-2-12
GEOLOGIST: J. Birkett
DRILLER: J. Haldiman

Time	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
1027	S626			35/60"		stiff	Gray	Clay some silt		wet	0	0	0	0
	27					m. stiff	Gray	Silt some clay tr. VF sand						
	28					m. dense	Gray	F-M sand some clay		wet	0	0	0	0
	29					soft m. dense	Gray light	Clay tr. silt F-M sand some C. sand and						
	30						Gray	sm. pebbles tr. silt		wood frag at 29.5' bgs wet	0.5	0	0	0
1037	S631			33/60"		m. dense	light Gray	F-C sand some sm to med pebbles		wet	0	0	0	0
	32													
	33					stiff	dk Gray	Organic rich clay		wet	0	0	0	0
	34													
	35									wet	0	0	0	0
	36				EOB 35' bgs									
	37													
	38													
	39													
	30													
	41													
	42													
	43													
	44													
	45													
	46													
	47													
	48													
	49													
	50													

* When rock coring, enter rock brokeness.

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

Remarks: See first page for details

Drilling Area Background (ppm): 0.0

Converted to Well: Yes X No ____ Well I.D. #: S43MW012

Tetra Tech, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620DT

BORING No.: 543MW14
DATE: 5-12-11
GEOLOGIST: Jacob Birkett
DRILLER: William Jacks

Time	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
0810	S-1	1		60/60"		m. dense	DK Brn	Top Soil w/some gravel		Hard dear to 5' bgs	0.1	0.1	0	0
		2				stiff	Brn	Silty Clay tr. F sand, few sm. gravel		moist				
		3				loose	Brn	Silty F-M sand tr. gravel			0.1	0.1	0	0
		4				stiff	Gray Brn	Silty clay		mottled moist				
		5				m. dense	Brn/Org	VF sand some clay		wet to moist	0.1	0.1	0	0
0816	S-2	6		48/60"		loose	Brn	Silty VF-F sand		wet	0.3	0.3	0	0
		7				m. dense	Gray	Silty VF-F sand tr. sm. gravel						
		8				stiff	Brn	Clayey F sand and gravel		wet	16.5	0.3	0	0
		9				stiff	Gray	Clay some F sand		two large gravel pieces 0-4 & 4-8 and 58"	13.2			
		10					↓	↓ ↓		wet	9.7	0.3	0	0
0823	S-3	11		54/60"		m. dense	Brn	Silty VF sand		wet	8.3	0.1	0	0
		12				m. dense	light Brn	F-M sand tr. silt		wet	9.4			
		13				↓	↓	↓ ↓			10.6	0.1	0	0
		14				m. dense	Brn	F-M sand some clay		wet	8.1			
		15				m. dense	Brn	F-M sand tr. silt		wet	3.1	0.1	0	0
0829	S-4	16		50/60"		m. dense	Brn	F-M sand tr. silt		wet	0.2	0	0	0
		17				dense	light Brn	F-M sand some lg gravel tr. silt		wet				
		18				dense		F-C sand and gravel (lg) tr. silt		wet crushed rock	0.1	0	0	0
		19				v. stiff	light Brn	Clay some silt tr. VF sand		mottled				
		20				↓	Gray/Brn	↓ ↓		moist	0.1	0	0	0
0845	S-5	21		41/60"		v. stiff	Gray	Silty Clay tr. VF sand		moist	0.2	0	0	0
		22				↓	Gray/Red	Silt some Clay						
		23				↓	Gray Brn Red	Clay		moist	0.3	0	0	0
		24				↓	↓	↓ ↓						
		25			EOB 25' bgs	↓	↓	↓ ↓		moist	0.2	0	0	0

* 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): 0.1

Remarks: Continuous macrocore to 20' bgs in 2" x 5' sleeves w/ 1½" cutting shoe. Discrete macrocore from 20-EOB

Converted to Well: Yes X No _____ Well I.D. #: 543MW14

Tetra Tech

BORING LOG

PROJECT NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620DT

BORING No.: S43 MW17
DATE: 7-12-12
GEOLOGIST: J. Birkett
DRILLER: J. Haldiman

Time	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
0825	S-1	1		60/60		loose stiff	Brn lt brn	Top Soil Silty Clay		dry	0	0	0	0
		2				↓	↓	↓						
		3				↓	↓	↓		dry	0	0	0	0
		4				very stiff	lt brn/gray	↓						
		5				very dense	lt brn	VF sand some silt and F sand		moist	0	0	0	0
0832	S-2	6		54/60		m. dense	brn	VF-F sand tr. silt		moist	0	0	0	0
		7				↓	↓	↓						
		8				↓	↓	pebble layer (0.3" Φ)		moist to wet	0	0	0	0
		9				m. stiff	brn/gray	Clay tr. silt		wet				
		10				m. dense	lt brn/gray	VF sand some clay		wet	0	0	0	0
0839	S-3	11		53/60"		↓	lt brn gray	↓		wet	0	0	0	0
		12				m. dense	Brn	VF-F sand tr. clay		wet				
		13				m. dense hard	Brn Brn	VF-F sand Gravel/Crushed rock		Wet	0	0	0	0
		14				stiff	Gray w/some	Clay		moist				
		15				soft	brn ↓	↓		wet	0	0	0	0
0847	S-4	16		50/60"		stiff	brn	Clay		wet	0	0	0	0
		17				↓	↓	↓						
		18				stiff	brn/gray	Clay tr. to some F sand		wet	0	0	0	0
		19				↓	↓	↓						
		20				m. dense	brn/gray	F-C sand some sm. pebbles tr. clay		wet	0	0	0	0
0850	S-5	21		28/60"		m. dense	brn/gray	F-C sand and crushed gravel tr. clay		wet	0.3	0	0	0
		22				↓	↓	↓ (1.5" Φ)			5.4	0	0	0
		23				↓	↓	↓		wet	3.3	0	0	0
		24				↓	↓	↓			7.1	0	0	0
		25				↓	↓	↓		wet	6.0	0	0	0

* 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): 0.0

Remarks: Continuous macrocore (2" X 5' sleeve) from 0-15' bgs
Discrete macrocore from 15-

Converted to Well: Yes X No ____ Well I.D. #: S43MW17 S and D

Tetra Tech

BORING LOG

PROJECT NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620DT

BORING No.: S43 MW17
DATE: 7-12-12
GEOLOGIST: J. Birkett
DRILLER: J. Haldiman

Time	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
0910	S-6	26		32/60"		dens,	Brn/Gray	F-C sand and gravel tr. clay		gravel up to 1" ⌀ wet	3.3	0	0	0
		27				↓	↓	↓		Clay lens at 27' (2" thick)	2.1			
		28				↓	↓	↓			3.1	0	0	0
		29				stiff	Gray	Clay some silt		wet	0			
		30				↓	↓	↓			0	0	0	0
0925	S-7	31		38/60"		stiff	Gray	Clay some silt		wet	0	0	0	0
		32				m. dense	Gray	F-C sand tr. silt			5.4			
		33				↓	↓	↓		wet	4.3	0	0	0
		34				↓	↓	↓			9.1			
		35				↓	↓	↓		wet	6.3	0	0	0
0940	S-8	36		33/60"		m. dense	Gray	F-C sand tr. silt			0	0	0	0
		37				stiff	Dk Gray	Organic rich clay						
		38				↓	↓	↓			0	0	0	0
		39												
		40				↓	↓	↓			0	0	0	0
		41			EOB 40' bgs									
		42												
		43												
		44												
		45												
		46												
		47												
		48												
		49												
		50												

* When rock coring, enter rock brokeness.

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

Remarks: See first page for details

Drilling Area Background (ppm): 0.0

Converted to Well: Yes X No ____ Well I.D. #: S43MW17S and D

2013

Soil Boring Logs

Tetra Tech

BORING LOG

PROJECT NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620DT

BORING No.: SAPZ01
DATE: 5-1-13
GEOLOGIST: J. Birkett
DRILLER: J. Haldiman

Time	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
		0												
	S-1	1		16/60		loose m.	H brn	F-C Sand some pebbles		moist	0	0	0	0
						m. dense	↓	↓						
						loose m. dense	tan Brn	Crushed rock F-C Sand some gravel tr. silt		crushed rock at 2'	0	0	0	0
						↓	↓			wet				
1301		5			▽	m. dense	Blk	Clayey F-C sand (organic rich			0	0	0	0
	S-2	6		40/60			Brn	F-M Sand some pebbles + gravel		wet Gravel >2" ⌀	0	0	0	0
						m. dense	Gray	Large Gravel and crushed rock some F-C sand						
						↓	↓	↓ ↓ tr. clay		wet	0	0	0	0
						Very stiff	Gray	Clay tr. silt						
1305		10				m. stiff	DK Gray	~~VF Sand~~ Clay some VF sand SB 5-1-13		wet	0	0	0	0
	S-3	11		58/60		m. stiff	DK Gray	Clay tr. silt		wet	0	0	0	0
						↓	↓	↓ ↓						
						m. stiff to stiff	Blk	Organic rich clay		wood frags and plant debris	0	0	0	0
1312		15								wet	0	0	0	0
	S-4	16		53/60						wet	0	0	0	0
										wet	0	0	0	0
1320		20								wet	0	0	0	0
					EOB 20' bgs									

* 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): 0.0

Remarks: Continuous macrocore w/ 2"x5' liner From 0-15'
Discrete macrocore 15-20'
2" cutting shoe

Converted to Well: Yes X No ____ Well I.D. #: S43PZ01

Tetra Tech

BORING LOG

PROJECT NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620DT

BORING No.: S43PZ02
DATE: 5-1-13
GEOLOGIST: J. Birkett
DRILLER: J. Haddiman

Time	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
		0												
	S-1	1		23/60		loose	lt brn	F-M sand some C sand and pebbles		moist	0	0	0	0
						↓	↓	↓ tr. gravel		moist				
						m. dense	↓	↓ ↓		moist to wet	0	0	0	0
					SZ	m. dense	Brn	F-M sand some large gravel tr. silt		wet				
1152		5				stiff	Gray lt brn	Clay tr. VF sand		wet	0	0	0	0
	S-2	6		50/60		↓	↓	↓ ↓			0	0	0	0
						m. dense	Grysh brn	F-M sand		wet				
						dense	lt gray	Clayey VF-F sand			0	0	0	0
						↓	↓	↓ ↓		wet				
1156		10				dense	lt gray	VF-F sand tr. to some silt tr.	clay		0	0	0	0
	S-3	11		40/60		dense	lt gray	VF-F sand tr. silt and clay		wet	0	0	0	0
						m. dense	gray	F-M sand some clay tr. gravel						
						m. dense	gray	F-M sand some clay						
						stiff	gray	Clay		wet	0	0	0	0
						↓	↓	↓ ↓						
1202		15				m. stiff	dk gray			wet	0	0	0	0
	S-4	16		50/60		stiff	dk gray blk	Organic rich clay		wet	0	0	0	0
										wet	0	0	0	0
1211		20				↓	↓	↓ ↓		wet	0	0	0	0
					EOB 20' bgs									

* 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): 0.0

Remarks: Continuous macrocore from 0-10' bgs in 2" x 5' acetate liner
Discrete macrocore from 10-20' bgs
2" cutting shoe

Converted to Well: Yes x No _____ Well I.D. #: S43PZ02

Tetra Tech

BORING LOG

PROJECT NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620DT

BORING No.: 543PZ03
DATE: 5-1-13
GEOLOGIST: J. Birkett
DRILLER: J. Haldiman

Time	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**
		0												
	S-1	1		30/60		loose	lt brn	F-C Sand and pebbles		moist	0	0	0	0
						m. dense		Some gravel		moist				
						m. dense	brn	F-C sand some silt and gravel		moist to wet ~~wet~~	0	0	0	0
						m. stiff	Gray Brn	Clay tr. F. sand		wet				
0953		5				M. stiff	DK Gray DK BRN	Organic rich clay		some plant debris wet wood	0	0	0	0
	S-2	6		60/60		↓	↓	↓ tr. F sand ↓		wet	0	0	0	0
						m. stiff	gray	Clay tr. F sand		moist to wet				
						↓	gray green	↓ ↓			0	0	0	0
						Very stiff		Clay some VF sand and silt tr. M sand		moist to wet				
0956		10				↓	↓	↓ ↓			0	0	0	0
	S-3	11		39/60		m. stiff	gray green	Clay some VF sand tr. gravel		wet	0	0	0	0
						m. dense m. stiff	lt brn gray	F-C sand some gravel tr. silt Clay tr. silt		wet				
						m. stiff	gray	F sandy Clay tr. pebbles		wet	0	0	0	0
						stiff	gray	Clay some VF-F sand		wood at 13' bgs moist to wet				
1003		15				↓	↓	↓ ↓			0	0	0	0
	S-4	16		50/60		m. stiff	gray	Clay		wet	0	0	0	0
						↓	↓	↓ ↓						
						↓	↓	↓ ↓		wet	0	0	0	0
						stiff	Blk	Organic rich Clay		some plant debris				
1017		20				↓	↓	↓ ↓		wet	0	0	0	0
	S-5				EOB 20' bgs									

* 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): 0.0

Remarks: Continuous macrocore from 0-15' bgs in 2" x 5' acetate liner
Discrete macrocore from 15-20' bgs
2" cutting shoe

Converted to Well: Yes X No _____ Well I.D. #: 543PZ03

Tetra Tech

BORING LOG

2nd attempt

PROJECT NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620DT

BORING No.: S43PZ04
DATE: 5-1-13
GEOLOGIST: J. Birkett
DRILLER: J. Haldiman

Time	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
		0												
	S-1	1		60/60		m. dense	Brn	Top soil + organics		moist	0	0	0	0
						dense	ltbrn	VF sand some silt tr. C. sand						
						↓	↓	↓ ↓						
						~~very dense~~				moist	0	0	0	0
						Very stiff	gray ltbrn	Silt some VF sand tr. M sand		iron some org staining				
1455		5				↓	↓	↓ ↓		Moist	0	0	0	0
	S-2	6		46/60		Very stiff	gry ltbrn	Silt tr to some VF sand		moist	0	0	0	0
						↓	↓	↓ ↓						
						↓	↓	↓ ↓		moist	0	0	0	0
						very stiff	gray	Clay some silt						
1500		10				m. stiff	dk gray	Clay Few organics		plant debris moist to wet	0	0	0	0
	S-3	11		36/60	▽	↓	↓	↓ ↓		moist to wet	0	0	0	0
						m. dense	ltbrn/gray	Clayey VF-F sand		wet				
						m dense	gray	VF-F sand tr. clay			0	0	0	0
						m. dense	gray	VF-F sand tr. clay and sm. pebbles		wet				
1506		15				m. dense / m. dense	gray / ltbrn	Clayey VF-F sand tr. pebbles / F-C sand and pebbles tr. clay and gravel			0	0	0	0
	S-4	16		47/60		Very stiff	gray	Clay tr. silt		wet	0	0	0	0
						↓	w/brn streaks	↓ ↓						
										moist	0	0	0	0
								↓ ↓						
1515		20				stiff	↓	Clay some VF-F sand		moist	0	0	0	0
								pretty much refusal drilling difficult						

* When rock coring, enter rock brokeness.

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

Remarks: Continuous macrocore from 0-15' bgs
Discrete macrocore from 15-20' bgs

Drilling Area Background (ppm): 0.0

Converted to Well: Yes X No ____ Well I.D. #: S43PZ04

Tetra Tech

BORING LOG

1st Attempt on beach

PROJECT NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620DT

BORING No.: S43PZ04
DATE: 5-1-13
GEOLOGIST: J. Birkett
DRILLER: J. Haldiman

Time	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
		0												
	S-1	1		48/60		loose	lt brn	F-C sand and pebbles tr. sm gravel		moist	0	0	0	0
						m. dense	lt brn	F-M sand tr. C sand						
						↓	↓	↓		moist	0	0	0	0
						↓	tan	↓ some gravel ↓						
						very stiff		Clay some silt						
0850		5				↓	gray lt brn	Silt some clay		moist	0	0	0	0
	S-2	6		53/60		very stiff	gray	Silt some clay		moist	0	0	0	0
						↓	↓	↓						
						↓	↓	↓		moist	0	0	0	0
							gray/green							
0905		10				↓	↓	↓		moist	0	0	0	0
	S-3	11		46/48		very stiff	gray/green	Silt some clay		moist	0	0	0	0
						↓		↓						
						↓	gray/green	↓		moist	0	0	0	0
0925						↓	brn	↓			0	0	0	0
		15			EOB 14' bgs					Refusal at 14' bgs				
	S-4	16								discontinue boring				
						No PZ installed								
						relocated to the east								
								~100 ft						
		20												
	S-5	21												
		25												

* 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): 0.0

Remarks: Continuous macrocore from 0-14' bgs in 2" x 5' acetate liner
▷ 2" cutting shoe

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech

BORING LOG

PROJECT NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620DT

BORING No.: 543MW27
DATE: 4-30-13
GEOLOGIST: J. Birkett
DRILLER: J. Haldiman

Time	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
		0												
	S-1	1		60/60		m.dense	DKBrn	Top Soil and organics		moist	0	0	0	0
						dense/very stiff	lt brn	Silt some VF sand						
						↓	lt brn gray	↓		moist	0	0	0	0
						↓	↓	↓						
1230		5				dense	lt brn gray	VF-F sand tr. silt		moist	0	0	0	0
	S-2	6		42/60		m.dense	brn	VF-F sand tr. silt		moist	0.1	0	0	0
						↓	↓	↓						
						↓	↓	↓			0	0	0	0
					▽	↓	brn/gray	↓		moist to wet wet				
1238		10				m.dense	gray	Clayey VF sand and silt		thin brn layers wet	0	0	0	0
	S-3	11		32/60		loose	lt brn	VF-M sand some silt tr. C sand		wet	0	0	0	0
						m.dense	lt brn	VF-F sand some silt		large pebble at 11.5' few black pockets				
						↓	↓	↓		wet	0	0	0	0
						dense	↓	↓						
1244		15				m.dense	lt brn w/purple hues	F sand some silt tr. M sand micaceous		thin clay lens at 14.5' wet	0	0	0	0
	S-4	16		20/60		↓	↓	↓		wet	0	0	0	0
						m.dense	lt brn	F-M sand tr. C. sand		wet	0	0	0	0
						↓	gray	↓						
1251		20				↓	↓	↓		wet	0	0	0	0
	S-5	21		25/60		m.dense	gray	F-M sand tr. C sand and silt		wet	0	0	0	0
						↓	↓	↓ more C sand		wet	0	0	0	0
						very stiff	gray	Clay						
1300		25				↓	brn gray	↓		moist to wet	0	0	0	0

* 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): 0.0

Remarks: Continuous macrocore in 2"x5' acetate liner from 0-15' bgs
Discrete macrocore from 15-35' bgs

Converted to Well: Yes X No ____ Well I.D. #: 543MW27

Tetra Tech

BORING LOG

PROJECT NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620DT

BORING No.: S43MW27
DATE: 4-30-13
GEOLOGIST: J. Birkett
DRILLER: J. Haldiman

Time	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**
		25												
	S-6	26		38/60		m. stiff	Gray	Clay		wet	0	0	0	0
						soft	↓	↓ ↓						
						m. stiff	Gray	Clay some silt		wet	0	0	0	0
						m. dense	DKGy	F-C sand some sm-med pebbles		wet				
1318		30				↓	Gray	↓ ↓			0	0	0	0
	S-7	31		24/60		m. dense	Gray	F-C sand some sm-med pebbles		wet	0	0	0	0
						↓	↓	↓ ↓						
										wet	0	0	0	0
						↓	↓	↓ ↓						
1331		35				stiff	Blk	Organic rich Clay		wet	0	0	0	0
					EOB 35' bgs									

* When rock coring, enter rock brokeness.

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

Remarks: See first page for details

Drilling Area Background (ppm): 0.0

Converted to Well: Yes X No ____ Well I.D. #: S43MW27

Tetra Tech

BORING LOG

PROJECT NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620DT

BORING No.: S43MW28
DATE: 4-29-13
GEOLOGIST: J. Birkett
DRILLER: J. Haldiman

Time	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	S-1	1		52/60		m.dense	Brn	Top Soil and sand F-C sand and gravel		wet	0	0	0	0
						m.dense	Brn	some silt						
						stiff	lt brn gray	Clay some silt		moist	0	0	0	0
						m.stiff	lt brn gray	Silt some clay and VF sand		moist				
1305		5				to stiff	↓	↓			0	0	0	0
	S-2	6		51/60		↓	lt brn gray	Silt some clay and F sand		moist	0	0	0	0
						m.dense stiff	lt brn gray lt brn	VF-F sand some silt tr. clay Clay tr. silt		moist				
						m.dense stiff	lt brn	VF-F sand some clay			0	0	0	0
						m.stiff	lt brn gray	Clay tr. VF sand		Moist to wet				
1320		10			II	m.dense	lt brn	VF-M sand			0	0	0	0
	S-3	11		40/60		↓	↓	↓		wet	0	0	0	0
						↓	↓	↓						
						dense	gray olg brn	VF sand tr. M sand		wet	0	0	0	0
						m.dense	gray	↓ ↓ no M. sand						
1327		15				soft	gray	Clay		wet Pockets of gravel (shells)	0	0	0	0
	S-4	16		35/60		m.stiff	gray	Clay		moist to wet	0	0	0	0
						↓	↓	few thin layers of black organics from 16-17'		↓				
						↓	↓	↓			0	0	0	0
1333		20				stiff to m.stiff	dk gray	Clay tr. F-C sand few sm. pebbles		↓	0	0	0	0
	S-5	21		33/36		m.stiff	Gray	F-M sandy Clay		wet	0	0	0	0
						m.dense	Gray Green	F-M sand tr. clay and C sand		small pockets of blk				
						m.stiff	Gray Brn	Clay some F-M sand		wet	0	0	0	0
						m.dense	Brn	F-M sand tr. clay						
1343		25				↓	↓	↓ ↓		wet	0	0	0	0

* 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): 0.0

Remarks: Continuous macrocore 2" x 5' in acetate sleeve from 0-15' bgs
Discrete macrocore from 15-39' bgs

Converted to Well: Yes X No _____ Well I.D. #: S43MW28

Tetra Tech

BORING LOG

PROJECT NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620DT

BORING No.: 543MW28
DATE: 4-29-13
GEOLOGIST: J. Birkett
DRILLER: J. Haldiman

Time	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
		25												
	5-6	26		27/60		m. stiff	dk Brn/Blk	Organic Rich clay tr. F. sand		moist to wet	0	0	0	0
						↓	↓	↓		black plant debris				
										moist to wet	0	0	0	0
						↓	↓	↓						
1355		30				v. stiff	dk gray	Clay some silt tr. F. Sand		moist to wet	0	0	0	0
	5-7	31		32/60		m. stiff	Gray	Clay		moist	0	0	0	0
						m. stiff	Gray Green	↓		↓				
								F-M sand some Clay		moist to wet	0	0	0	0
						m. dense	Gray Aqua Green							
1415		35				stiff		Clay tr. F sand		moist	0	0	0	0
	5-8	36		43/48		stiff	lt brn green	Clay tr. silt		moist	0	0	0	0
						↓	↓	↓						
						v. stiff	Green			moist	0	0	0	0
1430		39				↓	↓	Clay tr. F sand and silt						
		40			EOB 39' bgs refusal					moist	0	0	0	0

* When rock coring, enter rock brokeness.

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

Remarks: See first page for details

Drilling Area Background (ppm): 0.0

Converted to Well: Yes X No ____ Well I.D. #: 543MW28

Tetra Tech

BORING LOG

PROJECT NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620

BORING No.: S43MW29
DATE: 4-29-13
GEOLOGIST: J. Birkett
DRILLER: J. Haldiman

Time	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**
		0												
	S-1			60/60		m. dense stiff	Brn lt brn/gry	Top Soil, organics, sand roots Clay tr. silt		moist	0	0	0	0
						dense	lt brn	Silt some clay and UF sand tr. C. sand						
						dense	lt brn	VF sand some silt		moist	0	0	0	0
						stiff	lt brn/gry	Clay tr. silt		wet				
						m. dense	lt brn	F-C sand and gravel		wet				
1003		5				stiff dense	lt brn lt brn/gry	Clay tr. silt / Silt some F-C sand		moist	0	0	0	0
	S-2	6		54/60		dense	tan lt brn	Silt some F-M sand		moist	0	0	0	
						stiff	gray	Clay tr. silt		moist				
						m. dense	gray	F-M sand some clay		moist	0	0	0	0
						m. dense m. dense	brn org/brn	F-M sand tr. silt + sm. pebbles		moist				
1008		10			▽		to gray	VF-M sand tr. to some silt tr. clay		Alternating thin banding	0	0	0	0
	S-3	11		33/60		m. dense	lt brn	VF-M sand tr. silt		wet	0	0	0	0
						soft	brn w/	Clayey F-M sand		wet				
					Grading to		pink color				0	0	0	0
						soft	↓	F-M sand tr. silt and clay		wet				
1014		15				m. dense	lt brn to brn	F-M sand			0	0	0	0
	S-4	16		30/60		m. dense	gray	VF-F sand tr. silt		wet	0	0	0	0
						m. dense	gray	F-M sand tr. C. sand						
						↓	↓	↓		wet	0	0	0	0
								more C. sand few gravel						
1021		20				m. dense	gray	Clayey F-C sand and gravel		wet	0	0	0	0
	S-5	21		50/60		↓	↓ lt brn	↓		wet	0	0	0	0
					Very	stiff	lt brn gray	Clay tr. F-M sand						
						dense stiff	lt brn lt brn	Clayey F-M sand Clay tr. VF sand and silt		wet	0	0	0	0
						↓ v. stiff	↓ brn	↓ Clay		wet				
1040		25				v. stiff	dk gray	↓		moist	0	0	0	0

* When rock coring, enter rock brokeness.

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

Remarks: Continuous Macrocore 2" x 5' from 5-15'
Discrete Macrocore from 15-

Drilling Area Background (ppm): 0-0

Converted to Well: Yes X No ____ Well I.D. #: S43MW29

Tetra Tech

BORING LOG

PROJECT NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620DT

BORING No.: 543MW29
DATE: 4-29-13
GEOLOGIST: J. Birkett
DRILLER: J. Haldiman

Time	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
		25												
	S-6	26		40/42		Very stiff	DK Brn DK Gray	Clay		moist	0	0	0	0
		27												
		28								moist	0	0	0	0
		29			EOB 28.5' bgs Refusal					Hit refusal				
1110		30								Discontinue boring	0	0	0	0

* When rock coring, enter rock brokeness.

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

Remarks: See first page for details

Drilling Area Background (ppm): 0.0

Converted to Well: Yes X No ____ Well I.D. #: 543MW029

Tetra Tech

BORING LOG

PROJECT NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620DT

BORING No.: S43MW30
DATE: 5-2-13
GEOLOGIST: J. Birkett
DRILLER: J. Haldiman

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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0												
S-							See MW26/MW57		5' away from		0		0
							boring for lithology		MW26				
							No soil cores						
	5						collected until 30' bgs						
											0		0
	10												
											0		0
	15												
											0		0
	20												
											0		0
	25												

* When rock coring, enter rock brokeness.

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

Remarks: Discrete macrocore from 30-40' bgs in 2"x5' liner
2" cutting shoe

Drilling Area Background (ppm): 0.0

Converted to Well: Yes x No _____ Well I.D. #: S43MW30

Tetra Tech

BORING LOG

PROJECT NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620DT

BORING No.: 543MW30
DATE: 5-2-13
GEOLOGIST: J. Birkett
DRILLER: J. Haldiman

Time	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
		25												
								No soil cores collected				0		0
								until 30' bgs						
								TW57 See MW26 for						
								lithology from 0-30' bgs						
		30												
0906	S-1	31		50/60		m. stiff	DK Gray	Clayey VF sand some silt		wet	0.1	0	0	0
						↓	↓	↓						
										wet	0	0	0	0
								↓ less clay ↓						
		35				m. dense	Darker Gray	F sand some clay and pebbles tr. gravel SM		wet	0.1	0	0	0
	S-2	36		26/60		m. dense	light gray	~~F sand some clay~~ SP 5-2-13		wet	0.1	0	0	0
						↓	↓	F-C sand and pebbles (sm-med) tr. sm gravel						
						↓	↓	↓		wet	0.2	0	0	0
						stiff	blk	Organic rich clay		some plant debris				
0925		40				↓	↓	↓		wet	0	0	0	0
					EOB 40' bgs									

* When rock coring, enter rock brokeness.

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

Remarks: See first page for details

Drilling Area Background (ppm): 0.0

Converted to Well: Yes X No ____ Well I.D. #: 543MW30

Tetra Tech

BORING LOG

PROJECT NAME: NSF Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620DT

BORING No.: SG01
DATE: 5-6-13
GEOLOGIST: J. Birkett
DRILLER: S. Pennington

Time	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
		0												
	S-1	1		60/60		hard sl.FF	gray/tan	Gravel Silt some VF sand		moist	0	0	0	0
						↓	lt brn ↓	↓	↓					
										moist	0	0	0	
1530		5				m.dense	tan	VF sand tr. silt		moist	0	0	0	0
	S-2	6		36/60		m.dense	tan/lt brn	VF-F sand tr. silt			0	0	0	0
						↓	red/lt brn	↓	↓	moist				
						sl.FF	gray	VF sandy silt some clay		5435G01-0708 moist/wet	0	0	0	0
						m.dense	lt brn/gray	VF-F sand tr. silt		wet				
1533		10				↓	↓				0	0	0	0
	S-3	11		43/60		m.dense	gray/lt brn	VF-F sand tr. silt		wet	0	0	0	0
						↓	↓	↓	↓					
										wet	0	0	0	0
						m.dense	tan	F-M sand						
1545		15				↓	↓	↓	↓	wet	0	0	0	0
					EOB 15' bgs			install soil gas implant at 7.5' bgs						

* 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): 0.0

Remarks: Continuous macrocore w/ 2"x5' acetate liner from 0-15' bgs
Install soil gas implant at 7.5'

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech

BORING LOG

PROJECT NAME: NSF Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620DT

BORING No.: SG02
DATE: 6-5-13
GEOLOGIST: J. Birkett
DRILLER: S. Pennington

Time	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	S-1	1		18/60		hard	Blk	Asphalt		moist	0	0	0	0
						m.dense	Brn	F-M sand some silt						
										moist	0	0	0	0
								Missing, rock clogged cutting shoe (3-5' bgs)						
1448		5												
	S-2	6		44/60		m.dense	lt brn tan	VF sand tr. silt		moist	0	0	0	0
						↓	lt brn/ pink	VF sand tr. to some chl		S435G02-0708				
						dense	tan	Silt some VF sand						
					SL	m.dense	lt brn	VF-F sand tr. silt		moist to wet	0	0	0	0
						↓	↓	↓ ↓		wet				
1453		10				↓	↓	↓ tr. to some clay		clay lens at 9.5' bgs	0	0	0	0
	S-3	11		44/60		m.dense	lt brn	VF-F sand tr. to some clay		wet	0	0	0	0
						stiff	gray	Clay VF-F sand						
						m.dense	lt brn	VF-F sand some silt		wet	0	0	0	0
						m.dense	Gray	VF sand						
1500		15				m.dense/ m.dense	lt brn lt brn	F-M sand tr. silt F-M sand some clay		wet	0	0	0	0
					EOB 15' bgs			installed soil gas implant at ~~8~~ 7.5' bgs						

* When rock coring, enter rock brokeness.

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

Remarks: Continuous macrocore w/ 2"x5' acetate liner from 2"x5' bgs
Install soil gas implant 7.5' bgs

Drilling Area Background (ppm): 0.0

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech

BORING LOG

PROJECT NAME: NSF Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620DT

BORING No.: SG03
DATE: 6-5-13
GEOLOGIST: J. Birkett
DRILLER: S. Pennington

Time	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
		0												
	S-1	1		60/60		m. dense	brown	Top soil and silt		moist	0	0	0	0
						m. stiff	brown	Silt some clay tr. VF sand						
						stiff	Gray lt brn	Silt some clay tr. to some VF sand		moist	0	0	0	0
						↓	↓	↓						
1245		5				↓	↓	↓		moist	0	0	0	0
	S-2	6		53/60		m. dense	lt brn red tan	VF-F sand tr. silt/clay		moist	0	0	0	0
						m. dense	lt brn	VF-F sand						
						↓	lt brn	↓		moist	0	0	0	0
						m. dense	tan brn	VF-F sand tr. sm. gravel		dry				
1350		10				stiff	gray red brn	Silt some VF-F sand tr. clay		moist	0	0	0	0
	S-3	11		52/60		m. stiff	gray lt brn	Silty VF-F sand tr. clay		moist	0	0	0	0
					▽	↓	↓	↓		S43SG03-1011 moist to wet				
						m. dense	gray	Silty VF-F sand tr. to some clay		wet	0	0	0	0
						m. dense	gray pink	F sand some silt		large gravel at 13' bgs				
1400		15				m. dense / m. dense	lt brn / lt brn	VF-F sand tr. silt / Clayey VF-F sand		Clay lens at 14.25'	0	0	0	0
					EOB 15' bgs			installed soil gas implant at 11' bgs						

* When rock coring, enter rock brokeness.

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

Remarks: Continuous macrocore w/ 2" x 5' acetate liner from 0-15' bgs
Install soil gas implant at 11' bgs

Drilling Area Background (ppm): 0.0

Converted to Well: Yes ____ No ✓ Well I.D. #: ____

Tetra Tech

BORING LOG

PROJECT NAME: NSF Indian Head Site43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620DT

BORING No.: SG04
DATE: 5-6-13
GEOLOGIST: J. Birkett
DRILLER: S. Pennington

Time	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
		0												
	S-1	1		60/60		m. stiff m. stiff	brown	Top Soil and silt.		grass roots moist	0	0	0	0
						stiff	lt brn gray	Silt some clay tr. VF sand						
								less VF sand		moist	0	0	0	0
1040		5						more VF sand		moist	0	0	0	0
	S-2	6		51/60		m. dense	gray lt brn	VF-F sand some silt			0	0	0	0
						m. dense	gray lt brn	VF-F sand tr. silt		moist				
					▽					perched water moist to wet	0	0	0	0
						m. dense	lt brn	VF sand tr. silt		S435G04-10708				
						m. dense	lt brn gray	VF-F sand some clay		clay lens at 9'				
1050		10						less clay		very few pebbles	0	0	0	0
	S-3	11		45/60		m. dense	gray lt brn	VF-F sand some clay		moist to wet	0	0	0	0
						m. dense	gray lt brn	VF-F sand tr. clay						
							lt brn			wet	0	0	0	0
						m. dense loose	gray lt brn	VF-F sand some silt tr. clay F-M sand		wet				
1058		15				m. dense	lt brn	VF-F sand tr. silt		wet	0	0	0	0
	S-4	16		40/60		m. dense	lt brn	VF-M sand tr. silt		wet	0	0	0	0
										wet	0	0	0	0
						m. dense	gray	VF-M sand some pebbles tr. silt						
1116		20				dense	tan	F-C sand some gravel		wet	0	0	0	0
	S-5	21		20/60		m. dense	gray	F-C sand some C sand and gravel		14" of F-C sand	0	0	0	0
										wet	0	0	0	0
1130		25				stiff	gray	Clay		6" of clay in sleeve	0	0	0	0

* 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): 0.0

Remarks: Continuous macrocore from 0-20' bgs in 2" x 5' acetate liner
Discrete macrocore from 20-30' bgs
Install soil gas implant at 7.5' bgs

Converted to Well: Yes _____ No X Well I.D. #: _____

Tetra Tech

BORING LOG

PROJECT NAME: NSF Indian Head Site43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Vironex
DRILLING RIG: Geoprobe 6620DT

BORING No.: SG04
DATE: 5-6-13
GEOLOGIST: J. Birkett
DRILLER: S. Pennington

Time	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	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
		25												
	5-6	26		40/60		m.stiff	Gray	Clay tr. VF sand		~~mo~~ wet	0	0	0	0
						stiff	Gray	Silt some VF sand		wet	0	0	0	0
						m.dense	gray	F-M sand tr. silt						
1045		30				dense	gray	Clayey VF sand some silt		wet	0	0	0	0
		31			EOB 30' bgs									
		35												
		36												
		40												

* When rock coring, enter rock brokeness.

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

Remarks: See first page for details

Drilling Area Background (ppm): 0.0

Converted to Well: Yes _____ No X Well I.D. #: _____

Appendix C

Soil Sample Log Sheets

2011

Soil Sample Log Sheets

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S435B008-0608
Sample Location: SB08/MW03
Sampled By: J. Birke
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6-4-11 Time: 1140 Method: Hand trowel Monitor Reading (ppm): 0	6-8' bgs	Brn - light Brn	F. sand some silt and M. sand moist

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs (Terracore)	3 - 40mL glass w/5 mL MeOH	yes	
Explosives	1 - 4oz jar	yes	
Perchlorate	1 - 4oz jar	yes	
Shelby Tube	Shelby Tube	no	
Grain Size	1 - 4oz jar	yes	
Bulk Density, Effective Porosity	2 4oz jar	yes	
TAL Metals, Total CN, TOC	1 4oz jar	yes	

OBSERVATIONS / NOTES:

water table ~8' bgs
VOCs taken from 7-8' bgs

MAP:

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S435B008-0607
Sample Location: SB08/MW03
Sampled By: J. Birkett
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6-10-11 Time: 1725 Method: Terra Core Monitor Reading (ppm): 0	6-7' bgs	light Brn Brn	F. sand some silt and M. sand mois

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs (Terracore)	~~2~~ 4 ~~40mL glass w/ H_2SO_4~~ ~~2~~ - 40mL glass w/5 mL MeOH	yes	
Explosives	1 - 4oz jar	—	
Perchlorate	1 - 4oz jar	—	
Shelby Tube	Shelby Tube	—	
Grain Size	1 - 4oz jar	—	
Bulk Density, Effective Porosity		—	

OBSERVATIONS / NOTES:

5' W of original boring
Water table ~7' bgs
Resampled from the original sample collected on June 4, 2011

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
yes	—

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43SB009-0608
Sample Location: SB09 / MW04
Sampled By: J. Birke
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6-4-11 Time: 0910 Method: Hand trowel Monitor Reading (ppm): 0	6-8' bgs	Gray	F sand some clay tr. M. sand moist

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs (Terracore)	3 - 40mL glass w/5 mL MeOH	yes	
Explosives	1 - 4oz jar	yes	
Perchlorate	1 - 4oz jar	yes	
Shelby Tube	Shelby Tube	no	
Grain Size	1 - 4oz jar	no ~~yes~~ JB 6-22-11	
Bulk Density, Effective Porosity	1 4 oz jar	no	
TAL Metals, Total CN, TOC	1 4 oz jar	yes	

OBSERVATIONS / NOTES:

Water level ~7.5' bgs
VOCs taken from 6.5-7.5' bgs

MAP:

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: 5435B009-0708
Sample Location: SB09 / MW09
Sampled By: J. Birkett
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6-10-11 Time: 1710 Method: Terra Corr Monitor Reading (ppm): 0	7-8' bgs	Gray	F. sand some clay tr. M. sand moist to wet

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs (Terracore)	2 ~~40mL~~ glass w/NaHSO4 1 ~~8~~ - 40mL glass w/5 mL MeOH	yes	
Explosives	1 - 4oz jar	—	
Perchlorate	1 - 4oz jar	—	
Shelby Tube	Shelby Tube	—	
Grain Size	1 - 4oz jar	—	
Bulk Density, Effective Porosity			

OBSERVATIONS / NOTES:

Collected 5' SE of MW04
Resampled from the original sample collected on June 4, 2011

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.: 1710
—	5435B009-0708 -D

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43SB010-0709
Sample Location: SB010
Sampled By: JB
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6-3-11 Time: 1510 Method: Hand trowel Monitor Reading (ppm): 0	7-9' bgs	Brn Gray	F-M sand some silt wet (7.5-9) Clay and silt some F sand (7-7.5)

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs (Terracore)	3 - 40mL glass w/5 mL MeOH	yes	
Explosives	1 - 4oz jar	yes	
Perchlorate	1 - 4oz jar	yes	
Shelby Tube	Shelby Tube	no	
Grain Size	1 - 4oz jar	no ~~yes~~ JB 6-7-11	
Bulk Density, Effective Porosity		no	
TAL Metals, Total CN, TOC	4 oz jar	yes	

OBSERVATIONS / NOTES:

Water table ~8' bgs

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43SB011-0709
Sample Location: SB11/MW06
Sampled By: J. Birkett
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6-4-11 Time: 1526 Method: Hand trowel Monitor Reading (ppm): 0	7-9' bgs	Brn gray	F. sand some clay Moist

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs (Terracore)	3 - 40mL glass w/5 mL MeOH	yes	
Explosives	1 - 4oz jar	yes	
Perchlorate	1 - 4oz jar	yes	
Shelby Tube	Shelby Tube	yes	
Grain Size	1 - 4oz jar	no	
Bulk Density, Effective Porosity		no	
TAL Metals, Total CN, TOC	1 4oz jar	yes	

OBSERVATIONS / NOTES:

Water table ~8.5' bgs

VOCs taken from 7.5-8.5' bgs

MAP:

Circle if Applicable:

MS/MSD: —

Duplicate ID No.: 1526
S43SB011-0709-D

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43SB011-0507
Sample Location: SB011
Sampled By: J. Birkett
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6-10-11 Time: 1358 Method: Terra Core Monitor Reading (ppm): 1.4	5-7	Brn and Gray	F. sand some clay moist moist

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs (Terracore)	~~2 40mL glass w/ NaHSO4~~ 1 ~~2~~ - 40mL glass w/5 mL MeOH	yes	
Explosives	1 - 4oz jar	no	
Perchlorate	1 - 4oz jar	no	
Shelby Tube	Shelby Tube	no	
Grain Size	1 - 4oz jar	no	
Bulk Density, Effective Porosity		no	
Total Oxidant Demand (13-15' bgs)	1 2 inch x 2 inch uncut macrocore sleeve	yes	
↳ Time 1415			

OBSERVATIONS / NOTES:

resampled VOCs to replace the original sample on 6-4-11

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Sample ID: S435B012-0507

Project Site Name: Indian Head Site 43
Project No.: 112G00771

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

Sample ~~ID No.~~ Location: SB12/TW06
Sample Location: <
Sampled By: J. Birkett
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6-11-11 Time: 1055 Method: Hand trowel Monitor Reading (ppm): 0	5-7' bgs	Gry Brn	F. sand some silt tr. clay moist

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs (Terracore)	2 40mL glass w/NaHSO4 1 ~~3~~ - 40mL glass w/5 mL MeOH	yes	
Explosives	1 - 4oz jar	yes	
Perchlorate	1 - 4oz jar	yes	
Shelby Tube	Shelby Tube	no	
Grain Size	1 - 4oz jar	no	
Bulk Density, Effective Porosity		no	
TAL Metals, Total CN, TOC	1 4oz jar	yes	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	S435B012-0507-D (1055)

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43SB130608
Sample Location: SB13/TW07
Sampled By: K. Simpson
C.O.C. No.:

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

GRAB SAMPLE DATA:

Date: 6-3-11	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1120	6-8' bgs	Dk gray to Brn	Silt and clay some F. sand
Method: Hand Trowel			
Monitor Reading (ppm): 0			

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs (Terracore)	3 - 40mL glass w/5 mL MeOH	yes	
Explosives	1 - 4oz jar	yes	
Perchlorate	1 - 4oz jar amber	ye	
Shelby Tube	Shelby Tube	no	
Grain Size	1 - 4oz jar	no	
Bulk Density, Effective Porosity	~~1 4oz jar~~ JB 6-3-11	~~yes~~ 6-3-11 no	
TAL Metals, Total CN, TOC	1 4oz jar	yes	

OBSERVATIONS / NOTES:

Water Table ~ 7' bgs

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S435B014-0707
Sample Location: SB014 / TW08
Sampled By: J. Birkett
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6-4-11 Time: 1720 Method: Hand trowel Monitor Reading (ppm): 80-3.6	7-9' bgs	Brn Gray	(40/60) Clayey F. sand tr. silt moist

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs (Terracore)	6 ~~8~~ - 40mL glass w/5 mL MeOH	yes	
Explosives	2 ~~1~~ - 4oz jar	yes	
Perchlorate	2 ~~1~~ - 4oz jar	yes	
Shelby Tube	Shelby Tube	no	
Grain Size	1 - 4oz jar	no	
Bulk Density, Effective Porosity		no	
TAL Metals, Total CN, TOC	2 4 oz jar	yes	

OBSERVATIONS / NOTES:

Water table ~8' bgs
VOCs taken from 7.5-8.5' bgs

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
yes	—

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S435B015-0810
Sample Location: SB015
Sampled By: J. Birkett
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6-3-11 Time: 1300 Method: Hand trowel Monitor Reading (ppm): 69.3	8-10' bgs	Grav Brn	Silt some F. sand and clay fuel/solvent odor, moist to wet

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs (Terracore)	3 - 40mL glass w/5 mL MeOH	yes	
Explosives	1 - 4oz jar	yes	
Perchlorate	1 - 4oz jar	yes	
Shelby Tube	Shelby Tube	no	
Grain Size	1 - 4oz jar	no	
Bulk Density, Effective Porosity		no	
TAL Metals, Total CN, TOC	1 4 oz jar	yes	

OBSERVATIONS / NOTES:

Water table ~8' bgs

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S435B016-06-08
Sample Location: SB016 / TW10
Sampled By: J. Birkett
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6-5-11 Time: 1011 Method: Hand trowel Monitor Reading (ppm): 0.1	6-8' bgs	~~Clay some silt and F. sand 6-7' bgs~~ JB 6-5-11 ~~Silt~~ gray	Clay some silt and F. sand 6-7' bgs moist Silt some clay and F. sand 7-8' bgs moist

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs (Terracore)	3 - 40mL glass w/5 mL MeOH	yes	
Explosives	1 - 4oz jar	yes	
Perchlorate	1 - 4oz jar	yes	
Shelby Tube	Shelby Tube	no	
Grain Size	1 - 4oz jar	no	
Bulk Density, Effective Porosity		no	
TAL Metals, Total CN, TOC	1 4oz jar	yes	

OBSERVATIONS / NOTES:

takes VOCs from 7-7.5' bgs
water table ~8' bgs

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S435B016-0607
Sample Location: SB16/TW10
Sampled By: J. Birkett
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6-12-11 Time: 0930 Method: TerraCore Monitor Reading (ppm): 0.5	6-7' bgs	Gray	Clay some silt and F. Sand moist

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs (Terracore)	~~1 - 40mL glass w/5 mL MeOH~~ 2 - 40mL glass w/ NaHSO4	Yes	
Explosives	1 - 4oz jar	No	
Perchlorate	1 - 4oz jar	No	
Shelby Tube	Shelby Tube	No	
Grain Size	1 - 4oz jar	No	
Bulk Density, Effective Porosity		No	

OBSERVATIONS / NOTES:

Resampled from the original sample collected on June 5, 2011

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43SB017-0607
Sample Location: SB017 / TW11
Sampled By: J. Birke #
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6-10-11 Time: 1010 Method: Hand trowel Monitor Reading (ppm): 13.5	6-8'	Gray Brn	6-7' Clay some F, sand moist 7-8' F, sand tr, clay moist

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs (Terracore)	2 - 40mL glass w/5 mL MeOH	yes	
Explosives	1 - 4oz jar	yes	
Perchlorate	1 - 4oz jar	yes	
Shelby Tube	Shelby Tube	SB 6-10-11 NO	
Grain Size	2 - 4oz jar (in M-C sand)	yes	
Bulk Density, Effective Porosity		NO	
TAL Metals, Tot. CN, TOC	1 4oz jar	yes	

OBSERVATIONS / NOTES:

water table ~8' bgs
VOCs taken ~7.5' bgs (1020)
Grain size taken from 15-17' bgs in M-C sand

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: 5435B018-0507 ~~SB18/TW12~~ JB 6-10-11
Sample Location: SB18/TW12
Sampled By: J. Birkett
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6-10-11 Time: 1338 Method: Hand trowel Monitor Reading (ppm): 0	5-7' bgs	Gray/Brn	F. sand some silt moist to wet

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs (Terracore)	~~2 40mL glass w/ NaHSO4~~ 1 - 40mL glass w/5 mL MeOH	yes	
Explosives	1 - 4oz jar	yes	
Perchlorate	1 - 4oz jar	yes	
Shelby Tube	Shelby Tube	no	
Grain Size	1 - 4oz jar	no	
Bulk Density, Effective Porosity		no	
Tal Metals, Total CN, TOC	1 4oz jar	yes	

OBSERVATIONS / NOTES:

Water Level ~ 7' bgs

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: 5435B018-3234
Sample Location: SB18/TW12
Sampled By: J. Birkelt
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6-10-11 Time: 1600 Method: Hand trowel Monitor Reading (ppm): 0	32-34' bgs	Gray	M. Sand some C. Sand tr. silt wet

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs (Terracore)	3 - 40mL glass w/5 mL MeOH	no	
Explosives	1 - 4oz jar	no	
Perchlorate	1 - 4oz jar	no	
Shelby Tube	Shelby Tube	no	
Grain Size	2 ~~1~~ - 4oz jar	yes	
Bulk Density, Effective Porosity		no	

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: Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43SB019-0607
Sample Location: SB019 /SG01
Sampled By: J. Birkett
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6-11-11 Time: 0945 Method: Hand trowel Monitor Reading (ppm): 0.9	6-7' bgs	Gray	F, sand some silt tr. clay moist to wet

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs (Terracore)	2 - 40mL glass w/ 5 mL H_2SO_4 ~~1 - 40mL glass w/5 mL MeOH~~	yes	
Explosives	1 - 4oz jar	no	
Perchlorate	1 - 4oz jar	no	
Shelby Tube	Shelby Tube	no	
Grain Size	1 - 4oz jar	no	
Bulk Density, Effective Porosity		no	
Total Oxidant Demand (13-15' bgs) ↳ Time 0953	1 2 foot uncut liner	yes	

OBSERVATIONS / NOTES:

Water table ~ 7' bgs

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S435B022-0708
Sample Location: SB22/SG04
Sampled By: J. Birkett
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6-11-11 Time: 0902 Method: Hand trowel Monitor Reading (ppm): 653	7-8' bgs	gray/Brn	Silt some F. sand moist to wet strong odor

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs (Terracore)	2 - 40mL glass w/ NaHSO4 ~~1 - 40mL glass w/5 mL MeOH~~	yes	
Explosives	1 - 4oz jar	no	
Perchlorate	1 - 4oz jar	no	
Shelby Tube	Shelby Tube	no	
Grain Size	1 - 4oz jar	no	
Bulk Density, Effective Porosity		no	
Total Oxidant demand (13-15' bgs) ↳ Time 0908	2 foot uncut liner	yes	

OBSERVATIONS / NOTES:

Water table ~8' bgs

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

2012

Soil Sample Log Sheets

Tetra Tech, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

Sample ID No.: S43SB023-0001
Sample Location: S43SB023
Sampled By: J. Birkett
C.O.C. No.:

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

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

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 5-13-12 Time: 1110 Method: Hand Trowel and Handauger Monitor Reading (ppm): 0.3	0-1' bgs	Gray	Clay wet FM some organics and sand

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs (Terracore)	1 - 40mL glass w/5 mL MeOH	yes	
Explosives	1 - 4oz jar	yes	
Perchlorate	1 - 4oz jar	yes	

OBSERVATIONS / NOTES:

Collected in ditch below rip rap and silt fencing w/ hand auger, S43SB023 boring 4' north on slope

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	S43SB023-0001-D

Signature(s):

Tetra Tech, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43SB023-0607
Sample Location: S43SB023
Sampled By: J. Birkett
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 5-13-12 Time: 1128 Method: Hand Trowel and DPT Monitor Reading (ppm): 109	6-7' bgs	gray/brn	Silty F. sand tr. clay

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs (Terracore)	2 - 40mL glass w/5 mL MeOH 1 - 40mL glass w/ $NaHSO_4$	yes	
Explosives	1 - 4oz jar	yes	
Perchlorate	1 - 4oz jar	yes	

OBSERVATIONS / NOTES:

Collected 4' north of ditch via DPT macrocore

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43 SB024-0001
Sample Location: S43SB024
Sampled By: J. Birkett
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 5-13-12			
Time: 1023			
Method: Hand Trowel and Hand auger	0-1' bgs	Gray/Brn	Silty Clay wet
Monitor Reading (ppm): 0.1			

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs (Terracore)	1 ~~8~~ - 40mL glass w/5 mL MeOH 2 - 40mL glass w/ NaHSO4	yes	
Explosives	1 - 4oz jar	yes	
Perchlorate	1 - 4oz jar	yes	

OBSERVATIONS / NOTES:

Collected in ditch below riprap and silt fencing w/ hand auger, S43SB024 boring 4' north on slope

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43 5B024-0607
Sample Location: 5435B024
Sampled By: J. Birkett
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 5-13-12 Time: 1041 Method: Hand Trowel and DPT Monitor Reading (ppm): 4.4	6-7' bgs	brn/gray	Silty VF sand tr. gravel (sm-med) moist to wet

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs (Terracore)	3 - 40mL glass w/5 mL MeOH, 1 - 40mL glass w/ 1 mL H_2SO_4	yes	
Explosives	1 - 4oz jar	yes	
Perchlorate	1 - 4oz jar	yes	

OBSERVATIONS / NOTES:

Collected 4' north of ditch via DPT macrocore

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	S435B024-0607-D 1042

Signature(s):

Tetra Tech, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43 SB025-0001
Sample Location: S435B025
Sampled By: J. Birkett
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 5-13-12 Time: 0945 Method: Hand Trowel and hand auger Monitor Reading (ppm): 0.2	0-1' bgs	Brn/Gray	Silty Clay wet

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs (Terracore)	3 - 40mL glass w/ NaHSO4 ~~1~~ 3 - 40mL glass w/5 mL MeOH	Yes	
Explosives	1 - 4oz jar	Yes	
Perchlorate	1 - 4oz jar	Yes	

OBSERVATIONS / NOTES:

Collected in ditch below rip rap and silt fencing w/ hand auger, S435B026 boring 4' north on slope

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S435B025-0607
Sample Location: S435B025
Sampled By: J. Birkett
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 5-13-12 Time: 0958 Method: Hand Trowel and DPT Monitor Reading (ppm): 5.1	6-7' bgs	Brn/Gray	Silty F. sand tr. gravel moist to wet

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs (Terracore)	~~3~~ 40mL glass w/ $NaHSO_4$ ~~1~~ 3 - 40mL glass w/5 mL MeOH	yes	
Explosives	1 - 4oz jar	yes	
Perchlorate	1 - 4oz jar	yes	

OBSERVATIONS / NOTES:

Collected 4' north of ditch via DPT macrocore.

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

Sample ID No.: S43SB026-0001
Sample Location: S43SB026
Sampled By: J. Birkett
C.O.C. No.:

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

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

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6-13-12 Time: 0910 Method: Hand Trowel and hand auger Monitor Reading (ppm): 1.7	0-1'	Brn/Gray (mottled)	Silty Clay tr. F. sand wet

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs (Terracore)	~~1~~ 2 - 40mL glass w/ NaHSO4 ~~- 40mL glass w/5 mL MeOH~~	Yes	
Explosives	1 - 4oz jar	yes	
Perchlorate	1 - 4oz jar	yes	

OBSERVATIONS / NOTES:

Collected in ditch below rip rap and silt fencing w/hand auger, S43SB026 boring 4' north on slope

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43SB026-050G
Sample Location: S43SB026
Sampled By: J. Birkett
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 5-13-12 Time: 0920 Method: Hand Trowel and DPT Monitor Reading (ppm): 4.8	05-06 bgs	Brn/Gray	Silty F. sand some clay moist to wet

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs (Terracore)	2 - 40mL glass w/ $NaHSO_4$ 1 - 40mL glass w/5 mL MeOH	yes	
Explosives	1 - 4oz jar	yes	
Perchlorate	1 - 4oz jar	yes	

OBSERVATIONS / NOTES:

Collect 4' north of ditch via DPT macrocore

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

Sample ID No.: S43 SB027-0001
Sample Location: S43SB027
Sampled By: J. Birkett
C.O.C. No.:

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

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

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 5-13-12 Time: 0825 Method: Hand Trowel Handauger Monitor Reading (ppm): 0.3	0-1' bgs	DK brown and mottled brown/gray	Silty clay tr. F. sand some organics wet

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs (Terracore)	~~2 - 40mL glass w/ NaHSO4~~ 1 - 40mL glass w/5 mL MeOH	yes	
Explosives	1 - 4oz jar	yes	
Perchlorate	1 - 4oz jar	yes	

OBSERVATIONS / NOTES:

Collected in ditch below rip rap and silt fencing w/ hand auger, S43SB027 boring 4' north on slope

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43SB027-0708
Sample Location: S43SB027
Sampled By: J. Birkett
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 5-13-12 Time: 0850 Method: Hand Trowel and DPT Monitor Reading (ppm): 21.7	7-8' bgs	~~Brn~~ Gray	Silty Sand some clay wet

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs (Terracore)	2 - 40mL glass w/ $NaHSO_4$ 1 - 40mL glass w/5 mL MeOH	Yes	
Explosives	1 - 4oz jar	yes	
Perchlorate	1 - 4oz jar	yes	

OBSERVATIONS / NOTES:

Collect 4' north of ditch via DPT macrocore

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43 SB078-0001
Sample Location: S43SB078
Sampled By: J. Birkett
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 5-13-12 Time: 1203 Method: Hand Trowel and hand auger Monitor Reading (ppm): 3.3	0-1' bgs	Dk brn and Orange	Clayey organic matter and F-M sand some silt moist

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs (Terracore)	1 ~~3~~ - 40mL glass w/5 mL MeOH 40mL glass w/ NaHSO4	yes	
Explosives	1 - 4oz jar	yes	
Perchlorate	1 - 4oz jar	yes	

OBSERVATIONS / NOTES:

Collected 1' north of stream

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43SB028-0405
Sample Location: S43SB028
Sampled By: J. Birkett
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 5-13-12 Time: 1215 Method: Hand Trowel and hand auger Monitor Reading (ppm): 0.0	4-5' bgs	Gray	F-M sand some silt moist to wet

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs (Terracore)	3 - 40mL glass w/ NaHSO4 ~~18~~ - 40mL glass w/5 mL MeOH	yes	
Explosives	1 - 4oz jar	yes	
Perchlorate	1 - 4oz jar	yes	

OBSERVATIONS / NOTES:

Collect 1' north of stream

MAP:

Circle if Applicable:

MS/MSD yes

Duplicate ID No.: —

Signature(s):

Appendix D

Groundwater Grab Sample Log Sheets

2011

Groundwater Grab Sample Log Sheets

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temp Well GW Grab Sample
[] QA Sample Type:

Sample ID No.: S43 TW006-2832
Sample Location: TW06
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Date: 6-11-11 JB Time: ~~1255~~ 1305								
Method: Low Flow - Peristaltic	gray	4.97	0.120	18.81	383	6.46	0.0	49

PURGE DATA:

	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Date: 6-11-11								
Method: Low Flow - Peristaltic								
Monitor Reading (ppm):								
Well Casing Diameter & Material								
Type: Geoprobe rods	See Low Flow Purge Sheet for Details							
Total Well Depth (TD): 32								
Static Water Level (WL): —								
One Casing Volume(gal/L):								
Start Purge (hrs): 1217								
End Purge (hrs): 1255								
Total Purge Time (min): 38								
Total Vol. Purged (gal/L): 5 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes
Total Metals	HNO3	1 - 250mL poly bottle	yes
Filtered Metals	HNO3	1 - 250mL poly bottle	yes
Total CN	NaOH	1 - 250mL poly bottle	yes
Explosives	--	2 - 1L Amber glass	yes
Filtered Perchlorate	--	1 - 250mL poly bottle	yes
Anions (Cl-, NO3, NO2, SO4), Alkalinity	--	1 - 250mL poly bottle	no
MEE	HCl	3 - 40mL glass vials	no
Sulfide	Zn Acetate	1 - 250mL poly bottle	no
Dissolved TOC (Field Filtered)	H2SO4	2 - 40mL glass vials	no

OBSERVATIONS / NOTES:

Field Test Kits
Ferrous Iron = 3.2 ppm
Nitrate
Nitrite
D.O. 1.0 ppm

Negative Oil red O dye detection for DNAPL

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771

WELL ID.: TW06
DATE: 6-11-11

Time (Hrs.)	~~Water Level~~ Color (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
1217	Start purge (Sandy Slurry Brn)									
1226	Grayish Tan	400	6.25	0.152	Out of range	6.52	21.08	-6	0.0	
1231	" "	500	6.20	0.129	" "	6.23	19.82	9	0.0	
1236	" "	500	6.13	0.122	" "	10.55	18.95	4	0.0	
1241	" "	500	5.81	0.117	" "	11.36	18.36	11	0.0	
1246	" "	500	5.56	0.115	840	11.52	18.54	24	0.0	
1251	Gray	500	5.17	0.114	755	10.08	18.41	42	0.0	
1256	~~Collect Sample~~ JB 6/11	500	5.00	0.145	487	9.58	19.09	56	0.0	
1301	Gray	500	4.97	0.120	383	6.46	18.81	49	0.0	
1305	Collect sample									

SIGNATURE(S): [signature]

PAGE 1 OF 1

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temp. Well
[] QA Sample Type:

Sample ID No.: S43TW007-2327
Sample Location: TW007 SB
Sampled By: J. B KS
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (^{0}C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Date: 6-3-11								
Time: 1410								
Method: Low Flow - Peristaltic	light gray	5.00	0.197	19.52	Too turbid	3.07	0.0	22

PURGE DATA:

	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Date: 6-3-11								
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): 0								
Well Casing Diameter & Material								
Type: 1" S.S. Geoprobe Rods	See Low Flow Purge Sheet for Details							
Total Well Depth (TD): 27								
Static Water Level (WL): ~6.5								
One Casing Volume(gal/L):								
Start Purge (hrs): 1330								
End Purge (hrs): 1410								
Total Purge Time (min): 40								
Total Vol. Purged (gal/L): 6 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes
Total Metals	HNO3	1 - 250mL poly bottle	yes
Filtered Metals	HNO3	1 - 250mL poly bottle	yes
Total CN	NaOH	1 - 250mL poly bottle	yes
Explosives	--	2 - 1L Amber glass	yes
Filtered Perchlorate	--	1 - 250mL poly bottle	yes
Anions (Cl-, NO3, NO2, SO4), Alkalinity	--	1 - 250mL poly bottle	yes
MEE	HCl	3 - 40mL glass vials	yes
Sulfide	Zn Acetate	1 - 250mL poly bottle	yes
Dissolved TOC (Field Filtered)	H2SO4	2 - 40mL glass vials	yes

OBSERVATIONS / NOTES:

Field Test Kits
Ferrous Iron = 1.4 mg/L
Nitrate
Nitrite
D.O

No oil red dye detection

Circle if Applicable:

MS/MSD	Duplicate ID No.:
	S43TW007-2327-D

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771

WELL ID.: TW07
DATE: 6-3-11

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
1230										won't start
	Prime line w/ check valve									(sediment heavy)
1340	Gray sand	water/50%								very tubid (gray)
1345	–	500	5.83	0.235	Too turbid	5.01	21.21	-22	0.0	gray 2 gal
1353	–	500	5.36	0.197	" "	4.50	20.09	2	0.0	
1400		500	5.04	0.197	" "	4.14	19.55	20	0.0	light gray
1408	–	500	5.00	0.197	" "	3.07	19.52	22	0.0	6 gal
1410	Collect sample									

SIGNATURE(S): [signature]

PAGE 1 OF 1

TW08

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[X] Monitoring Well Data TW
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: S43TW082832
Sample Location: TW08
Sampled By: KS
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 6.5.11	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1010	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Low Flow - Peristaltic	GRAY	5.28	0.132	19.2	>900	3.76	0	2

PURGE DATA:

Date: 6.5.11	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): —								
Well Casing Diameter & Material.								
Type: 1" STEEL TW	See Low Flow Purge Sheet for Details							
Total Well Depth (TD): 32								
Static Water Level (WL): —								
One Casing Volume (gal/L):								
Start Purge (hrs): 0935								
End Purge (hrs): 1010								
Total Purge Time (min): 35								
Total Vol. Purged (gal/L): 2.0								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	✓
Total Metals	HNO3	1 - 250mL poly bottle	✓
Filtered Metals	HNO3 .45	1 - 250mL poly bottle	✓
Total CN	NaOH	1 - 250mL poly bottle	✓
Explosives	--	2 - 1L Amber glass	✓
Filtered Perchlorate	-- .2	1 - 250mL poly bottle	✓
~~Anions (Cl-, NO3, NO2, SO4)~~, Alkalinity	—	~~1 - 250mL poly bottle~~	—
~~MEE~~	~~HCl~~	~~3 - 40mL glass~~ vials	—
~~Sulfide~~	~~Zn Acetate~~	~~1 - 250mL poly~~ bottle	—
~~Dissolved TOC (Field~~ Filtered)	~~H2SO4~~	~~2 - 40mL glass~~ vials	—

OBSERVATIONS / NOTES:

Field Test Kits
Ferrous Iron = 1.2 mg/L
~~Nitrate~~
~~Nitrite~~

~1" SCREEN POINT TW
0.041 GA/FT

RED O DYE - NO OIL NOTED

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771

WELL ID.: TW08
DATE: 6·5·11

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ~~ppt~~	Comments START PURGE
0935	NA	200								GRAY, NO ODOR
0945	↓	↓	5.93	0.180	>900	3.25	20.2	-7	0	
0955	↓	↓	5.62	0.143	>900	3.16	19.4	-8	0	
1005	↓	↓	5.32	0.133	>900	2.19	19.8	-1	0	
1010	↓	↓	5.28	0.133	>900	3.76	19.2	2	0	

SIGNATURE(S): [illegible]

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[X] Monitoring Well Data TW
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: S43 TW0092125
Sample Location: TW09
Sampled By: KS
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 6·3·11	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Time: 1535								
Method: Low Flow - Peristaltic	LT GRAY	5.61	0.230	19.5	930	4.46	0	-14

PURGE DATA:

Date: 6·3·11	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): —								
Well Casing Diameter & Material								
Type: 1" STEEL TW	See Low Flow Purge Sheet for Details							
Total Well Depth (TD): 25								
Static Water Level (WL): ~8								
One Casing Volume(gal/L):								
Start Purge (hrs): 1515	~4 gal							
End Purge (hrs): 1535								
Total Purge Time (min): 20								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	—
Total Metals	HNO3	1 - 250mL poly bottle	—
Filtered Metals	HNO3	1 - 250mL poly bottle	—
Total CN	NaOH	1 - 250mL poly bottle	—
Explosives	--	2 - 1L Amber glass	—
Filtered Perchlorate	--	1 - 250mL poly bottle	—
Anions (Cl-, NO3, NO2, SO4), Alkalinity	--	1 - 250mL poly bottle	—
MEE	HCl	3 - 40mL glass vials	—
Sulfide	Zn Acetate	1 - 250mL poly bottle	—
Dissolved TOC (Field Filtered)	H2SO4	2 - 40mL glass vials	—

OBSERVATIONS / NOTES:

Field Test Kits
Ferrous Iron = 1.0 mg/L
Nitrate
Nitrite

NO OIL DETECTED WITH RED O DYE
SCREEN 21-25' BGS

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): [illegible]

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771

WELL ID.: TW09
DATE: 6·3·11

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % ~~or ppt~~	Comments START PURGE*
1515	~~15.15~~	200								GRAY - SEWER ODOR
1520		‖	6.07	0.237	529	4.88	20.1	-49	0	TURB = 529
1525	NA		5.99	0.231	905	4.74	18.9	-27	0	
1530			5.77	0.229	940	5.37	18.5	-21	0	
1535		↓	5.61	0.230	830	4.46	18.5	-14	0	

SIGNATURE(S): [illegible]

* PURGED 4 GAL PRIOR TO STARTING READINGS

PAGE 2 OF 2

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[X] Monitoring Well Data TW
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: S43TW102933
Sample Location: TW10
Sampled By: KS
C.O.C. No.:
Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: / Time:	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Method: Low Flow - Peristaltic								

PURGE DATA:

Date:	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): —								
Well Casing Diameter & Material.								
Type: 1" STEEL WELL POINT	See Low Flow Purge Sheet for D							
Total Well Depth (TD): 29								
Static Water Level (WL): —								
One Casing Volume (gal/L):								
Start Purge (hrs):								
End Purge (hrs):								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

DRY - NO SAMPLE

6.5.11

K. SIMPSON

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative		ected
VOCs	HCl		
Total Metals	HNO3		
Filtered Metals	HNO3		
Total CN	NaOH	1 - 250mL poly bottle	
Explosives	--	2 - 1L Amber glass	
Filtered Perchlorate	--	1 - 250mL poly bottle	
~~Anions (Cl-, NO3, NO2, SO4), Alkalinity~~	~~--~~	~~1 - 250mL poly bottle~~	—
~~MEE~~	~~HCl~~	~~3 - 40mL glass~~ vials	—
~~Sulfide~~	~~Zn Acetate~~	~~1 - 250mL poly~~ bottle	—
~~Dissolved TOC (Field Filtered)~~	~~H2SO4~~	~~2 - 40mL glass~~ vials	—

OBSERVATIONS / NOTES:

Field Test Kits
Ferrous Iron =
Nitrate
Nitrite

4' SCREEN POINT ~1"
0.041 GA/FT

RED O DYE

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): KS

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771

WELL ID.: S43 TW 10
DATE:

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % ~~or ppt~~	Comments START PURGE

SIGNATURE(S): [illegible]

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[X] Monitoring Well Data Temp Well
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: No Sample S43TW010-2832
Sample Location: TW 10/SB16
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date:	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time:	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Low Flow - Peristaltic	—	—	—	—	—	—	—	—

PURGE DATA:

Date:	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm):								
Well Casing Diameter & Material								
Type:	See Low Flow Purge Sheet for Details							
Total Well Depth (TD):	No Sample, Zone dry							
Static Water Level (WL):								
One Casing Volume(gal/L):								
Start Purge (hrs):								
End Purge (hrs):								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	N
Total Metals	HNO3	1 - 250mL poly bottle	O
Filtered Metals	HNO3	1 - 250mL poly bottle	
Total CN	NaOH	1 - 250mL poly bottle	
Explosives	--	2 - 1L Amber glass	S
Filtered Perchlorate	--	1 - 250mL poly bottle	a
Anions (Cl-, NO3, NO2, SO4), Alkalinity	--	1 - 250mL poly bottle	m
MEE	HCl	3 - 40mL glass vials	pl
Sulfide	Zn Acetate	1 - 250mL poly bottle	e
Dissolved TOC (Field Filtered)	H2SO4	2 - 40mL glass vials	

OBSERVATIONS / NOTES:

Field Test Kits
Ferrous Iron =
Nitrate
Nitrite

No Sample

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): [signature]

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771

WELL ID.: TW 10
DATE: 6-11-11 + 6-12-11

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
6-11-11	1420 Dry, no	water	seen on	tubing,	moist	sand at	end			
	For 6-12-11	will move	TW-10	closer	to original	TW-10	location.	where geol	ogy taken	
6-12-11	0945	Start pump,	no water,	pull out	tubing, look	for evidence	of water	but tubing	moist w/	sand on outside
	Interval dry	no water,	Thirdtry	at TW	10, no sa	mple co	llected			

SIGNATURE(S): [signature]

PAGE___OF___

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43 TW11 3034
Sample Location: TW11
Sampled By: KS
C.O.C. No.:
Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 6·10·11 KS	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: ~~1525~~ 1325	(Visual)	(S.U.)	(mS/cm)	(°C)	(NTU)	(mg/l)	(%)	(mV)
Method: Low Flow - Peristaltic	GRAY	5.31	0.112	19.8	718	2.97	0	9

PURGE DATA:

Date: 6·10·11	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): —								
Well Casing Diameter & Material.	WELL	POINT - GEO PROBE						
Type: 1" STEEL TW	See Low Flow Purge Sheet for Details							
Total Well Depth (TD): 34								
Static Water Level (WL): NA								
One Casing Volume (gal/L):								
Start Purge (hrs): 1235								
End Purge (hrs): ~~1525~~	1325	KS						
Total Purge Time (min): 50								
Total Vol. Purged (gal/L): 7.0	MEASURED							

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs ✓	HCl	3 - 40mL glass vials	✓
Total Metals ✓	HNO3	1 - 250mL poly bottle	✓
Filtered Metals ✓	HNO3	1 - 250mL poly bottle	✓
~~Total CN~~ TOTAL CN	NaOH	1 - 250mL poly bottle	✓
Explosives ✓	--	2 - 1L Amber glass	✓
Filtered Perchlorate ✓	--	1 - 250mL poly bottle	✓
~~Anions (Cl-, NO3, NO2, SO4), Alkalinity~~	~~—~~	~~1 - 250mL poly bottle~~	~~—~~
~~MEE~~	~~HCl~~	~~3 - 40mL glass vials~~	~~—~~
~~Sulfide~~	~~Zn Acetate~~	~~1 - 250mL poly bottle~~	~~—~~
~~Dissolved TOC (Field Filtered)~~	~~H2SO4~~	~~2 - 40mL glass vials~~	~~—~~

OBSERVATIONS / NOTES:

Field Test Kits
Ferrous Iron = 3.6 MG/L
~~Nitrate~~
~~Nitrite~~
RED DYE - NO OIL NOTED

1" SCREEN = 0.041 GA/FT

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	

Signature(s): [illegible]

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771

WELL ID.: S43 TW11
DATE: 6.10.11

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % ~~ppt~~	Comments GRAY HIGH SOLIDS
1235	NA	500	—	—	—	—	—	—	—	NO ODOR
1245	↓	↓	6.06	0.169	>900	4.91	20.5	-11	0	
1255	↓	↓	6.10	0.130	>900	3.66	19.6	-32	0	
1305	↓	↓	5.50	0.121	>900	4.03	19.3	3	0	
1300	↓	200	5.42	0.113	>900	4.03	19.2	10	0	
1315	↓	↓	5.22	0.113	829	4.07	18.9	14	0	
1325	↓	↓	5.31	0.112	718	2.97	19.0	9	0	
										SAMPLED
			1325 END PURGE/SAMPLE							
			TURB @		1345 =		654			
					END	OF	SAMPLING			

SIGNATURE(S): [illegible]

PAGE 2 OF 2

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

26-30

Project Site Name: Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[X] Monitoring Well Data TW
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: S43 TW12 ~~3035~~ KS
Sample Location: TW12
Sampled By: K. SIMPSON
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

6-11-11

SAMPLING DATA:

Date: 6-10-11 KS	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 0955	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Low Flow - Peristaltic	CLR/TAX	5.19	0.110	18.5	799	4.16	0	18

PURGE DATA:

Date: 6-10-11 KS	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): —								
Well Casing Diameter & Material.	SCREEN X 4'							
Type: 1" STEEL DPT	See Low Flow Purge Sheet for Details							
Total Well Depth (TD): 34								
Static Water Level (WL):								
One Casing Volume (gal/L):								
Start Purge (hrs): 0905								
End Purge (hrs): 0955								
Total Purge Time (min): 50								
Total Vol. Purged (gal/L): 8								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	—
Total Metals	HNO3	1 - 250mL poly bottle	—
Filtered Metals	HNO3	1 - 250mL poly bottle	—
Total CN	NaOH	1 - 250mL poly bottle	—
Explosives	--	2 - 1L Amber glass	—
Filtered Perchlorate	--	1 - 250mL poly bottle	—
~~Anions (Cl, NO3, NO2, SO4), Alkalinity~~	~~--~~	~~1 - 250mL poly bottle~~	—
~~MEE~~	~~HCl~~	~~3 - 40mL glass vials~~	—
~~Sulfide~~	~~Zn Acetate~~	~~1 - 250mL poly bottle~~	—
~~Dissolved TOC (Field Filtered)~~	~~H2SO4~~	~~2 - 40mL glass vials~~	—

OBSERVATIONS / NOTES:

Field Test Kits
Ferrous Iron = 3.0 MG/L
~~Nitrate~~
~~Nitrite~~

DRY - PULLED SCREEN UP TO 26-30' TD
WILL TRY & PURGE 6.11.11

RED O DYE - NO OIL NOTED

SURGED (ALL) TWs WITH TUBING 1ST 10 MIN. - TUBING SET 1' OFF BTM

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	

Signature(s): [signature]

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771

WELL ID.: S43 TW12
DATE: 6.10.11

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity ~~% or ppt~~	Comments START PURGE
0905	NA	500								GRAY HIGH SOLIDS
0915			6.07	0.188	>900	4.21	19.3	-10	0	
0925			5.42	0.133	>900	3.34	18.2	-15		
0935			5.13	0.117	>900	3.24	18.8	5		CLEARING
0945		200	5.19	0.113	859	3.80	18.8	16		
0955			5.19	0.112	799	4.16	18.5	18		SAMPLED

SIGNATURE(S): [illegible]

2012

Groundwater Grab Sample Log Sheets

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW 13-2933
Sample Location: TW13
Sampled By: Jr Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 4-20-12	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Time: 1523								
Method: Peristaltic	gray	6.16	0.321	20.20	Over Range	8.86	0.2	-26

PURGE DATA:

Date: 4-20-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP	
Method: Peristaltic	0.5 gal	6.07	0.506	20.28	Over Range	9.04	0.2	-22	Gray
Monitor Reading (ppm): —	1.5 gal	6.16	0.321	20.20	Over Range	8.86	0.2	-26	Gray
Well Casing Diameter & Material									
Type: 1" Stainless Steel									
Total Well Depth (TD): 33.5									
Static Water Level (WL): --									
One Casing Volume(gal/L): --									
Start Purge (hrs): 1509									
End Purge (hrs): 1523									
Total Purge Time (min): 14									
Total Vol. Purged (gal/L): 1.5 gal									

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 29.5 to 33.5 ft bgs
Purge rate: 300 mL/min

Stains or odors observed: Yes [Yes] No [X]
Slight Sheen

Circle if Applicable:

MS/MSD Duplicate ID No.: —

Signature(s):

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW14-13~~17~~ JB
Sample Location: TW 14
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 4-20-12	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (^{0}C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Time: 1620								
Method: Peristaltic	brown	5.33	0.153	18.57	O.R.	8.77	0.1	102

PURGE DATA:

Date: 4-20-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	5.43	0.163	20.88	Out of Range	4.41	0.1	95
Monitor Reading (ppm): —	1.5 gal	5.33	0.153	18.57	Out of Range	8.77	0.1	102
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): JB ~~18~~ 17								
Static Water Level (WL): --								
One Casing Volume(gal/L): --								
Start Purge (hrs): 1605								
End Purge (hrs): 1620								
Total Purge Time (min): 15								
Total Vol. Purged (gal/L): 1.5 gal								

Brn

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 13 to ~~17~~ JB ft bgs
Purge rate: 300 mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW14-2933
Sample Location: TW 14
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 4-20-12	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Time: 1650								
Method: Peristaltic	gray	6.08	0.378	21.07	OverRange	7.14	0.2	-8

PURGE DATA:

Date: 4-20-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	6.08	0.378	21.07	OverRange	7.14	0.2	-8
Monitor Reading (ppm): —	~~8 gal~~	Before Sampling TW went dry twice						
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 33								
Static Water Level (WL): --								
One Casing Volume(gal/L): --								
Start Purge (hrs): 1625								
End Purge (hrs): 1650								
Total Purge Time (min): ~10								
Total Vol. Purged (gal/L): 0.75 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 29 to 33 ft bgs
Purge rate: — mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW 15-1721
Sample Location: TW 15
Sampled By: J. Birkell
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 4-22-12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1115	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Peristaltic	Brn	5.54	0.336	13.60	OverRange	3.20	0.2	150

PURGE DATA:

Date: 4-22-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	4.96	0.403	13.41	OverRange	3.89	0.2	237
Monitor Reading (ppm): –	2 gal	5.54	0.336	13.60	" "	3.20	0.2	150
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 21								
Static Water Level (WL): --								
One Casing Volume(gal/L): --								
Start Purge (hrs): 1050								
End Purge (hrs): 1105								
Total Purge Time (min): 15								
Total Vol. Purged (gal/L): 2 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	Yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 17 to 21 ft bgs
Purge rate: 400 mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW15-2933
Sample Location: TW 15
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 4-22-12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1123	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Peristaltic	gray	6.10	0.248	14.21	O.R.	2.19	0.0	-36

PURGE DATA:

Date: 4-22-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	6.06	0.259	14.02	Over Range	1.48	0.1	-16
Monitor Reading (ppm): —	2 gal	6.10	0.248	14.21	" "	2.19	0.0	-36
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 33								
Static Water Level (WL): --								
One Casing Volume(gal/L): --								
Start Purge (hrs): 1108								
End Purge (hrs): 1123								
Total Purge Time (min): 15								
Total Vol. Purged (gal/L): 2 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	Yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 29 to 33 ft bgs
Purge rate: 400 mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW16-1721
Sample Location: TW 16
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 4-22-12	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (^{0}C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Time: 1335								
Method: Peristaltic	light brn	5.66	0.403	13.16	O. R.	3.96	0.2	53

PURGE DATA:

Date: 4-22-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	5.66	0.403	13.16	OverRange	3.96	0.2	53
Monitor Reading (ppm): —	~~2 gal~~							
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 21								
Static Water Level (WL): --								
One Casing Volume(gal/L): --								
Start Purge (hrs): 1306								
End Purge (hrs): 1335								
Total Purge Time (min): 10								
Total Vol. Purged (gal/L): 0.75 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 17 to 21 ft bgs
Purge rate: — mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD: —
Duplicate ID No.: S43TW16-1721-D 1336

Signature(s):

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW16-2933
Sample Location: TW16
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 4-22-12	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Time: 1330								
Method: Peristaltic	gray	6.26	0.252	14.87	O.R.	2.16	0.1	-48

PURGE DATA:

Date: 4-22-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	5.92	0.274	14.32	Over Range	1.81	0.1	-5
Monitor Reading (ppm): —	2 gal	6.26	0.252	14.87	" "	2.16	0.1	-48
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 33								
Static Water Level (WL): --								
One Casing Volume(gal/L): --								
Start Purge (hrs): 1315								
End Purge (hrs): 1330								
Total Purge Time (min): 15								
Total Vol. Purged (gal/L): 2 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 29 to 33ft bgs
Purge rate: 400 mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD: —
Duplicate ID No.: —

Signature(s): [signature]

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW 17-1923
Sample Location: TW 17
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 4-22-12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1532	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Peristaltic	lt brn	5.16	0.097	13.47	O.R.	2.03	0.0	73

PURGE DATA:

Date: 4-22-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	5.80	0.104	13.45	Over Range	2.16	0.0	33
Monitor Reading (ppm): —	2 gal	5.16	0.097	13.47	" "	2.03	0.0	73
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 23								
Static Water Level (WL): --								
One Casing Volume(gal/L): --								
Start Purge (hrs): 1517								
End Purge (hrs): 1532								
Total Purge Time (min): 15								
Total Vol. Purged (gal/L): 2 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 19 to 23ft bgs
Purge rate: 400mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): [signature]

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW 17-2933
Sample Location: TW 17
Sampled By: J. Birkeit
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 4-22-12	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (^{0}C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Time: 1515								
Method: Peristaltic	lt gray	6.05	0.184	13.37	0 R	2.53	0.1	-3

PURGE DATA:

Date: 4-22-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	5.70	0.200	12.85	Over Range	2.88	0.1	36
Monitor Reading (ppm): —	2 gal	6.05	0.184	13.37	" "	2.53	0.1	-3
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 33								
Static Water Level (WL): --								
One Casing Volume(gal/L): --								
Start Purge (hrs): 1500								
End Purge (hrs): 1515								
Total Purge Time (min): 15								
Total Vol. Purged (gal/L): 2gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 29 to 33ft bgs
Purge rate: 400mL/min

Stains or odors observed	Yes	No
		X

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW 18 - 1923
Sample Location: TW18
Sampled By: RMS
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5/5/12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1658	(Visual)	(S.U.)	(mS/cm)	(°C)	(NTU)	(mg/l)	(%)	(mV)
Method: Peristaltic	grey	5.82	0.317	17.97	>1000	3.39	0.2	17

PURGE DATA:

Date: 5/5/12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	5.84	0.329	19.66	>1000	2.56	0.2	48
Monitor Reading (ppm):	2 gal	5.85	0.318	18.49	>1000	2.45	0.2	25
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD):								
Static Water Level (WL): --								
One Casing Volume(gal/L): --								
Start Purge (hrs):								
End Purge (hrs):								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 19 to 23 ft bgs
Purge rate: mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD | Duplicate ID No.:

Signature(s):

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW18 - 3034
Sample Location: TW18
Sampled By: RMS
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5/5/12	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Time: 1525								
Method: Peristaltic	Hazy	5.54	0.180	19.81	71000	2.15	0.1	50

PURGE DATA:

Date: 5/5/12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	5.98	0.196	23.47	>1000	3.23	0.1	28
Monitor Reading (ppm): —	1.0 gal	5.94	0.186	21.05	>1000	1.80	0.1	41
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD):								
Static Water Level (WL): --								
One Casing Volume(gal/L): --								
Start Purge (hrs):								
End Purge (hrs):								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 30 to 34 ft bgs
Purge rate: mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD | Duplicate ID No.:

Signature(s):

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW 19-1923
Sample Location: TW19
Sampled By: J. Birkeff
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 4-21-12	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (^{0}C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Time:								
Method: Peristaltic								

PURGE DATA:

Date: 4-21-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal							
Monitor Reading (ppm):	2 gal							
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 23								
Static Water Level (WL): --								
One Casing Volume(gal/L): --								
Start Purge (hrs):								
End Purge (hrs):								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

DRY
No Sample

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 19 to 23 ft bgs
Purge rate: mL/min

Stains or odors observed: Yes [ ] No [ ]

Circle if Applicable:

MS/MSD	Duplicate ID No.: —

Signature(s):

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW19 - 2024
Sample Location: TW19
Sampled By: pms
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5/4/12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 0940	(Visual)	(S.U.)	(mS/cm)	(°C)	(NTU)	(mg/l)	(%)	(mV)
Method: Peristaltic	gray	5.04	0.252	17.84	>1000	1.71	0.1	34

PURGE DATA:

Date: 5/4/12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	4.89	0.314	19.15	>1000	1.24	0.2	11
Monitor Reading (ppm):	1.0 gal	5.02	0.244	18.14	>1000	1.67	0.1	21
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD):								
Static Water Level (WL): --								
One Casing Volume(gal/L): --								
Start Purge (hrs):								
End Purge (hrs):								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 20 to 24 ft bgs
Purge rate: mL/min

Stains or odors observed	Yes	No
		X

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW 19-2332
Sample Location: TW 19
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 4-21-12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1400	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Peristaltic	Gray	5.85	0.181	19.65	Out of Range Gray	1.88	0.1	-1

PURGE DATA:

Date: 4-21-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	6.25	0.203	21.63	Gray	3.31	0.1	-30
Monitor Reading (ppm): —	2 gal	5.85	0.181	19.65	Gray	1.88	0.1	-1
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 32								
Static Water Level (WL): --								
One Casing Volume(gal/L): --								
Start Purge (hrs): 1344								
End Purge (hrs): 1400								
Total Purge Time (min): 16								
Total Vol. Purged (gal/L): 2 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	9 ~~8~~ - 40mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 28 to 32 ft bgs
Purge rate: 500 mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD: yes
Duplicate ID No.: —

Signature(s):

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW20-1923
Sample Location: TW 20
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 4-21-12	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Time: 1230								
Method: Peristaltic	brown silty	5.76	0.206	19.96	Brown	2.81	0.1	49

PURGE DATA:

Date: 4-21-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	5.58	0.394	23.25	Brown	3.84	0.2	67
Monitor Reading (ppm): —	1 1/2 gal	5.76	0.206	19.96	Brown	2.81	0.1	49
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 23								
Static Water Level (WL): --								
One Casing Volume(gal/L): --								
Start Purge (hrs): 1153								
End Purge (hrs): 1230								
Total Purge Time (min): 10 min								
Total Vol. Purged (gal/L): 1 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 19 to 23 ft bgs
Purge rate: 300 mL/min

Very Muddy Stains or odors observed — Yes [ ] No [X]

TW went dry after 0.5 gal, let recharge

Circle if Applicable:

MS/MSD: —
Duplicate ID No.: —

Signature(s): [signature]

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW20-2933
Sample Location: TW 20
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 4-21-12	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (^{0}C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Time: 1215								
Method: Peristaltic	Gray	5.94	0.308	19.97	Over Range	9.32	0.1	9

PURGE DATA:

Date: 4-21-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	6.08	0.346	21.32	Over Range	9.02	0.2	-66
Monitor Reading (ppm): —	1.5 gal	5.94	0.308	19.97	Over Range	9.32	0.1	9
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 33								
Static Water Level (WL): --								
One Casing Volume(gal/L): --								
Start Purge (hrs): 1200								
End Purge (hrs): 1215								
Total Purge Time (min): 15								
Total Vol. Purged (gal/L): 1.5 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 29 to 33 ft bgs
Purge rate: 500 mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD: —

Duplicate ID No.: S43-TW20-2933-D 1216

Signature(s):

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW21-1923
Sample Location: TW 21
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 4-21-12	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Time: 1600								
Method: Peristaltic	Brn/Gray	5.91	0.422	19.74	OverRange	3.99	0.2	-14

PURGE DATA:

Date: 4-21-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP	
Method: Peristaltic	0.5 gal	6.01	0.417	20.60	OverRange	2.22	0.2	8	Brown
Monitor Reading (ppm): —	2 gal	5.91	0.422	19.74	OverRange	3.99	0.2	-14	Brn/Gray
Well Casing Diameter & Material									
Type: 1" Stainless Steel									
Total Well Depth (TD): 23									
Static Water Level (WL): --									
One Casing Volume(gal/L): --									
Start Purge (hrs): 1544									
End Purge (hrs): 1600									
Total Purge Time (min): 16									
Total Vol. Purged (gal/L): 2 gal									

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 19 to 23ft bgs
Purge rate: 400 mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW 21-~~2832~~ 2630
Sample Location: TW 21
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 4-21-12	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Time: 1625								
Method: Peristaltic	Gray	6.24	0.329	19.24	OverRange	2.41	0.2	-13

PURGE DATA:

Date: 4-21-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	6.07	0.328	19.96	OverRange	2.59	0.2	-17
Monitor Reading (ppm): —	2 gal	6.24	0.329	19.24	OverRange	2.41	0.2	-13
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 30								
Static Water Level (WL): --								
One Casing Volume(gal/L): --								
Start Purge (hrs): 1610								
End Purge (hrs): 1625								
Total Purge Time (min): 15								
Total Vol. Purged (gal/L): 2 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 26 to 30 ft bgs
Purge rate: 400 mL/min

Stains or odors observed: Yes [ ] No [X]

Had to pull original sample depth up 2' from 28-32 to 26-30

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW 22 - 10-14
Sample Location: TW 22
Sampled By: RMS
C.O.C. No.:
Type of Sample:
[] Low Concentration
[X] High Concentration

SAMPLING DATA:

Date: 5/4/12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1116	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Peristaltic	NA							

PURGE DATA:

Date: 5/4/12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal							
Monitor Reading (ppm): 34	2 gal	NA						
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD):								
Static Water Level (WL): --								
One Casing Volume(gal/L): --								
Start Purge (hrs):								
End Purge (hrs):								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 10 to 14 ft bgs
Purge rate: mL/min

Stains or odors observed: Yes [X] No [ ]

PID reading 34ppm, from rods, driller noticed odor

Approx 1/2 gallon purge, tough to get water, air in tubing

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW22-2226
Sample Location: TW 22
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 4-27-12	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (^{0}C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Time: 1512								
Method: Peristaltic	brown/gray	5.81	0.331	19.26	OverRange	1.41	0.2	-35

PURGE DATA:

Date: 4-27-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	6.05	0.339	21.84	OverRange	0.73	0.2	-14
Monitor Reading (ppm): —	2 gal	5.81	0.331	19.26	" "	1.41	0.2	-35
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 26								
Static Water Level (WL): --								
One Casing Volume(gal/L): --								
Start Purge (hrs): 1453								
End Purge (hrs): 1512								
Total Purge Time (min): 19								
Total Vol. Purged (gal/L): 2								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 22 to 26 ft bgs
Purge rate: 300 mL/min

Stains or odors observed	Yes	No
		X

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW22 - ~~32~~ 33-37
Sample Location: TW 22
Sampled By: RMS
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (^{0}C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Date: ~~4-27~~ 25/4/12								
Time: 1050								
Method: Peristaltic	Cloudy	NA						

PURGE DATA:

	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Date: 4-27-12								
Method: Peristaltic + checkvalve	~~0.5 gal~~							
Monitor Reading (ppm): — NA	~~2 gal~~							
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): ~~36~~ 37								
Static Water Level (WL): --								
One Casing Volume(gal/L): --								
Start Purge (hrs):								
End Purge (hrs):								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes
Barely produced 1/2 gallon, little Air in tubing and let sit for 15min, collected with check valve			
Notice water came up into tubing after screen was deployed.			
?			

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom 33 37
Temporary well screened from ~~32~~ to ~~36~~ ft bgs
Purge rate: mL/min

Stains or odors observed: Yes [ ] No [X]

4-27-12
- Drilled and set TW from 30-34' twice, both of which were dry. Both times pulled up 2' to be screened from 28-32', but dry again. Reattempted on 4-28-12 from 32-36' bgs

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW23-1014
Sample Location: TW23
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 4-27-12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1315	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Peristaltic	brown	4.74	0.288	17.99	OverRange	3.86	0.1	52

PURGE DATA:

Date: 4-27-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	4.74	0.288	17.99	OverRange	3.86	0.1	52
Monitor Reading (ppm): —	~~2 gal~~							
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 14								
Static Water Level (WL): --								
One Casing Volume(gal/L): --								
Start Purge (hrs): 1310								
End Purge (hrs): 1315								
Total Purge Time (min): 5								
Total Vol. Purged (gal/L): 0.5 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 10 to 14 ft bgs
Purge rate: — mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW23-2226
Sample Location: TW23
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 4-27-12	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Time: 1305								
Method: Peristaltic	brown	4.78	0.227	17.49	Over Range	1.89	0.1	117

PURGE DATA:

Date: 4-27-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	4.86	0.234	18.66	Over Range	1.60	0.1	83
Monitor Reading (ppm): —	2 gal	4.78	0.227	17.49	" "	1.89	0.1	117
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 26								
Static Water Level (WL): --								
One Casing Volume(gal/L): --								
Start Purge (hrs): 1250								
End Purge (hrs): 1305								
Total Purge Time (min): 15								
Total Vol. Purged (gal/L): 2 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 22 to 26 ft bgs
Purge rate: 500 mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD: —
Duplicate ID No.: —

Signature(s): [signature]

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW 23-3236
Sample Location: TW 23 - 3236
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (^{0}C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Date: 4-27-12								
Time: 1242								
Method: Peristaltic	Gray	5.39	0.272	19.68	OverRange	1.49	0.1	67

PURGE DATA:

Date: 4-27-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	5.00	0.519	21.85	OverRange	1.79	0.2	94
Monitor Reading (ppm): —	2 gal	5.39	0.272	19.68	" "	1.49	0.1	67
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 36								
Static Water Level (WL): --								
One Casing Volume(gal/L): --								
Start Purge (hrs): 1227								
End Purge (hrs): 1242								
Total Purge Time (min): 15								
Total Vol. Purged (gal/L): 2 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 32 to 36 ft bgs
Purge rate: 500 mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW24-23-27
Sample Location: TW24
Sampled By: ~~J. Birkett~~ RMS
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5-23-12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1430	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Peristaltic	NA							

PURGE DATA:

Date: 5-23-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal							
Monitor Reading (ppm): —	2 gal	No parameters						
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD):								
Static Water Level (WL): --								
One Casing Volume(gal/L): --								
Start Purge (hrs):								
End Purge (hrs):								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 22 to 27 ft bgs
Purge rate: mL/min

Stains or odors observed: Yes [ ] No [X]

Could not obtain sample. Re-try push to 27 bgs
Collected sample from 23-27' bgs, after quick purge of 1/4 gallon, slow producer

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW 24 + 3286
Sample Location: TW 24
Sampled By: RMS
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5/4/12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1330	(Visual)	(S.U.)	(mS/cm)	(°C)	(NTU)	(mg/l)	(%)	(mV)
Method: Peristaltic	Grey Cloudy	6.36	0.176	22.42	>1000	1.2	0.1	-8

PURGE DATA:

Date: 5-4-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	6.2	0.200	24.15	>1000	1.75	0.1	-27
Monitor Reading (ppm): 6.5	1.5 gal	6.34	0.171	22.65	>1000	2.5	0.1	-10
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD):								
Static Water Level (WL): --								
One Casing Volume(gal/L): --								
Start Purge (hrs):								
End Purge (hrs):								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 32 to 36 ft bgs
Purge rate: mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD: —
Duplicate ID No.: —

Signature(s):

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW 25-1115
Sample Location: TW 25
Sampled By: RMS
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Date: 5/3/12								
Time: 1330								
Method: Peristaltic	Brn	4.79	0.065	22.20	>1000	3.62	0.0	103

PURGE DATA:

	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Date: 5-5-12								
Method: Peristaltic	0.5 gal	5.31	0.082	24.32	>1000	4.82	0.0	47
Monitor Reading (ppm): —	1.0 gal	5.02	0.065	22.48	>1000	2.89	0.0	68
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD):								
Static Water Level (WL): --								
One Casing Volume(gal/L): --								
Start Purge (hrs):								
End Purge (hrs):								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	YES

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 4 to 15 ft bgs
Purge rate: mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD | Duplicate ID No.:

Signature(s):

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW25-2933
Sample Location: TW 25
Sampled By: RMS
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Date: 5/5/12								
Time: 1318 1340								
Method: Peristaltic								

PURGE DATA:

	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Date: 5/5/12								
Method: Peristaltic	0.5 gal	Slow producer, not enough water for parameters						
Monitor Reading (ppm): —	2 gal							
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD):								
Static Water Level (WL): --								
One Casing Volume(gal/L): --								
Start Purge (hrs):								
End Purge (hrs):								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 29 to 33 ft bgs
Purge rate: mL/min

Stains or odors observed: Yes [ ] No [X]

1311 / letting sit to get water
1340 Collected sample

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW26-1014
Sample Location: TW26
Sampled By: RMS
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Date: 5/5/12								
Time: 1230								
Method: Peristaltic	Brown	5.67	0.325	24.17	7/000	3.00	0.2	37

PURGE DATA:

Date: 5/5/12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	Barely enough water to take one reading,						
Monitor Reading (ppm): —	2 gal	air pockets in tubing						
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD):								
Static Water Level (WL): --								
One Casing Volume(gal/L): --								
Start Purge (hrs):								
End Purge (hrs):								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 10 to 14 ft bgs
Purge rate: mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW26-3236
Sample Location: TW26
Sampled By: RMS
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5/5/12	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Time: 1140								
Method: Peristaltic	gray/cloudy	6.16	0.540	21.56	>100	1.28	0.3	4

PURGE DATA:

Date: 5/5/12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	6.02	0.530	23.00	>1000	1.60	0.3	104
Monitor Reading (ppm): –	1.0 gal	6.21	0.543	22.10	>1000	0.86	0.3	3
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD):								
Static Water Level (WL): --								
One Casing Volume(gal/L): --								
Start Purge (hrs):								
End Purge (hrs):								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 32 to 36 ft bgs
Purge rate: mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD | Duplicate ID No.:

Signature(s):

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW27-14-18
Sample Location: TW27
Sampled By: RMS
C.O.C. No.:
Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5/5/12	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Time:								
Method: Peristaltic								

PURGE DATA:

Date: 5/5/12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal							
Monitor Reading (ppm):	2 gal							
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD):								
Static Water Level (WL): --								
One Casing Volume(gal/L): --								
Start Purge (hrs):								
End Purge (hrs):								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE NOT Obtained

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	~~yes~~ NO WATER

* Tryed to collect sample 3 times with No Luck

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 14 to 18 ft bgs
Purge rate: mL/min

Stains or odors observed: Yes [ ] No [X]

No Water 17-21', collected MC from 0-20' bgs, observed wet zone 15-17'
pushing down to collect grab 14-18' ~~pulling up screen 2.5 in~~
* (Dry) Still could be tough to obtain grab sample
Trying again, No luck abandoning location

Circle if Applicable:

MS/MSD	Duplicate ID No.:	Signature(s):

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW27-2933
Sample Location: TW27
Sampled By: RMS
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Date: 5/4/12								
Time: 1700								
Method: Peristaltic	gray	5.96	0.254	21.96	71000	0.46	0.1	-61

PURGE DATA:

	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Date: 5-4-12								
Method: Peristaltic	0.5 gal	5.98	0.260	23.24	71000	2.19	0.1	-23
Monitor Reading (ppm): —	1.0 gal	5.97	0.253	22.82	71000	0.42	0.1	-50
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD):								
Static Water Level (WL): --								
One Casing Volume(gal/L): --								
Start Purge (hrs):								
End Purge (hrs):								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 29 to 33 ft bgs
Purge rate: mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD | Duplicate ID No.:

Signature(s):

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW 28 - 1721
Sample Location: TW 28
Sampled By: RMS
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5/4/12 Time: 1625	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Method: Peristaltic	tan cloudy	6.03	0.249	22.35	>1000	0.79	0.1	-13

PURGE DATA:

Date: 5/4/12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	6.27	0.272	25.71	>1000	0.52	0.1	-62
Monitor Reading (ppm): —	2 gal	6.27	0.258	23.48	>1000	0.35	0.1	-61
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD):								
Static Water Level (WL): --								
One Casing Volume(gal/L): --								
Start Purge (hrs):								
End Purge (hrs):								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 17 to 21 ft bgs
Purge rate: mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW28-2933
Sample Location: TW 28
Sampled By: RMS
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Date: 5/4/12 Time: 1545 Method: Peristaltic	gray cloudy	5.84	0.272	22.38	800	2.43	0.1	-16

PURGE DATA:

	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Date: 5/4/12								
Method: Peristaltic	0.5 gal	6.94	0.296	26.34	>1000	1.7	0.1	-48
Monitor Reading (ppm):	2 gal	5.99	0.276	23.81	850	2.59	0.1	-46
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 33								
Static Water Level (WL): -- NA								
One Casing Volume(gal/L): -- NA								
Start Purge (hrs):								
End Purge (hrs):								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 29 to 33 ft bgs
Purge rate: mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD | Duplicate ID No.: S43TW28-2933D

Signature(s):

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW29 - 2226
Sample Location: TW29
Sampled By: RMS
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5/6/12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1520	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Peristaltic	lt brn	5.83	0.191	19.10	>1000	1.72	0.1	

PURGE DATA:

Date: 5/6/12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	6.11	0.227	22.30	>1000	1.16	0.1	-68
Monitor Reading (ppm): —	1.0 gal	6.21	0.189	20.45	>1000	2.21	0.1	-24
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD):								
Static Water Level (WL): --								
One Casing Volume(gal/L): --								
Start Purge (hrs):								
End Purge (hrs):								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	YES

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 22 to 26 ft bgs
Purge rate: mL/min

Stains or odors observed	Yes	No
		X

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW29-3236
Sample Location: S43TW 29
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5-11-12 Time: 1325	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (^{0}C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Method: Peristaltic	brnish gray	—	—	—	—	—	—	—

PURGE DATA:

Date: 5-11-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	No	parameters					
Monitor Reading (ppm): —	~~1.5 gal~~							
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 36'								
Static Water Level (WL): —								
One Casing Volume(gal/L):								
Start Purge (hrs): 1307								
End Purge (hrs): 1325								
Total Purge Time (min): —								
Total Vol. Purged (gal/L): 0.5 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 32 to 36 ft bgs
Purge rate: — mL/min

Stains or odors observed: Yes [ ] No [X]

Well goes dry at 1317
Very poor producer
Very silty w/ VF sand

Circle if Applicable:

MS/MSD —
Duplicate ID No.: —

Signature(s): [signature]

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW30-1317
Sample Location: TW 30
Sampled By: RMS
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5/6/12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1410	(Visual)	(S.U.)	(mS/cm)	(°C)	(NTU)	(mg/l)	(%)	(mV)
Method: Peristaltic	BRN	4.53	0.085	18.50	>1000	6.36	0.0	96

PURGE DATA:

Date: 5/6/12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	4.90	0.095	18.69	>1000	3.47	0.0	67
Monitor Reading (ppm): —	1.0 gal	4.62	0.098	18.54	>1000	5.21	0.0	85
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD):								
Static Water Level (WL): --								
One Casing Volume(gal/L): --								
Start Purge (hrs):								
End Purge (hrs):								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 13 to 17 ft bgs
Purge rate: mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD | Duplicate ID No.: S43TW30-1317D

Signature(s):

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW30-2226
Sample Location: TW 30
Sampled By: RMS
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5/6/12	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Time: 1346								
Method: Peristaltic	tan	NA						

PURGE DATA:

Date: 5/6/12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	5.61	0.219	18.84	>1000	3.42	0.1	37
Monitor Reading (ppm): —	1.0 gal	5.58	0.206	19.48	>1000		0.1	64
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD):								
Static Water Level (WL): --								
One Casing Volume(gal/L): --								
Start Purge (hrs):								
End Purge (hrs):								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	YES

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 22 to 26 ft bgs
Purge rate: mL/min

Stains or odors observed: Yes [ ] No [X]

Not enough water for parameters on last sample reading

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW30-3236
Sample Location: TW30
Sampled By: RMS
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Date: 5/6/12								
Time: 1320								
Method: Peristaltic	Hazy	5.65	0.268	18.53	>1000	7.82	0.1	50

PURGE DATA:

	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Date: 5/6/12								
Method: Peristaltic	0.5 gal	5.78	0.298	20.42	>1000	2.10	0.1	10
Monitor Reading (ppm): —	1.0 gal	5.94	0.278	19.09	>1000	1.42	0.1	8
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD):								
Static Water Level (WL): --								
One Casing Volume(gal/L): --								
Start Purge (hrs):								
End Purge (hrs):								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 32 to 36 ft bgs
Purge rate: mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW31-1014
Sample Location: TW 31
Sampled By: RMS
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5/6/12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1145	(Visual)	(S.U.)	(mS/cm)	(°C)	(NTU)	(mg/l)	(%)	(mV)
Method: Peristaltic	Hbrn	4.67	0.184	16.93	890	2.74	0.1	123

PURGE DATA:

Date: 5/6/12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	4.72	0.194	18.14	71000	0.94	0.1	72
Monitor Reading (ppm): —	6.0 gal	4.77	0.184	17.32	71000	2.62	0.1	91
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD):								
Static Water Level (WL): --								
One Casing Volume(gal/L): --								
Start Purge (hrs):								
End Purge (hrs):								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 10 to 14 ft bgs
Purge rate: mL/min

Stains or odors observed: Yes [ ] No [✓]

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW 31 - 2226
Sample Location: TW 31
Sampled By: RMS
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Date: 5/6/18								
Time: 1128								
Method: Peristaltic	lt brn	5.67	0.310	17.70	>1000	2.17	0.1	59

PURGE DATA:

	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Date: 5/6/18								
Method: Peristaltic	0.5 gal	5.77	0.280	19.03	>1000	2.12	0.1	54
Monitor Reading (ppm): —	1.0 gal	5.82	0.309	18.26	>1000	2.24	0.1	50
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD):								
Static Water Level (WL): --								
One Casing Volume(gal/L): --								
Start Purge (hrs):								
End Purge (hrs):								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 22 to 26 ft bgs
Purge rate: mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD | Duplicate ID No.:

Signature(s):

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW31-3236
Sample Location: TW 31
Sampled By: RMS
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5/6/12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: ~~1000~~ 1200	(Visual)	(S.U.)	(mS/cm)	(°C)	(NTU)	(mg/l)	(%)	(mV)
Method: Peristaltic	N/A (Gray)							

PURGE DATA:

Date: 5/6/12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	6.16	0.294	18.52	>1000	1.30	0.1	-36
Monitor Reading (ppm): —	1.0 gal	Slow producer, NO Additional parameters						
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD):								
Static Water Level (WL): --								
One Casing Volume(gal/L): --								
Start Purge (hrs):								
End Purge (hrs):								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 32 to 36 ft bgs
Purge rate: mL/min

Stains or odors observed: Yes [ ] No [X]

Slow producer, much silt & fines, collected initial readings, let recharge and collect sample, 2nd attempt little water only, letting sit longer

Circle if Applicable:

MS/MSD | Duplicate ID No.:

Signature(s):

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW 32-2226
Sample Location: TW 32
Sampled By: RMS
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5/6/12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 0945	(Visual)	(S.U.)	(mS/cm)	(°C)	(NTU)	(mg/l)	(%)	(mV)
Method: Peristaltic	Hbrn	5.13	0.363	15.76	>1000	2.10	0.2	101

PURGE DATA:

Date: 5/6/12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	5.41	0.356	16.19	>1000	1.48	0.2	34
Monitor Reading (ppm): —	1.0 gal	5.26	0.362	15.90	>1000	2.92	0.2	64
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD):								
Static Water Level (WL): --								
One Casing Volume(gal/L): --								
Start Purge (hrs):								
End Purge (hrs):								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	Yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 22 to 26 ft bgs
Purge rate: mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD	Duplicate ID No.: S43TW32-2226D

Signature(s):

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW32 - 3236
Sample Location: TW 32
Sampled By: RMS
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5/6/12	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Time: 0910								
Method: Peristaltic	grey	5.66	0.233	15.75	>1000	2.42	0.1	34

PURGE DATA:

Date: 5/6/12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	5.88	0.254	16.29	>1000	4.20	0.1	35
Monitor Reading (ppm): —	1.0 gal	5.70	0.234	15.90	>1000	2.76	0.1	38
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD):								
Static Water Level (WL): --								
One Casing Volume(gal/L): --								
Start Purge (hrs):								
End Purge (hrs):								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 32 to 36 ft bgs
Purge rate: mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW 33-2226
Sample Location: S43TW 33
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5-11-12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1650	(Visual)	(S.U.)	(mS/cm)	(°C)	(NTU)	(mg/l)	(%)	(mV)
Method: Peristaltic	gray	4.98	0.278	18.10	OverRange	2.40	0.1	60

PURGE DATA:

Date: 5-11-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	4.88	0.283	18.79	OverRange	1.53	0.1	43
Monitor Reading (ppm): —	1.5 gal	4.98	0.278	18.10	" "	2.40	0.1	60
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 26								
Static Water Level (WL): —								
One Casing Volume(gal/L):								
Start Purge (hrs): 1635								
End Purge (hrs): 1650								
Total Purge Time (min): 15								
Total Vol. Purged (gal/L): 1.5 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 22 to 26 ft bgs
Purge rate: 400 mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW33-3236
Sample Location: S43TW33
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5-11-12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1632	(Visual)	(S.U.)	(mS/cm)	(°C)	(NTU)	(mg/l)	(%)	(mV)
Method: Peristaltic	DK Gray	5.69	0.253	19.81	Over Range	1.43	0.1	2

PURGE DATA:

Date: 5-11-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristatic	0.5 gal	5.94	0.285	20.43	Over Range	0.67	0.1	-15
Monitor Reading (ppm): 0.0	1.5 gal	5.69	0.253	19.81	" "	1.43	0.1	2
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 36								
Static Water Level (WL): —								
One Casing Volume(gal/L):								
Start Purge (hrs): 1617								
End Purge (hrs): 1632								
Total Purge Time (min): 15								
Total Vol. Purged (gal/L): 1.5 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 32 to 36 ft bgs
Purge rate: 400 mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): J. Birkett

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW34-2226
Sample Location: S43TW 34
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5-11-12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1000	(Visual)	(S.U.)	(mS/cm)	(°C)	(NTU)	(mg/l)	(%)	(mV)
Method: Peristaltic	light brown	5.20	0.165	14.72	OverRange	2.63	0.1	119

PURGE DATA:

Date: 5-11-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	5.05	0.165	14.87	OverRange	2.75	0.0	109
Monitor Reading (ppm):	2 ~~1.5~~ gal	5.20	0.165	14.72	" "	2.63	0.1	119
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 26								
Static Water Level (WL): —								
One Casing Volume(gal/L):								
Start Purge (hrs): 0945								
End Purge (hrs): 1000								
Total Purge Time (min): 15								
Total Vol. Purged (gal/L): 2 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	9 ~~8~~ 40-mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 22 to 26 ft bgs
Purge rate: 500 mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD	Duplicate ID No.:
yes	—

Signature(s):

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW34-3236
Sample Location: S43TW34
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5-11-12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 0940	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Peristaltic	gray	5.79	0.225	15.12	Over Range	2.96	0.1	70

PURGE DATA:

Date: 5-11-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	5.65	0.308	15.16	Over Range	2.64	0.1	113
Monitor Reading (ppm): —	1.5 gal	5.79	0.225	15.12	" "	2.96	0.1	70
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 36								
Static Water Level (WL): —								
One Casing Volume(gal/L):								
Start Purge (hrs): 0925								
End Purge (hrs): 0940								
Total Purge Time (min): 15								
Total Vol. Purged (gal/L): 15								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 32 to 36 ft bgs
Purge rate: 400 mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD: —

Duplicate ID No.: S43TW34-3236-D 0941

Signature(s):

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW35-2226
Sample Location: S43TW 35
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5-11-12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1200	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Peristaltic	light brn	4.95	0.099	18.69	OverRange	2.09	0.0	109

PURGE DATA:

Date: 5-11-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	5.19	0.110	19.76	OverRange	1.46	0.1	65
Monitor Reading (ppm): —	1.5 gal	4.95	0.099	18.69	" "	2.09	0.0	109
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 26								
Static Water Level (WL): —								
One Casing Volume(gal/L):								
Start Purge (hrs): 1145								
End Purge (hrs): 1200								
Total Purge Time (min): 15								
Total Vol. Purged (gal/L): 1.5 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 22 to 26 ft bgs
Purge rate: 400 mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): [signature]

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW35-3236
Sample Location: S43TW35
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5-11-12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: ~~1152~~ 1150	(Visual)	(S.U.)	(mS/cm)	(°C)	(NTU)	(mg/l)	(%)	(mV)
Method: Peristaltic	thick Gray	6.13	0.302	21.17	OverRange	3.33	0.1	42

PURGE DATA:

Date: 5-11-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	6.13	0.302	21.17	OverRange	3.33	0.1	42
Monitor Reading (ppm): —	~~1.0~~ gal							
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 36								
Static Water Level (WL): —								
One Casing Volume(gal/L):								
Start Purge (hrs): 1135								
End Purge (hrs): ~~1150~~ 1150								
Total Purge Time (min): 15								
Total Vol. Purged (gal/L): 1.0 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 32 to 36 ft bgs
Purge rate: 200 mL/min

Had to redrill

Stains or odors observed: Yes [ ] No [X]

Very thick gray silty water
Note: Went dry at 1145, let recharge then sample but kept the same time

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW36-2024
Sample Location: S43TW36
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 6-1-12	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Time: 1129								
Method: Peristaltic	light brown	5.69	0.197	20.45	Over Range	3.25	0.1	30

PURGE DATA:

Date: 6-1-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	5.92	0.230	20.92	Over Range	7.12	0.1	21
Monitor Reading (ppm): 0.0	2.5 gal	5.69	0.197	20.45	" "	3.25	0.1	30
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 24								
Static Water Level (WL): —								
One Casing Volume(gal/L):								
Start Purge (hrs): 1114								
End Purge (hrs): 1129								
Total Purge Time (min): 15								
Total Vol. Purged (gal/L): 2.5 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	9 ~~8~~ 40-mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 20 to 24 ft bgs
Purge rate: 750 mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD (yes)

Duplicate ID No.: —

Signature(s):

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW 36-3034
Sample Location: S43TW 36
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 6-1-12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1124	(Visual)	(S.U.)	(mS/cm)	(°C)	(NTU)	(mg/l)	(%)	(mV)
Method: Peristaltic	dk gry	6.10	0.254	21.80	Over Range	4.83	0.1	-68

PURGE DATA:

Date: 6-1-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	5.99	0.652	24.77	Over Range	5.36	0.3	-50
Monitor Reading (ppm): —	1.5 gal	6.10	0.254	21.80	" "	4.83	0.1	-68
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 34								
Static Water Level (WL): —								
One Casing Volume(gal/L):								
Start Purge (hrs): 1109								
End Purge (hrs): 1124								
Total Purge Time (min): 15								
Total Vol. Purged (gal/L): 1.5 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 30 to 34 ft bgs
Purge rate: 400 mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): J. Birkett

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW37-2024
Sample Location: S43TW37
Sampled By: J. Birkett
C.O.C. No.: ~~J. Hollinan~~ JB 6-1-12
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 6-1-12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1405	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Peristaltic	brn	5.23	0.192	19.71	OverRange	2.64	0.1	85

PURGE DATA:

Date: 6-1-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	5.34	0.246	23.05	OverRange	3.93	0.1	28
Monitor Reading (ppm): —	2.5 gal	5.23	0.192	19.71	" "	2.64	0.1	85
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 24								
Static Water Level (WL): —								
One Casing Volume(gal/L):								
Start Purge (hrs): 1350								
End Purge (hrs): 1405								
Total Purge Time (min): 15								
Total Vol. Purged (gal/L): 2.5 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 20 to 24 ft bgs
Purge rate: 750 mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD	Duplicate ID No.: 1406
—	S43TW37-2024-D

Signature(s): J. Birkett

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW37-3135
Sample Location: S43TW 37
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 6-1-12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1409	(Visual)	(S.U.)	(mS/cm)	(°C)	(NTU)	(mg/l)	(%)	(mV)
Method: Peristaltic	dk gray	6.15	0.211	20.92	Over Range	2.64	0.1	-63

PURGE DATA:

Date: 6-1-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	5.97	0.221	22.21	Over Range	3.91	0.1	-65
Monitor Reading (ppm): —	1.5 gal	6.15	0.211	20.92	" "	2.64	0.1	-63
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 35								
Static Water Level (WL): —								
One Casing Volume(gal/L):								
Start Purge (hrs): 1354								
End Purge (hrs): 1409								
Total Purge Time (min): 15								
Total Vol. Purged (gal/L): 1.5 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 31 to 35ft bgs
Purge rate: 300 mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD: —
Duplicate ID No.: —

Signature(s):

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW 38-1822
Sample Location: S43TW 38
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 6-2-12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1420	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Peristaltic	brown	6.10	0.348	18.08	OverRange	3.73	0.2	-99

PURGE DATA:

Date: 6-2-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	5.82	0.468	19.71	OverRange	4.31	0.2	-91
Monitor Reading (ppm): 0.0	2.5 gal	6.10	0.348	18.08	" "	3.73	0.2	-99
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 22								
Static Water Level (WL): —								
One Casing Volume(gal/L):								
Start Purge (hrs): 1406								
End Purge (hrs): 1420								
Total Purge Time (min): 14								
Total Vol. Purged (gal/L): 2.5 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	Yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 18 to 22ft bgs
Purge rate: 750 mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD: —
Duplicate ID No.: —

Signature(s): J. Birkett

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW 38-2832
Sample Location: S43TW 38
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (^{0}C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Date: 6-12-12								
Time: 1442								
Method: Peristaltic	DK Gray	6.22	0.260	19.41	OverRange	4.54	0.1	-76

PURGE DATA:

	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Date: 6-12-12								
Method: Peristaltic	0.5 gal	6.26	0.276	20.02	OverRange	2.04	0.1	-80
Monitor Reading (ppm): —	2.5 gal	6.22	0.260	19.41	" "	4.54	0.1	-76
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 32								
Static Water Level (WL): ~~1432~~ JB 6-12-12								
One Casing Volume(gal/L):								
Start Purge (hrs): 1432								
End Purge (hrs): 1442								
Total Purge Time (min): 10								
Total Vol. Purged (gal/L): 2 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 28 to 32 bgs
Purge rate: 750 mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): [signature]

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW 39-0812
Sample Location: S43TW 39
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 6-2-12	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (^{0}C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Time: 1835								
Method: Peristaltic	Brown	—	—	—	—	—	—	—

PURGE DATA:

Date: 6-2-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	No		Parameters				
Monitor Reading (ppm): —	1.5 gal							
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 12								
Static Water Level (WL): —								
One Casing Volume(gal/L):								
Start Purge (hrs): 1835								
End Purge (hrs): 1835								
Total Purge Time (min): —								
Total Vol. Purged (gal/L): —								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	Yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 8 to 12ft bgs
Purge rate: — mL/min

Stains or odors observed: Yes [ ] No [X]

Only 2 full vials collected
Filled 1/2 3rd vial

located at S43MW09S and D
• right on woodline

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW40-2226
Sample Location: S43TW40
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 6-19-12	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (^{0}C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Time: 1008								
Method: Peristaltic	Brn/Gray	5.81	0.285	20.95	OverRange	3.36	0.1	35

PURGE DATA:

Date: 6-19-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	5.77	0.291	21.90	~~4.19~~ 6-19-12	4.19	0.1	62
Monitor Reading (ppm): —	2 ~~1.5~~ gal	5.81	0.285	20.95	OverRange	3.36	0.1	35
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 26								
Static Water Level (WL): —								
One Casing Volume(gal/L):								
Start Purge (hrs): 0958								
End Purge (hrs): 1008								
Total Purge Time (min): 10								
Total Vol. Purged (gal/L): 2.0 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 22 to 26 ft bgs
Purge rate: 700 mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): J. Birkett

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW40-3236
Sample Location: S43TW 40
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 6-18-12 Time: 1425	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Method: Peristaltic	light gray	5.71	0.371	20.32	OverRange	2.23	0.2	28

PURGE DATA:

Date: 6-18-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	5.73	0.371	21.55	OverRange	5.23	0.2	48
Monitor Reading (ppm): —	2.5 gal	5.71	0.371	20.32	" "	2.23	0.2	28
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 36								
Static Water Level (WL): —								
One Casing Volume(gal/L):								
Start Purge (hrs): 1410								
End Purge (hrs): 1425								
Total Purge Time (min): 15								
Total Vol. Purged (gal/L): 2.5gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	Yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 32 to 36 ft bgs
Purge rate: 500 mL/min

Stains or odors observed: Yes [ ] No [X]

Circle If Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW41-1822
Sample Location: S43TW41
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 6-18-22	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Time: 1022								
Method: Peristaltic	Light Brn	5.13	0.232	17.30	OverRange	4.19	0.1	152

PURGE DATA:

Date: 6-18-22	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	4.81	0.490	18.16	OverRange	5.87	0.2	184
Monitor Reading (ppm): —	2.5 gal	5.13	0.232	17.30	" "	4.19	0.1	152
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 22								
Static Water Level (WL): —								
One Casing Volume(gal/L):								
Start Purge (hrs): 1007								
End Purge (hrs): 1022								
Total Purge Time (min): 15								
Total Vol. Purged (gal/L): 2.5gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 18 to 22ft bgs
Purge rate: 600 mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD: —

Duplicate ID No.: 1023
S43TW41-1822

Signature(s):

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW41-3337
Sample Location: S43TW 41-
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 6-18-12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1035	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Peristaltic	brn	—	—	—	—	—	—	—

PURGE DATA:

Date: 6-18-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal							
Monitor Reading (ppm): —	1.5 gal	No		parameters				
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 37								
Static Water Level (WL): —								
One Casing Volume(gal/L):								
Start Purge (hrs): 1030								
End Purge (hrs): 1035								
Total Purge Time (min): 5								
Total Vol. Purged (gal/L): 0.75 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 33 to 37 ft bgs
Purge rate: — mL/min

Stains or odors observed: Yes [X] No [ ]

only 2 vials filled

Circle If Applicable:

MS/MSD —

Duplicate ID No.: —

Signature(s): J. Birkett

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW42-1822
Sample Location: S43TW 42
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 6-18-12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1230	(Visual)	(S.U.)	(mS/cm)	(°C)	(NTU)	(mg/l)	(%)	(mV)
Method: Peristaltic	light brown	4.89	0.182	17.90	Over Range	2.35	0.1	198

PURGE DATA:

Date: 6-18-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	4.97	0.194	18.79	Over Range	8.99	0.1	199
Monitor Reading (ppm): —	2.5 gal	4.89	0.182	17.90	" "	2.35	0.1	198
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 22								
Static Water Level (WL): —								
One Casing Volume(gal/L):								
Start Purge (hrs): 1216								
End Purge (hrs): 1230								
Total Purge Time (min): 14								
Total Vol. Purged (gal/L): 2.5 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 18 to 22 ft bgs
Purge rate: 600 mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW 42-337
Sample Location: S43TW 42
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 6-18-12	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Time: 1330								
Method: Peristaltic	brown silty	—	—	—	—	—	—	—

PURGE DATA:

Date: 6-18-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	No		Parameters				
Monitor Reading (ppm): —	1.5 gal							
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 37								
Static Water Level (WL): —								
One Casing Volume(gal/L):								
Start Purge (hrs): 1328								
End Purge (hrs): 1330								
Total Purge Time (min): 2 min								
Total Vol. Purged (gal/L): —								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	Yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 33 to 37 ft bgs
Purge rate: — mL/min

Stains or odors observed: Yes [ ] No [X]

Circle If Applicable:

MS/MSD —
Duplicate ID No.: —

Signature(s):

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW 43-1519
Sample Location: S43TW 43
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 6-19-12	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (^{0}C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Time: 0846								
Method: Peristaltic	tan color	4.66	0.288	18.61	318	3.56	0.1	206

PURGE DATA:

Date: 6-19-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	4.89	0.311	18.68	895	3.36	0.1	206
Monitor Reading (ppm): —	2.5 gal	4.66	0.288	18.61	318	3.56	0.1	206
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 19								
Static Water Level (WL): —								
One Casing Volume(gal/L):								
Start Purge (hrs): 0831								
End Purge (hrs): 0846								
Total Purge Time (min): 15								
Total Vol. Purged (gal/L): 2.5 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 15 to 19 ft bgs
Purge rate: 700 mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD —

Duplicate ID No.: —

Signature(s): [signature]

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW 44-1317
Sample Location: S43TW 44
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 6-19-12	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Time: 1155								
Method: Peristaltic	tan tint	5.00	0.217	26.94	OverRange	3.19	0.1	175

PURGE DATA:

Date: 6-19-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	5.00	0.217	26.94	OverRange	3.19	0.1	175
Monitor Reading (ppm):	~~1.5 gal~~							
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 17								
Static Water Level (WL): –								
One Casing Volume(gal/L):								
Start Purge (hrs): 1147								
End Purge (hrs): 1155								
Total Purge Time (min): 8								
Total Vol. Purged (gal/L): 0.5 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 13 to 17 ft bgs
Purge rate: — mL/min

Stains or odors observed: Yes [ ] No [X]

Well goes dry after 2 min purge
Cleared up before sampling ~ 200 NTU

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): J. Birkett

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW 44-3943
Sample Location: S43TW 44
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 6-19-12	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Time:								
Method: Peristaltic								

PURGE DATA:

Date: 6-19-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method:	0.5 gal	NO		SAMPLE				
Monitor Reading (ppm):	1.5 gal							
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD):								
Static Water Level (WL):								
One Casing Volume(gal/L):								
Start Purge (hrs):								
End Purge (hrs):								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	No

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from to ft bgs
Purge rate: mL/min

Stains or odors observed: Yes [ ] No [ ]

(Dry)
No water at following intervals
- 39-43'
- 35-39'
- 33-37'

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s): J. Birkett

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW 45-2024
Sample Location: S43TW 45
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 6-19-12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1512	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Peristaltic	tan color	5.81	0.249	22.64	OverRange	3.31	0.1	95

PURGE DATA:

Date: 6-19-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	5.81	0.249	22.64	OverRange	3.31	0.1	95
Monitor Reading (ppm):	1.5 gal							
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 24								
Static Water Level (WL): —								
One Casing Volume(gal/L):								
Start Purge (hrs): 1449								
End Purge (hrs): 1512								
Total Purge Time (min): —								
Total Vol. Purged (gal/L): 0.75 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	Yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 20 to 24ft bgs
Purge rate: — mL/min

Stains or odors observed: Yes [ ] No [X]

Went dry had to let recharge

Circle if Applicable:

MS/MSD: yes
Duplicate ID No.: —

Signature(s):

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW 45-3337
Sample Location: S43TW 45
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 6-19-12	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (^{0}C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Time:								
Method: Peristaltic								

PURGE DATA:

Date: 6-19-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal							
Monitor Reading (ppm): —	1.5 gal							
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 37								
Static Water Level (WL): —								
One Casing Volume(gal/L):								
Start Purge (hrs):								
End Purge (hrs):								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

No Sample
Two Attempts

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	No

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from to ft bgs
Purge rate: mL/min

Stains or odors observed — Yes: [ ] No: [ ]

No water at
- 33-37'
- 30-34'
- 28-32'

Circle if Applicable:

MS/MSD | Duplicate ID No.:

Signature(s):

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW 45-3741
Sample Location: S43TW 45
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Date: 6-21-12								
Time: 1035								
Method: Peristaltic	Very muddy brown	—	—	—	—	—	—	—

PURGE DATA:

	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Date: 6-21-12								
Method: Peristy	0.5 gal	—	—	—	—	—	—	—
Monitor Reading (ppm):	1.5 gal							
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 41								
Static Water Level (WL): —								
One Casing Volume(gal/L):								
Start Purge (hrs): 1033								
End Purge (hrs): 1035								
Total Purge Time (min): 2								
Total Vol. Purged (gal/L): 0.1 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 37 to 41 ft bgs
Purge rate: — mL/min

Pulled out tubing, reverse pump and sampled

Stains or odors observed: Yes [ ] No [X]

Water could possibly be mud that entered drill string through threads since it is so muddy and didn't produce much water

Circle if Applicable:

MS/MSD —
Duplicate ID No.: —

Signature(s): J. Birkett

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW 46-0408
Sample Location: S43TW 46
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 6-22-12	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Time:								
Method: Peristaltic								

PURGE DATA:

Date: 6-22-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	NO		SAMPLE				
Monitor Reading (ppm): —	1.5 gal							
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 8								
Static Water Level (WL):								
One Casing Volume(gal/L):								
Start Purge (hrs):								
End Purge (hrs):								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	NO

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 4 to 8 ft bgs
Purge rate: mL/min

Stains or odors observed: Yes [ ] No [ ]

6-21-12 Set TW at 10-14, 8-12, and 6-10' bgs
- No water
Let 4-8' bgs sit overnight
- Still no water

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): J. Birkett

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW 46-4044
Sample Location: S43TW 46
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 6-21-12	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Time:								
Method: Peristaltic								

PURGE DATA:

Date: 6-21-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method:	0.5 gal	No Sample						
Monitor Reading (ppm):	1.5 gal							
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD):								
Static Water Level (WL):								
One Casing Volume(gal/L):								
Start Purge (hrs):								
End Purge (hrs):								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	NO

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from to ft bgs
Purge rate: mL/min

Stains or odors observed: Yes [ ] No [ ]

No sample obtained from 40-44, 36-40, or 32-36

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): J. Birkett

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW 47-1014
Sample Location: S43TW 47
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 6-21-12	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Time: 0738								
Method: Peristaltic	brown	—	—	—	—	—	—	—

PURGE DATA:

Date: 6-21-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	—	—	—	—	—	—	—
Monitor Reading (ppm): —	1.5 gal							
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 14								
Static Water Level (WL): —								
One Casing Volume(gal/L):								
Start Purge (hrs): 0736								
End Purge (hrs): 0738								
Total Purge Time (min): 2								
Total Vol. Purged (gal/L): 0.2 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 10 to 14 ft bgs
Purge rate: 300 mL/min

Stains or odors observed: Yes [ ] No [X]

Installed 6-20-12, Let sit overnight due to tight formation. Very little water in TW so collect water as soon as it came out tubing. No parameters

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW48-1519
Sample Location: S43TW48
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 6-20-12	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Time:								
Method: Peristaltic								

PURGE DATA:

Date: 6-20-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method:	0.5 gal	NO		SAMPLE				
Monitor Reading (ppm):	1.5 gal							
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD):								
Static Water Level (WL):								
One Casing Volume(gal/L):								
Start Purge (hrs):								
End Purge (hrs):								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	NO

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 15 to 19 ft bgs
Purge rate: mL/min

Stains or odors observed: Yes [ ] No [ ]

(Dry)
No Water at following intervals
- 15-19' bgs
- 13-17'
- 9-13'

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s): J. Birkett

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW 48-~~39~~ 40 44
Sample Location: S43TW 48 JB 6-20-12
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Date: 6-20-12								
Time: 1242								
Method: Peristaltic	gray silty	6.09	0.262	25.18	OverRange	4.76	0.1	51

PURGE DATA:

	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Date: 6-20-12								
Method: Peristaltic	0.5 gal	6.09	0.262	25.18	OverRange	4.76	0.1	51
Monitor Reading (ppm): —	~~1.5 gal~~							
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 44								
Static Water Level (WL): —								
One Casing Volume(gal/L):								
Start Purge (hrs): 1237								
End Purge (hrs): 1242								
Total Purge Time (min): 5								
Total Vol. Purged (gal/L): 0.75 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 40 to 44 ft bgs
Purge rate: 300 mL/min

Stains or odors observed: Yes [ ] No [X]

Water in rods very low, must use check valve

Circle if Applicable:

MS/MSD —
Duplicate ID No.: —

Signature(s):

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW49-1721
Sample Location: S43TW 49
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 6-19-12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1715	(Visual)	(S.U.)	(mS/cm)	(°C)	(NTU)	(mg/l)	(%)	(mV)
Method: Peristaltic	tan tint	4.97	0.249	19.25	631	2.82	0.1	158

PURGE DATA:

Date: 6-19-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	5.14	0.257	22.43	Overrange	3.02	0.1	152
Monitor Reading (ppm): —	1.5 gal	4.97	0.249	19.25	631	2.82	0.1	158
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 21								
Static Water Level (WL): —								
One Casing Volume(gal/L):								
Start Purge (hrs): 1700								
End Purge (hrs): 1715								
Total Purge Time (min): 15								
Total Vol. Purged (gal/L): 2.5 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 17 to 21 ft bgs
Purge rate: 750 mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD —

Duplicate ID No.: S43TW49-1721-D 1716

Signature(s):

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW 49-3337
Sample Location: S43TW
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 6-19-12	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Time:								
Method: Peristaltic								

PURGE DATA:

Date: 6-19-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal							
Monitor Reading (ppm): —	1.5 gal	No water						
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD):								
Static Water Level (WL): —								
One Casing Volume(gal/L):								
Start Purge (hrs):								
End Purge (hrs):								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	NO

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from to ft bgs
Purge rate: mL/min

Stains or odors observed: Yes [ ] No [ ]

No water at 33-37'
pulled up 5' so screened from 28-32'
let sit over night but still no water

Circle if Applicable:

MS/MSD —
Duplicate ID No.: —

Signature(s):

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW 50-1822
Sample Location: S43TW 50
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 6-20-12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 0851	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Peristaltic	tan color	5.17	0.129	17.94	495	2.70	0.1	173

PURGE DATA:

Date: 6-20-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	4.90	0.199	19.85	963	3.14	0.1	215
Monitor Reading (ppm): —	2.5 gal	5.17	0.129	17.94	495	2.70	0.1	173
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 22								
Static Water Level (WL): —								
One Casing Volume(gal/L):								
Start Purge (hrs): 0836								
End Purge (hrs): 0851								
Total Purge Time (min): 15								
Total Vol. Purged (gal/L): 2.5 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 18 to 22ft bgs
Purge rate: 700 mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW50-3236
Sample Location: S43TW 50
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 6-20-12	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (^{0}C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Time:								
Method: Peristaltic								

PURGE DATA:

Date: 6-20-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	No Water						
Monitor Reading (ppm): —	1.5 gal							
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 36								
Static Water Level (WL): —								
One Casing Volume(gal/L):								
Start Purge (hrs):								
End Purge (hrs):								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	NO

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from to ft bgs
Purge rate: mL/min

Stains or odors observed: Yes [ ] No [ ]

No water at 32-36'
Pull up 3' No water from 29-33'
Pull up 2' No water from 27-31

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): J. Birkett

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW 51-1721
Sample Location: S43TW 51
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Date: 6-21-12								
Time: 1201								
Method: Peristaltic	tan color	5.10	0.146	19.44	833	3.13	0.1	178

PURGE DATA:

	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Date: 6-21-12								
Method: Peristaltic	0.5 gal	5.29	0.239	22.56	Over Range	4.42	0.1	188
Monitor Reading (ppm):	2.5 gal	5.10	0.146	19.44	833	3.13	0.1	178
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 21								
Static Water Level (WL):								
One Casing Volume(gal/L):								
Start Purge (hrs): 1146								
End Purge (hrs): 1201								
Total Purge Time (min): 15								
Total Vol. Purged (gal/L): 2.5 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 17 to 21 ft bgs
Purge rate: 750 mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD —

Duplicate ID No.: —

Signature(s): J. Birkett

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW 52-1014
Sample Location: S43TW 52
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (^{0}C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Date: 6-21-12								
Time: 1551								
Method: Peristaltic	dk gray	—	—	—	—	—	—	—

PURGE DATA:

	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Date: 6-21-12								
Method: Peristaltic	0.5 gal							
Monitor Reading (ppm): —	1.5 gal							
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 14								
Static Water Level (WL): —								
One Casing Volume(gal/L):								
Start Purge (hrs): 1550								
End Purge (hrs): 1551								
Total Purge Time (min): 1								
Total Vol. Purged (gal/L): 0.1 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 10 to 14ft bgs
Purge rate: — mL/min

Stains or odors observed: Yes [ ] No [X]

Upon installation TW dry
Let recharge for 15 min then sample

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): J. Birkett

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF-Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temp Well / GW Grab
[] QA Sample Type:

Sample ID No.: S43TW52-3842
Sample Location: S43TW52
Sampled By: J. Birke
C.O.C. No.:
Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 7-10-12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time:	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	
Method:								

PURGE DATA:

Date:	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Method:	NO		SAMPLE					
Monitor Reading (ppm):								
Well Casing Diameter & Material			TW		DRY			
Type:								
Total Well Depth (TD):								
Static Water Level (WL):								
One Casing Volume(gal/L):								
Start Purge (hrs):								
End Purge (hrs):								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
No sample			

OBSERVATIONS / NOTES:

Push screen to 38-42' - no water
Pull up screen to 35-39' - no water

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW 53-1317
Sample Location: S43TW 53
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 6-22-12	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (^{0}C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Time: 0945								
Method: Peristaltic	brn	—	—	—	—	—	—	—

PURGE DATA:

Date: 6-22-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	—	—	—	—	—	—	—
Monitor Reading (ppm): —	1.5 gal							
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 17								
Static Water Level (WL): —								
One Casing Volume(gal/L):								
Start Purge (hrs): 0944								
End Purge (hrs): 0945								
Total Purge Time (min): 1								
Total Vol. Purged (gal/L): 0.1 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 13 to 17ft bgs
Purge rate: — mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW 53-2428
Sample Location: S43TW 53
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 6-22-12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 0942	(Visual)	(S.U.)	(mS/cm)	(°C)	(NTU)	(mg/l)	(%)	(mV)
Method: Peristaltic	light gray	5.41	0.249	20.32	941	3.01	0.1	41

PURGE DATA:

Date: 6-22-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	5.35	0.345	22.92	Over Range	4.32	0.2	66
Monitor Reading (ppm): —	2.5 gal	5.41	0.249	20.32	941	3.01	0.1	41
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 28								
Static Water Level (WL): —								
One Casing Volume(gal/L):								
Start Purge (hrs): 0927								
End Purge (hrs): 0942								
Total Purge Time (min): 15								
Total Vol. Purged (gal/L): 2.5 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 24 to 28ft bgs
Purge rate: 750 mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD: —

Duplicate ID No.: S43TW53-2428-D 0943

Signature(s): [signature]

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW 54-1721
Sample Location: S43TW 54
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 6-22-12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1048	(Visual)	(S.U.)	(mS/cm)	(°C)	(NTU)	(mg/l)	(%)	(mV)
Method: Peristaltic	light brown	5.23	0.147	21.64	Over Range	2.78	0.1	105

PURGE DATA:

Date: 6-22-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	5.60	0.150	24.11	Over Range	3.24	0.1	84
Monitor Reading (ppm): —	2.0 gal	5.23	0.147	21.64	" "	2.78	0.1	105
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 21								
Static Water Level (WL): —								
One Casing Volume(gal/L):								
Start Purge (hrs): 1033								
End Purge (hrs): 1048								
Total Purge Time (min): 15								
Total Vol. Purged (gal/L): 2.0								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 17 to 21 ft bgs
Purge rate: 700 mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): J. Birkett

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW55-1822
Sample Location: S43TW55
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 6-22-12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1220	(Visual)	(S.U.)	(mS/cm)	(°C)	(NTU)	(mg/l)	(%)	(mV)
Method: Peristaltic	far color	4.50	0.160	19.44	867	3.41	0.1	217

PURGE DATA:

Date: 6-22-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	4.54	0.161	21.16	633	4.53	0.1	204
Monitor Reading (ppm): —	1.5 gal	4.50	0.160	19.44	867	3.41	0.1	217
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 22								
Static Water Level (WL): —								
One Casing Volume(gal/L):								
Start Purge (hrs): 1206								
End Purge (hrs): 1220								
Total Purge Time (min): 14								
Total Vol. Purged (gal/L): 2.0 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 18 to 22 ft bgs
Purge rate: 700 mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD: —
Duplicate ID No.: —

Signature(s): [signature]

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW56-1620
Sample Location: S43TW56
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 6-22-12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1150	(Visual)	(S.U.)	(mS/cm)	(°C)	(NTU)	(mg/l)	(%)	(mV)
Method: Peristaltic	Light brn	4.77	0.102	19.23	OverRange	2.85	0.0	184

PURGE DATA:

Date: 6-22-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	5.21	0.111	22.56	OverRange	3.98	0.1	148
Monitor Reading (ppm): —	2.0 gal	4.77	0.102	19.23	OverRange	2.85	0.0	184
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 20								
Static Water Level (WL): —								
One Casing Volume(gal/L):								
Start Purge (hrs): 1135								
End Purge (hrs): 1150								
Total Purge Time (min): 15								
Total Vol. Purged (gal/L): 2.0 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 16 to 20 ft bgs
Purge rate: 700 mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD: —
Duplicate ID No.: —

Signature(s): J. Birkett

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW 57-1923
Sample Location: S43TW 57
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 7-12-12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1545	(Visual)	(S.U.)	(mS/cm)	(°C)	(NTU)	(mg/l)	(%)	(mV)
Method: Peristaltic	Gray	5.41	0.259	21.63	Over Range	4.29	0.1	73

PURGE DATA:

Date: 7-12-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	5.12	0.413	25.35	Over Range	8.98	0.2	91
Monitor Reading (ppm): —	1.5 gal	5.41	0.259	21.63	" "	4.29	0.1	73
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 23								
Static Water Level (WL): —								
One Casing Volume(gal/L):								
Start Purge (hrs): 1537								
End Purge (hrs): 1545								
Total Purge Time (min): 12								
Total Vol. Purged (gal/L): 2 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 19 to 23 bgs
Purge rate: 700 mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD: —
Duplicate ID No.: —

Signature(s):

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW 57-2933
Sample Location: S43TW 57
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 7-13-12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 0720	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Peristaltic	Gray	—	—	—	—	—	—	—

PURGE DATA:

Date: 7-13-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	—	—	—	—	—	—	—
Monitor Reading (ppm): —	1.5 gal		—	—	—	—	—	—
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 33								
Static Water Level (WL): —								
One Casing Volume(gal/L):								
Start Purge (hrs): 0719								
End Purge (hrs): 0720								
Total Purge Time (min): 1 min								
Total Vol. Purged (gal/L): 0.1 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 29 to 33ft bgs
Purge rate: —— mL/min

Stains or odors observed: Yes [ ] No [X]

Very little water
Installed 7-12-12
Let sit overnight and then sample

Circle if Applicable:

MS/MSD: —
Duplicate ID No.: —

Signature(s):

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW SA01-3034
Sample Location: S43TW SA01
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[] Low Concentration
[X] High Concentration

SAMPLING DATA:

Date: 5-13-12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1409	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Peristaltic	gray	6.09	0.181	20.99	OverRange	2.01	0.1	32

PURGE DATA:

Date: 5-13-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	6.05	0.231	23.56	OverRange	2.24	0.1	80
Monitor Reading (ppm): —	1.5 gal	6.09	0.181	20.99	" "	2.01	0.1	32
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 34								
Static Water Level (WL): —								
One Casing Volume(gal/L):								
Start Purge (hrs): 1354								
End Purge (hrs): 1409								
Total Purge Time (min): 15								
Total Vol. Purged (gal/L): 1.5 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from to ft bgs
Purge rate: mL/min

Stains or odors observed: Yes [ ] No [X]

adjacent to MW01
1340 Start advancing rod 5
1350 Down to depth screen exposed

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	~~S43TWSA01-3034-D~~ JB 5-13-12

Signature(s):

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW SA02-1413
Sample Location: S43TW SA02
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5-11-12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1448	(Visual)	(S.U.)	(mS/cm)	(°C)	(NTU)	(mg/l)	(%)	(mV)
Method: Peristaltic	light Brn	5.43	0.206	21.01	Over Range	1.59	0.1	89

PURGE DATA:

Date: 5-11-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	5.43	0.206	21.01	Over Range	1.59	0.1	89
Monitor Reading (ppm): —	~~1.5 gal~~							
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 18								
Static Water Level (WL): —								
One Casing Volume(gal/L):								
Start Purge (hrs): 1440								
End Purge (hrs): 1448								
Total Purge Time (min): 8								
Total Vol. Purged (gal/L): 0.75 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 13 to 18 ft bgs
Purge rate: — mL/min

Stains or odors observed: Yes [ ] No [X]

Well went dry at 1445
Let recharge
-after recharge water has tan tint (128 NTU)

Circle if Applicable:

MS/MSD — Duplicate ID No.: —

Signature(s):

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TW 5A02-3034
Sample Location: S43TW
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5-11-12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1435	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Peristaltic	Gray	5.95	0.297	22.70	Over Range	1.98	0.1	9

PURGE DATA:

Date: 5-11-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal	6.22	0.334	25.20	Over Range	1.46	0.2	-6
Monitor Reading (ppm): —	1.5 gal	5.95	0.297	22.70	" "	1.98	0.1	9
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 34								
Static Water Level (WL): —								
One Casing Volume(gal/L):								
Start Purge (hrs): 1415								
End Purge (hrs): 1435								
Total Purge Time (min): 20								
Total Vol. Purged (gal/L): 1.5 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	Yes

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from 30 to 34 ft bgs
Purge rate: 300 mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD: —
Duplicate ID No.: —

Signature(s):

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Temporary Well Groundwater Grab
[] QA Sample Type:

Sample ID No.: S43TWSA03-1014
Sample Location: S43TWSA03
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5-13-12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time:	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Peristaltic								

PURGE DATA:

Date: 5-13-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Peristaltic	0.5 gal							
Monitor Reading (ppm): —	1.5 gal							
Well Casing Diameter & Material								
Type: 1" Stainless Steel								
Total Well Depth (TD): 14								
Static Water Level (WL): —								
One Casing Volume(gal/L):								
Start Purge (hrs):								
End Purge (hrs):								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

NO SAMPLE

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	~~✓~~

OBSERVATIONS / NOTES:

Tubing pulled 1 foot off bottom
Temporary well screened from to ft bgs
Purge rate: mL/min

Stains or odors observed: Yes [ ] No [ ]

1330 Made three attempts to collect sample from 10-14
No water

located adjacent to MW04

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): J. Birkett

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF-Indian Head
Project No.: 112G00771

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

Sample ID No.: S43MW09S-Grab
Sample Location: S43MW09S
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	~~Other~~ ORP (mV)
Date: 6-2-12								
Time: 1815								
Method: Peristaltic	Clear	6.19	0.350	18.32	6.4	4.32	0.2	68

PURGE DATA:

	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	~~Other~~ ORP	
Date: 6-2-12									Water Level
Method: Peristaltic	0.5 gal	6.49	0.723	20.66	293	4.09	0.4	-39	17.12
Monitor Reading (ppm): —	1.0 gal	6.19	0.350	18.32	6.4	4.32	0.2	68	20.40
Well Casing Diameter & Material Type: 2" PVC									
Total Well Depth (TD): 23.62									
Static Water Level (WL): 17.12									
One Casing Volume(gal/L):									
Start Purge (hrs): 1758									
End Purge (hrs): 1815									
Total Purge Time (min): 17									
Total Vol. Purged (gal/L): 1.0 gal									

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOC	HCl	3 40mL vials	yes

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF-Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43MW09D-Grab
Sample Location: S43MW09D
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 6-2-12	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	~~Other~~ ORP (mV)
Time: 1830								
Method: Peristaltic	clear	6.20	0.307	17.10	70	2.77	0.1	-14

PURGE DATA:

Date: 6-2-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	~~Other~~ ORP
Method: Peristaltic	1 gal	6.29	0.306	17.49	80	3.68	0.1	-1
Monitor Reading (ppm): —	2.5 gal	6.20	0.307	17.10	70	2.77	0.1	-14
Well Casing Diameter & Material Type: 2" PVC								
Total Well Depth (TD): 35.76								
Static Water Level (WL): 7.76								
One Casing Volume(gal/L):								
Start Purge (hrs): 1816								
End Purge (hrs): 1830								
Total Purge Time (min): 14								
Total Vol. Purged (gal/L): 2.5 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOC	HCl	3 40mL glass vials	Yes

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[X] Monitoring Well Data JB 6-3-12
~~[X] Other Well Type: Temporary Well Groundwater Grab~~
[] QA Sample Type:

Sample ID No.: JB 6-3-12 ~~S43TW~~ S43MW12-Grab
Sample Location: ~~S43TW~~ S43MW12
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (^{0}C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Date: 6-3-12								
Time: 1115								
Method: Peristaltic	Gray	6.37	0.290	18.22	OverRange	2.04	0.1	-110

PURGE DATA:

	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Date: 6-3-12								
Method: Peristaltic	1.5 gal	6.49	0.349	18.30	OverRange	3.71	0.2	-119
Monitor Reading (ppm): —	2.5 gal	6.37	0.290	18.22	" "	2.04	0.1	-110
Well Casing Diameter & Material								
Type: ~~1" Stainless Steel~~ 1" PVC								
Total Well Depth (TD):								
Static Water Level (WL): 12.75								
One Casing Volume(gal/L):								
Start Purge (hrs): 1102								
End Purge (hrs): 1115								
Total Purge Time (min): 13								
Total Vol. Purged (gal/L): 2.5 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	Yes

OBSERVATIONS / NOTES:

~~Tubing pulled 1 foot off bottom~~ JB 6-3-12
~~Temporary well screened from to ft bgs~~
Purge rate: mL/min

Stains or odors observed: Yes [ ] No [X]

Circle if Applicable:

MS/MSD —
Duplicate ID No.: —

Signature(s): J. Birkett

Appendix E

Monitoring Well Construction Logs and Development Records

2011

Monitoring Well Construction Logs and Development Records

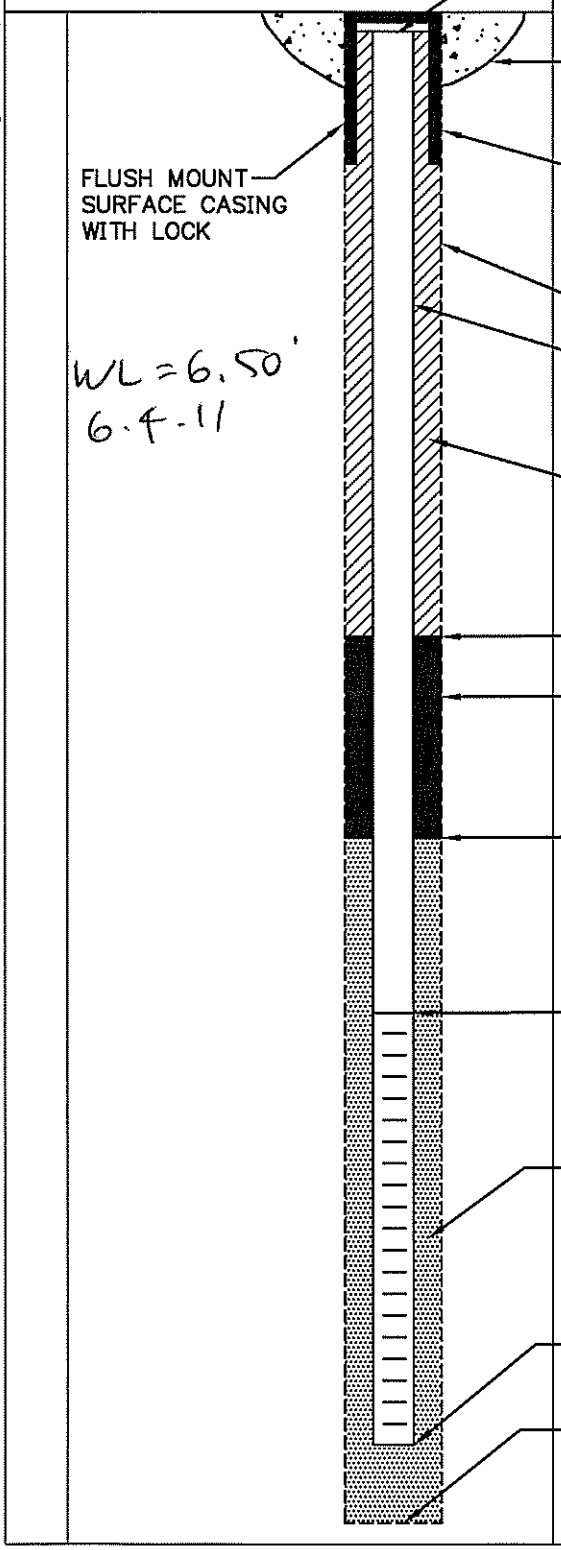
WELL NO.: S43MW03

Tetra Tech NUS, Inc.

OVERBURDEN
MONITORING WELL SHEET
FLUSH - MOUNT

GEOPROBE 7822DT

PROJECT INDIAN HEAD	LOCATION SITE 43	DRILLER S43MW03 C. GAMWELL
PROJECT NO. 12600771	BORING S43SB08	DRILLING METHOD HSA
DATE BEGUN 6.4.11	DATE COMPLETED 6.4.11	
FIELD GEOLOGIST KEITH SIMPSON		DEVELOPMENT METHOD GRUNDFOS PUMP
GROUND ELEVATION	DATUM	



ELEVATION TOP OF RISER: _____ BGS

TYPE OF SURFACE SEAL: CONCRETE 2x2' PAD

TYPE OF PROTECTIVE CASING: _____

I.D. OF PROTECTIVE CASING: _____

DIAMETER OF HOLE: 6" OD HSA

TYPE OF RISER PIPE: SCH 40 PVC

RISER PIPE I.D.: 2" PVC

TYPE OF BACKFILL/SEAL: BENTONITE/CEMENT GROUT

ELEVATION/DEPTH TOP OF SEAL: 19'

TYPE OF SEAL: BENTONITE CHIPS

ELEVATION/DEPTH TOP OF SAND: 21'

ELEVATION/DEPTH TOP OF SCREEN: 24'

TYPE OF SCREEN: SCH 40 -2" PVC

SLOT SIZE x LENGTH: 0.010 x 10'

TYPE OF SAND PACK: #1 QUARTZ

DIAMETER OF HOLE ~~IN BEDROCK~~: 6" OD HSA

ELEVATION / DEPTH BOTTOM OF SCREEN: 34'

ELEVATION / DEPTH BOTTOM OF SAND: 35'

ELEVATION/DEPTH BOTTOM OF HOLE: 35'

BACKFILL MATERIAL BELOW SAND: NA

ACAD:FORM_MWFM.dwg 07/20/99 INL

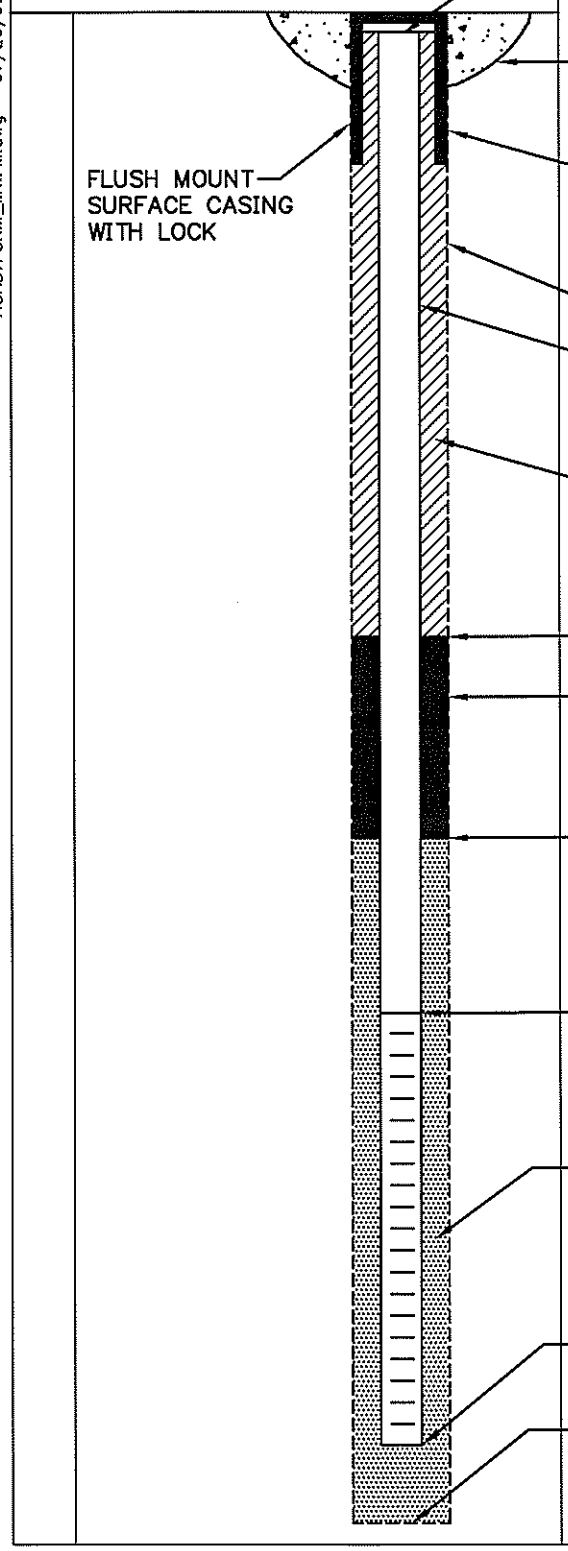
WELL NO.: S43MW04

Tetra Tech NUS, Inc.

OVERBURDEN
MONITORING WELL SHEET
FLUSH - MOUNT

GEOPROBE 7822 DT

PROJECT INDIAN HEAD	LOCATION SITE 43	DRILLER COREY GAMMELIN
PROJECT NO. 112G00771	BORING SB43-09	DRILLING METHOD HSA
DATE BEGUN 6.5.11	DATE COMPLETED 6.5.11	
FIELD GEOLOGIST KEITH SIMPSON		DEVELOPMENT METHOD GRUNDFOS PUMP
GROUND ELEVATION	DATUM	



ELEVATION TOP OF RISER: BGS

TYPE OF SURFACE SEAL: CONCRETE 2X2' PAD

TYPE OF PROTECTIVE CASING:

I.D. OF PROTECTIVE CASING:

DIAMETER OF HOLE: 6" OD HSA

TYPE OF RISER PIPE: SCH 40 - 2" FLUSH JOINT PVC

RISER PIPE I.D.: 2" PVC

TYPE OF BACKFILL/SEAL: BENTONITE/CEMENT GROUT

ELEVATION/DEPTH TOP OF SEAL: (2')/ 17' BGS

TYPE OF SEAL: BENTONITE CHIPS

ELEVATION/DEPTH TOP OF SAND: 19 /

ELEVATION/DEPTH TOP OF SCREEN: 23 /

TYPE OF SCREEN: SCH 40 - 2" PVC

SLOT SIZE x LENGTH: 0.010 X 10'

TYPE OF SAND PACK: #1 QUARTZ

DIAMETER OF HOLE IN BEDROCK: 6" OD HSA

ELEVATION / DEPTH BOTTOM OF SCREEN: 33 /

ELEVATION / DEPTH BOTTOM OF SAND: 33 /

ELEVATION/DEPTH BOTTOM OF HOLE: 33 /

BACKFILL MATERIAL BELOW SAND: NA

ACAD: FORM_MWFM.dwg 07/20/99 INL

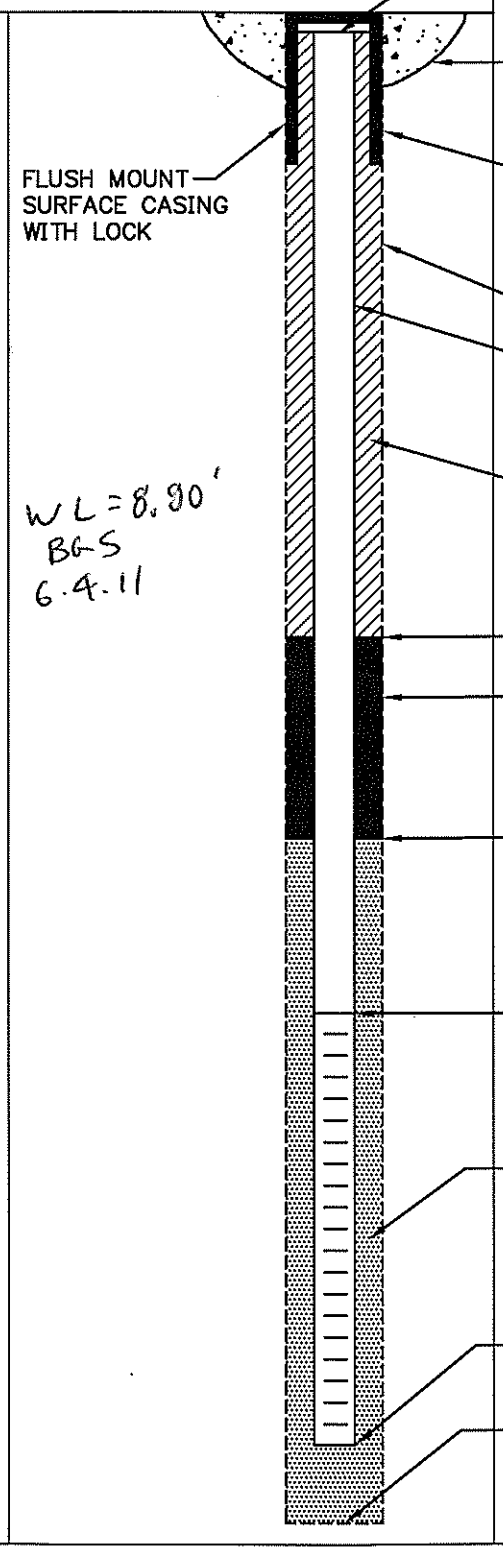
WELL NO.: 543 MW05

Tetra Tech NUS, Inc.

OVERBURDEN
MONITORING WELL SHEET
FLUSH - MOUNT

GEOPROBE 7822 DT

PROJECT INDIAN HEAD	LOCATION SITE 43	DRILLER COREY CAMPBELL
PROJECT NO. 112G00771	BORING 543 SB 10	DRILLING METHOD HSA
DATE BEGUN 6.4.11	DATE COMPLETED 6.4.11	
FIELD GEOLOGIST KEITH SIMPSON		DEVELOPMENT METHOD GRUNDFOS PUMP
GROUND ELEVATION	DATUM	



ELEVATION TOP OF RISER: _____

ALL BGS ↓

TYPE OF SURFACE SEAL: CONCRETE 2x2' PAD

TYPE OF PROTECTIVE CASING: _____

I.D. OF PROTECTIVE CASING: _____

DIAMETER OF HOLE: 6" OD HSA

TYPE OF RISER PIPE: SCH 40 FLUSH JOINT PVC

RISER PIPE I.D.: 2" PVC

TYPE OF BACKFILL/SEAL: BENTONITE/CEMENT GROUT

ELEVATION/DEPTH TOP OF SEAL: 16 /

TYPE OF SEAL: BENTONITE/~~CEMENT GROUT~~ KS CHIPS

ELEVATION/DEPTH TOP OF SAND: 18 /

ELEVATION/DEPTH TOP OF SCREEN: 21 /

TYPE OF SCREEN: SCH 40 - 2" PVC

SLOT SIZE x LENGTH: 0.010 X 10'

TYPE OF SAND PACK: #1 QUARTZ

DIAMETER OF HOLE ~~IN BEDROCK~~: 6" OD HSA

ELEVATION / DEPTH BOTTOM OF SCREEN: 31 /

ELEVATION / DEPTH BOTTOM OF SAND: 40 /

ELEVATION/DEPTH BOTTOM OF HOLE: 40 /

BACKFILL MATERIAL BELOW SAND: — NA

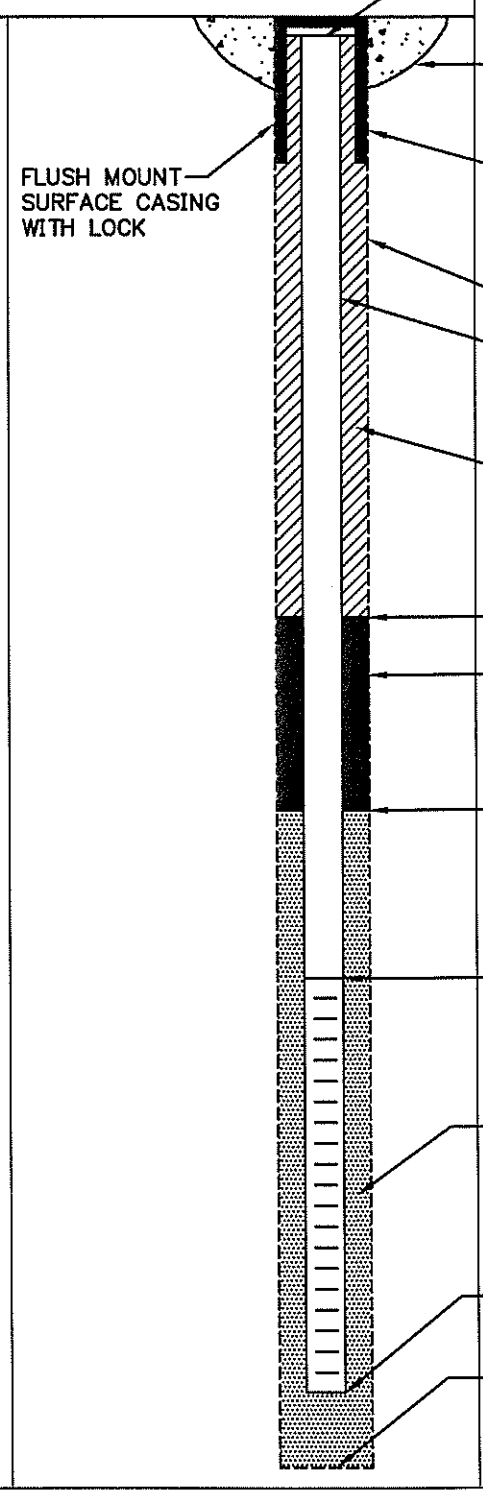
ACAD: FORM_MWFM.dwg 07/20/99 INL

WELL NO.: SB3MW06

Tetra Tech NUS, Inc.

OVERBURDEN
MONITORING WELL SHEET
FLUSH - MOUNT

PROJECT INDIAN HEAD	LOCATION SITE 43	DRILLER COREY CAMWELL
PROJECT NO. 112G00771	BORING SB 11	DRILLING METHOD HSA
DATE BEGUN	DATE COMPLETED	
FIELD GEOLOGIST K. SIMPSON		DEVELOPMENT METHOD GRUNDFOS PUMP
GROUND ELEVATION	DATUM	



ELEVATION TOP OF RISER: BGS

TYPE OF SURFACE SEAL: CONCRETE 2X2 PAD

TYPE OF PROTECTIVE CASING:

I.D. OF PROTECTIVE CASING:

DIAMETER OF HOLE: 6" OD HSA

TYPE OF RISER PIPE: SCH 40 PVC - FLUSH JOINT

RISER PIPE I.D.: 2" PVC

TYPE OF BACKFILL/SEAL: BENTONITE/CEMENT GROUT

ELEVATION/DEPTH TOP OF SEAL: 13 /

TYPE OF SEAL: BENTONITE CHIPS

ELEVATION/DEPTH TOP OF SAND: 15 /

ELEVATION/DEPTH TOP OF SCREEN: 17 /

TYPE OF SCREEN: SCH 40-2" PVC

SLOT SIZE x LENGTH: 0.010 X 10'

TYPE OF SAND PACK: #1 QUARTZ

DIAMETER OF HOLE IN BEDROCK: 6" OD HSA

ELEVATION / DEPTH BOTTOM OF SCREEN: 27 /

ELEVATION / DEPTH BOTTOM OF SAND: 29 /

ELEVATION/DEPTH BOTTOM OF HOLE: 29 /

BACKFILL MATERIAL BELOW SAND: — NA

ACAD:FORM_MWFM.dwg 07/20/99 INL

Tetra Tech NUS, Inc.

MONITORING WELL DEVELOPMENT RECORD

RE DEVELOP EXIST WELL + REPLACED PAD

Well: S43 MW 01
Site: 43
Date Installed:
Date Developed: 6-12-11
Dev. Method: PUMP SURGE
Pump Type: 12V WHALE

Depth to Bottom (ft.):
Static Water Level Before (ft.): 6.90
Static Water Level After (ft.): 7.30
Screen Length (ft.):
Specific Capacity:
Casing ID (in.): 2" PVC FLUSH MT

Responsible Personnel: K. SIMPSON
Drilling Co.: —
Project Name: SITE 43
Project Number: 112G00771

2 GPM PUMP RATE

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.)
1446	?	0	6.90	—			—	GRAY TO BRN
1450		8	6.90	18.1	5.61	0.236	480	LT SEWAGE ODOR
1457		32	7.31	18.1	4.91	0.184	752	
1507		52	7.30	16.6	4.45	0.182	94	CLEARING
1515		68	7.30	16.8	4.39	0.177	64	— ✓
1520	0	78	—				—	SURGED AGAIN AT END

Tetra Tech NUS, Inc.

MONITORING WELL DEVELOPMENT RECORD

Well: MW03
Site: Site 43
Date Installed:
Date Developed: 6-12-11
Dev. Method: whale pump/Hand surge
Pump Type: whale pump

Depth to Bottom (ft.): 34
Static Water Level Before (ft.): 14.56
Static Water Level After (ft.):
Screen Length (ft.): 10
Specific Capacity:
Casing ID (in.): 2"

Responsible Personnel: J. Birkett
Drilling Co.: Ground Zero
Project Name: Indian Head Site 43
Project Number: 112G00771

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.)
1030	Start dev		24.05	20.04	7.93	0.384	Out of Range	Brown sandy *out of Range is 3800 NTU
1035		10 gal	24.93	20.65	8.60	0.294	" "	Brown sandy
1040		20 gal	25.62	19.28	9.11	0.246	" "	Brown
1045		35 gal	25.50	18.40	8.51	0.239	Out of Range	Surged screen after
1055		50 gal	26.04	17.96	7.11	0.234	215	Tan Surged after
1100		55 gal	Stop dev, need another drum					
1213	Start re-dev	60 gal	23.42	21.54	9.21	0.334	Out of Range	Surged before reading
1221		75 gal	24.29	20.63	8.79	0.222	" "	tan
1228		85 gal	25.23	20.20	7.40	0.221	178	tan/clear
1240		100 gal	26.23	19.49	11.21	0.383	79.3	tan/clear
1245		105 gal	Stop dev.					

Tetra Tech NUS, Inc.

MONITORING WELL DEVELOPMENT RECORD

SITE 43

Site: INDIAN HEAD
Well: MW04
Date Installed: 6.5.11
Date Developed: 6.12.11
Dev. Method: SURG/ PUMP
Pump Type: 12V WATER

Depth to Bottom (ft.): 35.00
Static Water Level Before (ft.): 9.89
Static Water Level After (ft.): 22.78
Screen Length (ft.): 10
Specific Capacity:
Casing ID (in.): 2" PVC - STICK-UP

Project Name: SITE 43
Project Number: 112G06771
Site Geologist: K. SIMPSON
Drilling Co.: GROUND ZERO

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.)
1030	0.1	0	9.89					GRAY, LT SULFUR ODOR
1040	0	20	22.60	19.2	6.14	0.265	>900	
1050	↓	40	22.70	16.1	5.82	0.175	>900	
1100	↓	60	22.70	15.9	4.90	0.165	700	CLEARING
1110	↓	80	22.78	16.1	4.80	0.159	534	
1120	↓	100	↓	15.8	4.75	0.157	300	
1125	↓	110	↓	15.8	4.73	0.155	222	2-DRUMS

2 GPM PUMP RATE

Tetra Tech NUS, Inc.

MONITORING WELL DEVELOPMENT RECORD

Well: S43MW05
Site: Site 43
Date Installed:
Date Developed: 6-11-11
Dev. Method: hand surge
Pump Type: whale pump

Depth to Bottom (ft.): 31
Static Water Level Before (ft.):
Static Water Level After (ft.):
Screen Length (ft.): 10
Specific Capacity:
Casing ID (in.): 2

Responsible Personnel: J. Birkett
Drilling Co.: Ground Zero
Project Name: Indian Head Site 43
Project Number: 112G00771

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.)
1448	Start development							20 gal already in drum
	Surge entire screen every 5-10 min							
1515		40	—	20.82	5.98	0.106	Out of Range	Stop surging
1523		60	—	19.05	5.94	0.098	741	
1530		80	—	18.43	5.72	0.093	239	
1544		100	—	18.96	5.58	0.098	65.1	

Tetra Tech NUS, Inc.

MONITORING WELL DEVELOPMENT RECORD

Well: S43 MW06
Site: 43
Date Installed: 6.5.11
Date Developed: 6.12.11
Dev. Method: SURGE/PUMP
Pump Type: 12V WAATE

Depth to Bottom (ft.): 29
Static Water Level Before (ft.): 6.15
Static Water Level After (ft.):
Screen Length (ft.): 10
Specific Capacity:
Casing ID (in.): 2" PVC FLUSH MT

Responsible Personnel: K. SIMPSON
Drilling Co.: GROUND ZERO
Project Name: INDIAN HEAD
Project Number: 112G0071

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.)
1225	0.1	0	6.15	—	—	—	—	DRY AFTER 2 GAL
								GRAY HIGH TSS
1240		3	9.80					DRY @ 1242
1305		5	11.50	19.8	6.28	0.186	>900	RESTART
1314		10	23.00					SURGING & PUMPING — DRY
1319		12	10.50					RESTART
1320		13						DRY
								DRY
								END DEVELOPMENT

2012

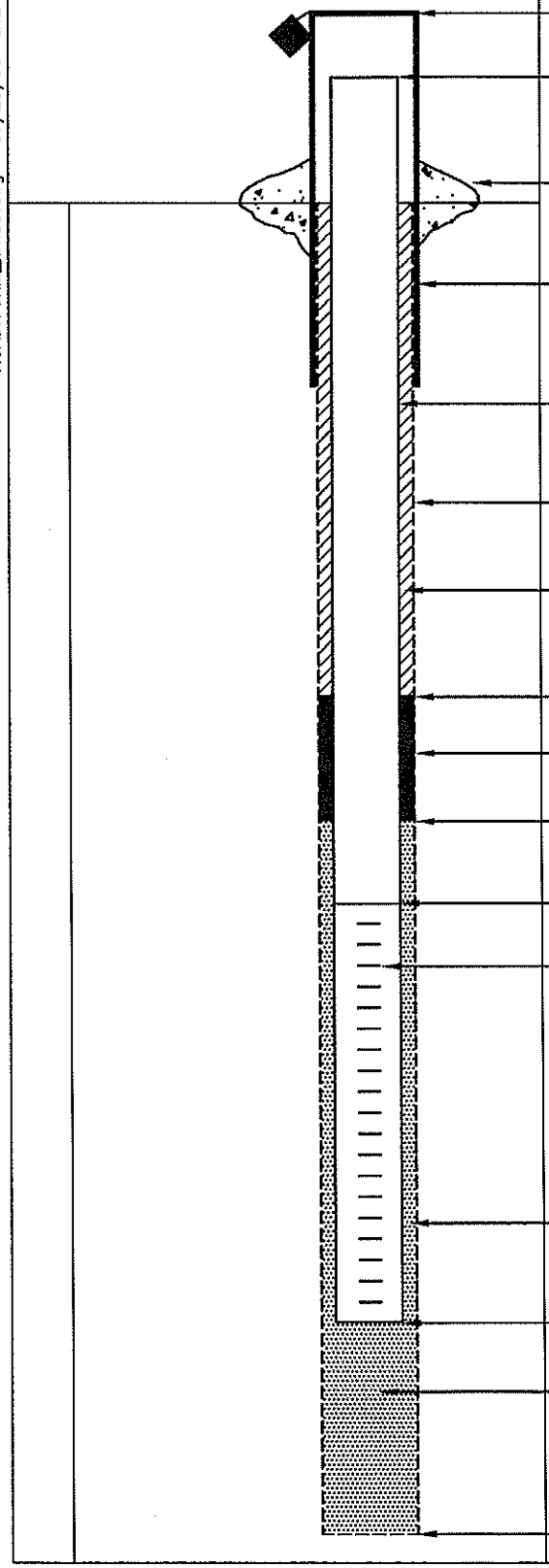
Monitoring Well Construction Logs and Development Records

WELL NO.: S43MW07

Tetra Tech

OVERBURDEN MONITORING WELL SHEET STICK-UP

PROJECT NSF-IH Site 43	LOCATION S43MW07	DRILLER J. Haldiman
PROJECT NO. 112G00771	BORING —	DRILLING METHOD HSA via Geoprobe
DATE BEGUN 5-20-12	DATE COMPLETED 5-20-12	
FIELD GEOLOGIST J. Birkett		DEVELOPMENT METHOD Whale pump + manual surge
GROUND ELEVATION	DATUM	



ELEVATION/HEIGHT OF TOP OF SURFACE CASING: / 3'

ELEVATION/HEIGHT OF TOP OF RISER PIPE: / 2.75'

TYPE OF SURFACE SEAL: Concrete

I.D. OF SURFACE CASING: 4"
TYPE OF SURFACE CASING: Protective Steel Casing (round)

RISER PIPE I.D.: 2"
TYPE OF RISER PIPE: Schedule 40 PVC

BOREHOLE DIAMETER: 6 1/4"

TYPE OF BACKFILL: Cement Bentonite grout

ELEVATION/DEPTH TOP OF SEAL: / 16'

TYPE OF SEAL: Bentonite chips

DEPTH TOP OF SAND PACK: 20'

ELEVATION/DEPTH TOP OF SCREEN: / 23'

TYPE OF SCREEN: Schedule 40 PVC

SLOT SIZE x LENGTH: 0.010" x 10'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: #1 Silica Sand

ELEVATION/DEPTH BOTTOM OF SCREEN: / 33'

ELEVATION/DEPTH BOTTOM OF SAND PACK: / 33'
BACKFILL MATERIAL BELOW SAND:

ELEVATION/DEPTH OF HOLE: / 33'

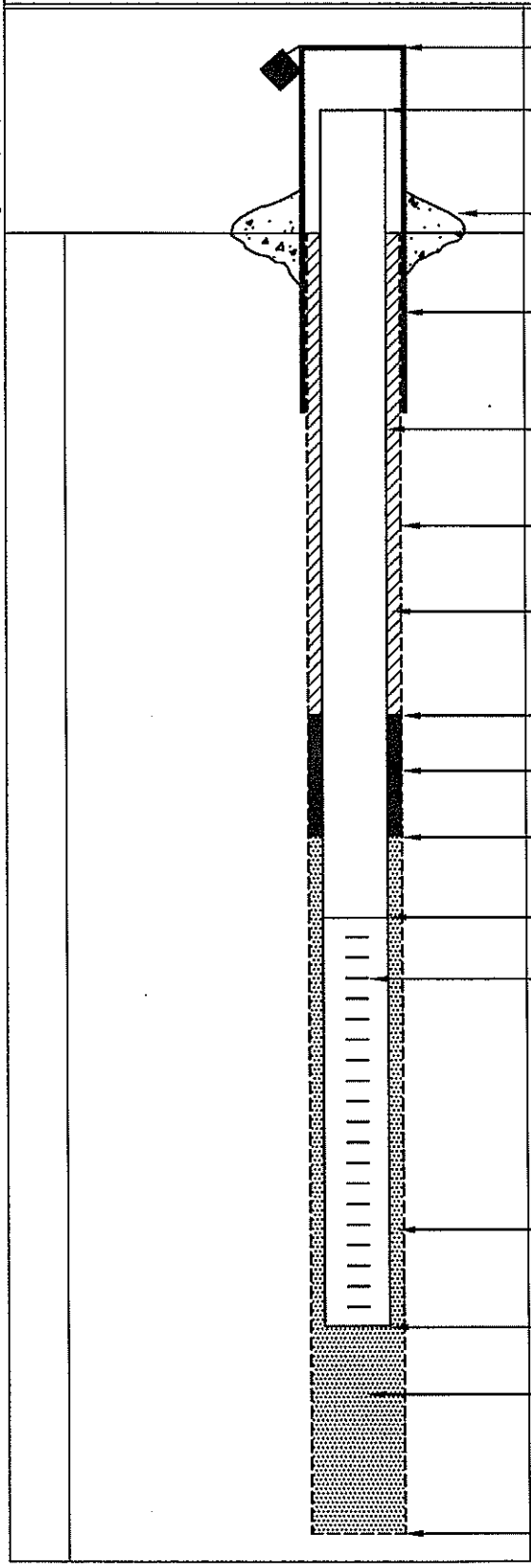
ACAD: FORM_MWSU.dwg 07/20/99 INL

WELL NO.: S43MW08

Tetra Tech

OVERBURDEN MONITORING WELL SHEET STICK-UP

PROJECT NSF-Indian Head Site 43	LOCATION S43MW08	DRILLER J. Haldiman
PROJECT NO. 112G00771	BORING	DRILLING METHOD HSA via Geoprobe
DATE BEGUN 5-19-12	DATE COMPLETED 5-19-12	
FIELD GEOLOGIST J. Birkett		DEVELOPMENT METHOD Whalepump + Manual Surge
GROUND ELEVATION	DATUM	



ELEVATION/HEIGHT OF TOP OF SURFACE CASING: / 3'

ELEVATION/HEIGHT OF TOP OF RISER PIPE: / 2.75'

TYPE OF SURFACE SEAL: Concrete

I.D. OF SURFACE CASING: 4"

TYPE OF SURFACE CASING: Protective Steel Casing (round)

RISER PIPE I.D.: 2"

TYPE OF RISER PIPE: Schedule 40 PVC

BOREHOLE DIAMETER: 6 1/4"

TYPE OF BACKFILL: Cement bentonite grout

ELEVATION/DEPTH TOP OF SEAL: / 16'

TYPE OF SEAL: Bentonite Chips

DEPTH TOP OF SAND PACK: 20'

ELEVATION/DEPTH TOP OF SCREEN: / 23'

TYPE OF SCREEN: Schedule 40 PVC

SLOT SIZE x LENGTH: 0.010" x 10'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: #1 Silica Sand

ELEVATION/DEPTH BOTTOM OF SCREEN: / 33'

ELEVATION/DEPTH BOTTOM OF SAND PACK: / 33'

BACKFILL MATERIAL BELOW SAND:

ELEVATION/DEPTH OF HOLE: / 33'

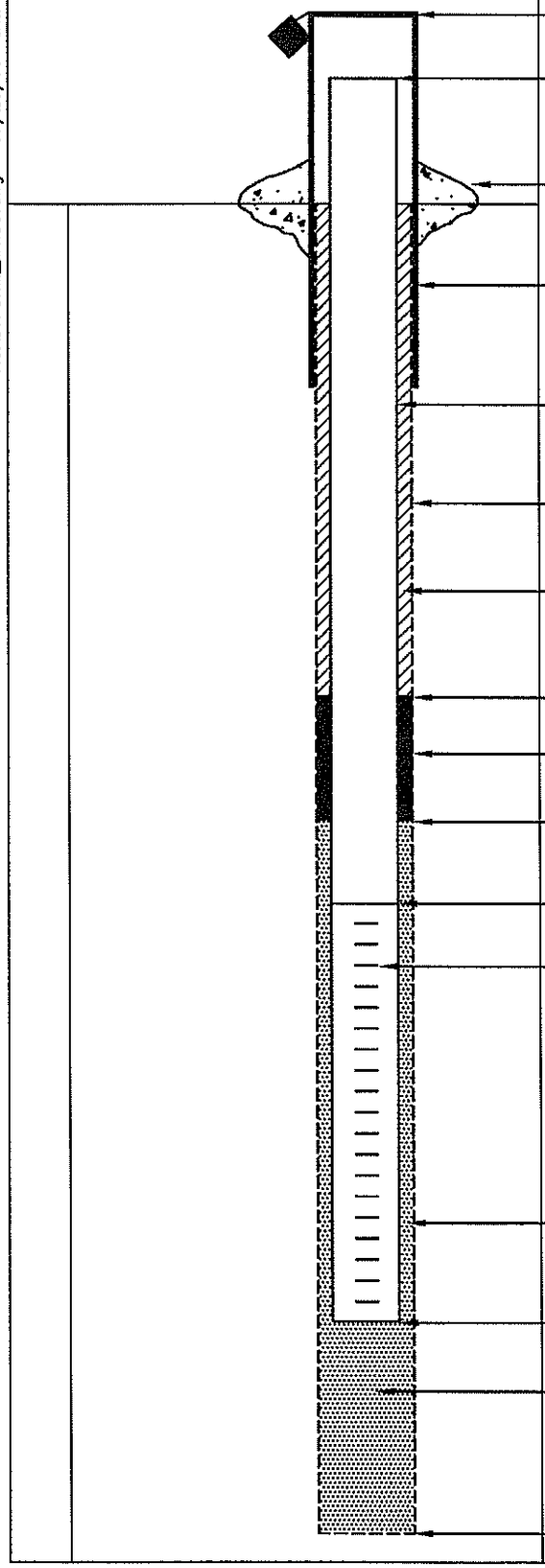
ACAD:FORM_MWSU.dwg 07/20/99 INL

WELL NO.: 543MW09S

Tetra Tech

OVERBURDEN MONITORING WELL SHEET STICK-UP

PROJECT NSF-Indian Head Site 43	LOCATION 543MW09S	DRILLER J. Haldeman (Vironex)
PROJECT NO. 112G00771	BORING 543MW09	DRILLING METHOD HSA via DPT rig
DATE BEGUN 7-17-12	DATE COMPLETED 7-17-12	
FIELD GEOLOGIST J. Birkett		DEVELOPMENT METHOD Check value
GROUND ELEVATION	DATUM	



ELEVATION/HEIGHT OF TOP OF SURFACE CASING: 13.25'

ELEVATION/HEIGHT OF TOP OF RISER PIPE: 13'

TYPE OF SURFACE SEAL: Concrete

I.D. OF SURFACE CASING: 4"
TYPE OF SURFACE CASING: Steel (round)

RISER PIPE I.D.: 2"
TYPE OF RISER PIPE: Schedule 40 PVC

BOREHOLE DIAMETER: 6 3/4"

TYPE OF BACKFILL: Bentonite chips (hydrated)

ELEVATION/DEPTH TOP OF SEAL: 10.5'

TYPE OF SEAL: Bentonite chips (hydrated)

DEPTH TOP OF SAND PACK: 4'

ELEVATION/DEPTH TOP OF SCREEN: 16'

TYPE OF SCREEN: Schedule 40 PVC

SLOT SIZE x LENGTH: 0.010" x 10'

I.D. OF SCREEN: Schedule 40 PVC

TYPE OF SAND PACK: #1 Silica Sand

ELEVATION/DEPTH BOTTOM OF SCREEN: 16'

ELEVATION/DEPTH BOTTOM OF SAND PACK: 16'
BACKFILL MATERIAL BELOW SAND:

ELEVATION/DEPTH OF HOLE: 16'

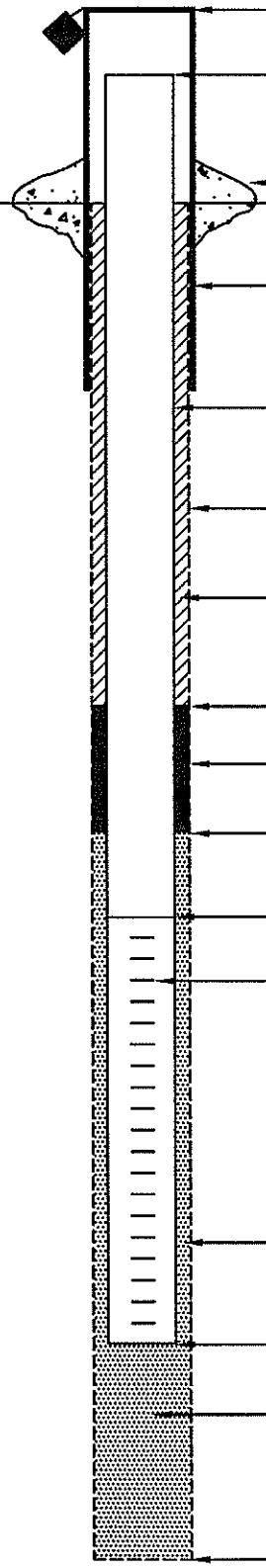
ACAD:FORM_MWSU.dwg 07/20/99 INL

WELL NO.: S43MW09D

Tetra Tech

OVERBURDEN MONITORING WELL SHEET STICK-UP

PROJECT NSF-Indian Head Site 43	LOCATION S43MW09D	DRILLER J. Haldiman
PROJECT NO. 112G00771	BORING —	DRILLING METHOD HSA via Geoprobe
DATE BEGUN 5-18-12	DATE COMPLETED 5-19-12	
FIELD GEOLOGIST J. Birkett		DEVELOPMENT METHOD Whole pump and manual surge
GROUND ELEVATION	DATUM	



ELEVATION/HEIGHT OF TOP OF SURFACE CASING: /3'

ELEVATION/HEIGHT OF TOP OF RISER PIPE: /2.75'

TYPE OF SURFACE SEAL: Concrete

I.D. OF SURFACE CASING: 4"

TYPE OF SURFACE CASING: Protective Steel Casing (Round)

RISER PIPE I.D.: 2"

TYPE OF RISER PIPE: Schedule 40 PVC

BOREHOLE DIAMETER: 6 1/4"

TYPE OF BACKFILL: Cement bentonite grout

ELEVATION/DEPTH TOP OF SEAL: /21'

TYPE OF SEAL: Bentonite chips

DEPTH TOP OF SAND PACK: 25'

ELEVATION/DEPTH TOP OF SCREEN: /28'

TYPE OF SCREEN: Schedule 40 PVC

SLOT SIZE x LENGTH: 0.010" x 5'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: #1 Silica Sand

ELEVATION/DEPTH BOTTOM OF SCREEN: /33'

ELEVATION/DEPTH BOTTOM OF SAND PACK: /33'

BACKFILL MATERIAL BELOW SAND:

ELEVATION/DEPTH OF HOLE: /33'

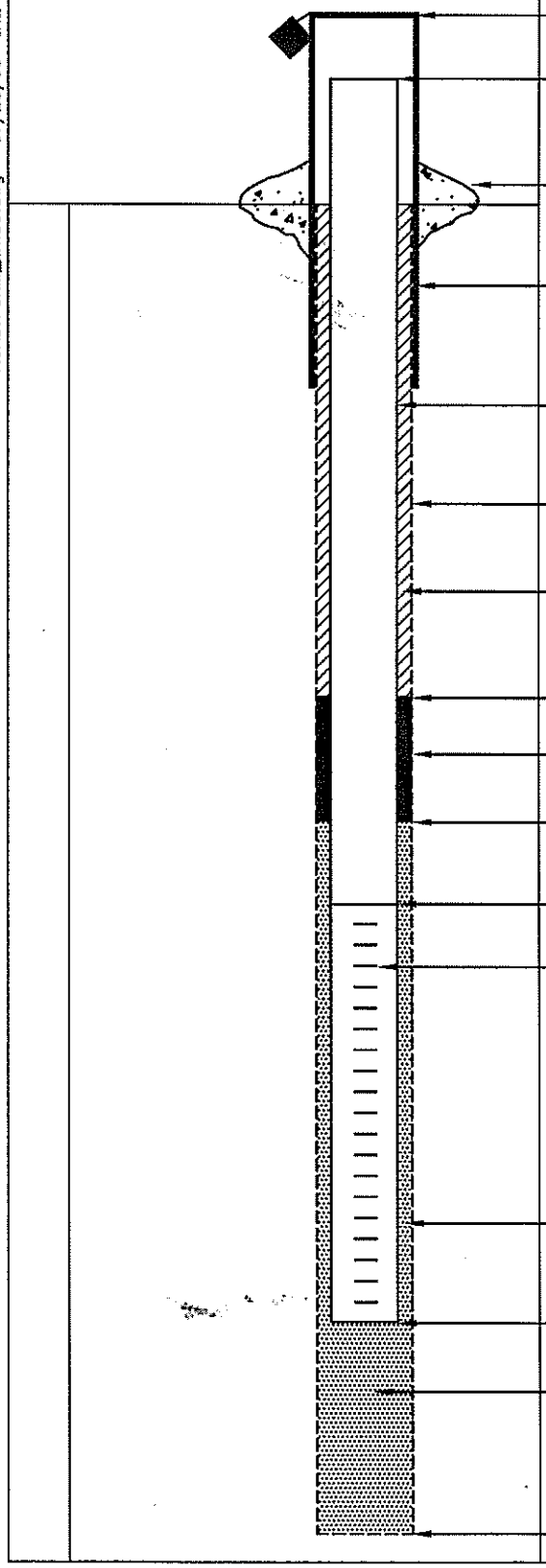
ACAD:FORM_MWSU.dwg 07/20/99 INL

WELL NO.: 543MW10

Tetra Tech

OVERBURDEN MONITORING WELL SHEET STICK-UP

PROJECT NSF-Indian Head Site 43	LOCATION 543MW10	DRILLER A. Hittinger
PROJECT NO. 112G00771	BORING	DRILLING METHOD HSA w/Geoprobe
DATE BEGUN 5-18-12	DATE COMPLETED 5-18-12	
FIELD GEOLOGIST J. Birkett		DEVELOPMENT METHOD Whale Pump + manual surge
GROUND ELEVATION	DATUM	



ELEVATION/HEIGHT OF TOP OF SURFACE CASING: 13'

ELEVATION/HEIGHT OF TOP OF RISER PIPE: 12.75'

TYPE OF SURFACE SEAL: Concrete

I.D. OF SURFACE CASING: 4"
TYPE OF SURFACE CASING: Protective Steel Casing round

RISER PIPE I.D.: 2"
TYPE OF RISER PIPE: Schedule 40 PVC

BOREHOLE DIAMETER: 6 1/4"

TYPE OF BACKFILL: Cement bentonite grout

ELEVATION/DEPTH TOP OF SEAL: 23'

TYPE OF SEAL: Bentonite chips

DEPTH TOP OF SAND PACK: 27'

ELEVATION/DEPTH TOP OF SCREEN: 30'

TYPE OF SCREEN: Schedule 40 PVC

SLOT SIZE x LENGTH: 0.010" x 5'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: #1 Silica Sand

ELEVATION/DEPTH BOTTOM OF SCREEN: 35'

ELEVATION/DEPTH BOTTOM OF SAND PACK: 35'
BACKFILL MATERIAL BELOW SAND:

ELEVATION/DEPTH OF HOLE: 35'

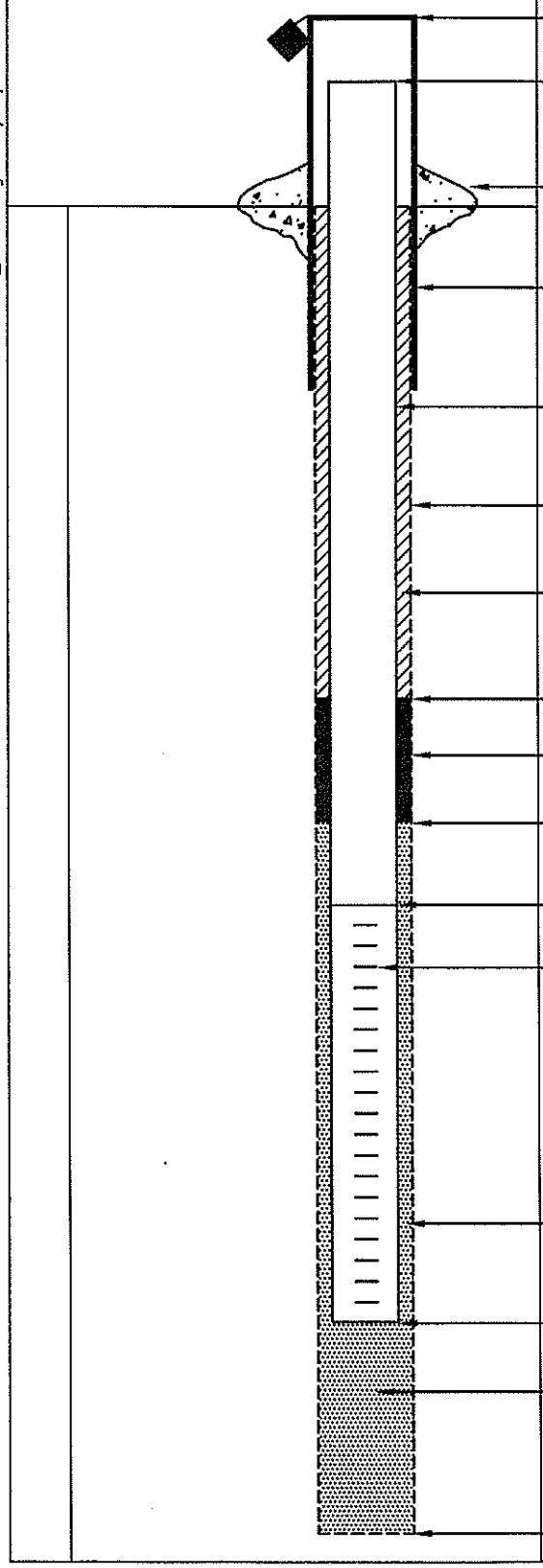
ACAD:FORM_MWSU.dwg 07/20/99 INL

WELL NO.: S43MW11

Tetra Tech

OVERBURDEN MONITORING WELL SHEET STICK-UP

PROJECT NSF Indian Head Site43	LOCATION S43MW11	DRILLER J. Haldiman
PROJECT NO. 112G0077/	BORING —	DRILLING METHOD HSA via Geoprobe
DATE BEGUN 5-20-12	DATE COMPLETED 5-20-12	
FIELD GEOLOGIST J. Birkett		DEVELOPMENT METHOD
GROUND ELEVATION	DATUM	



ELEVATION/HEIGHT OF TOP OF SURFACE CASING: /3'

ELEVATION/HEIGHT OF TOP OF RISER PIPE: /2.75

TYPE OF SURFACE SEAL: Concrete

I.D. OF SURFACE CASING: 4"
TYPE OF SURFACE CASING: Protective Steel Casing (round)

RISER PIPE I.D.: 2"
TYPE OF RISER PIPE: Schedule 40 PVC

BOREHOLE DIAMETER: 6 1/4"

TYPE OF BACKFILL: Cement bentonite grout

ELEVATION/DEPTH TOP OF SEAL: /19'

TYPE OF SEAL: Bentonite chips

DEPTH TOP OF SAND PACK: 23'

ELEVATION/DEPTH TOP OF SCREEN: /26'

TYPE OF SCREEN: Schedule 40 PVC

SLOT SIZE x LENGTH: 0.010" x 10'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: #1 Silica Sand

ELEVATION/DEPTH BOTTOM OF SCREEN: /36'

ELEVATION/DEPTH BOTTOM OF SAND PACK: /36'
BACKFILL MATERIAL BELOW SAND: —

ELEVATION/DEPTH OF HOLE: /36'

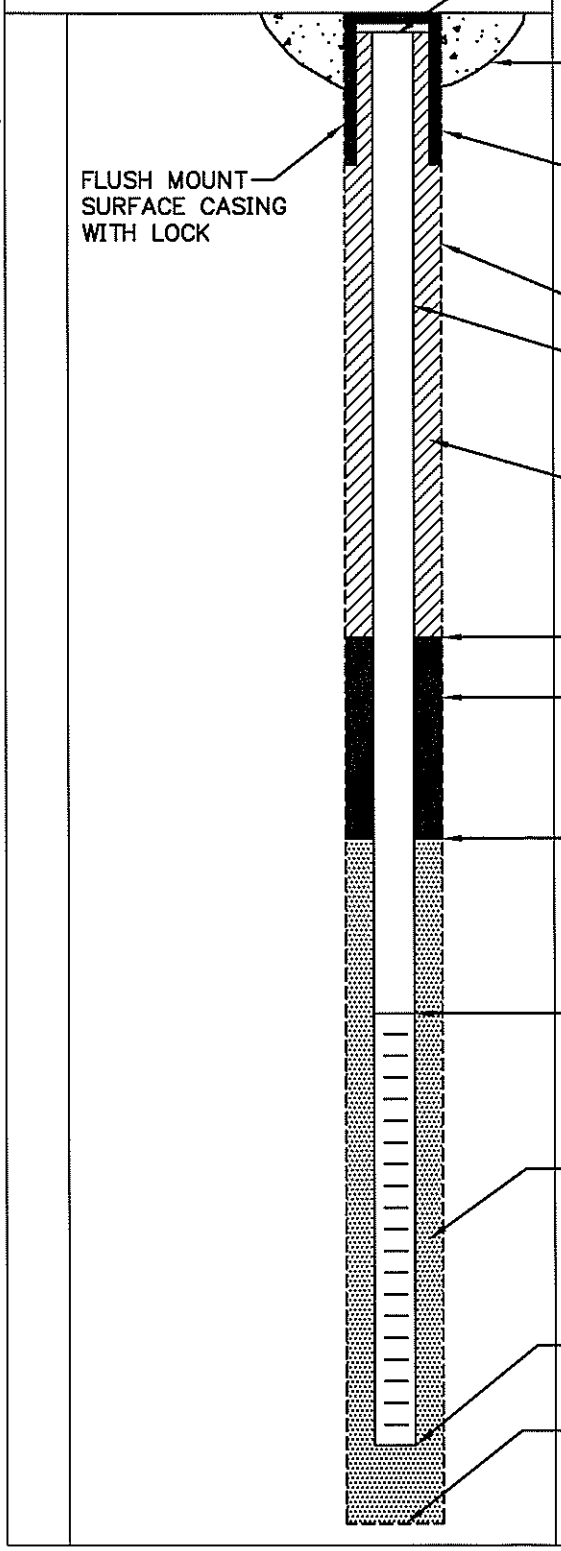
ACAD:FORM_MWSU.dwg 07/28/99 INL

WELL NO.: 543MW12

Tetra Tech NUS, Inc.

OVERBURDEN
MONITORING WELL SHEET
FLUSH - MOUNT

PROJECT NSF-Indian Head Site 43	LOCATION 543MW12	DRILLER J. Haldiman
PROJECT NO. 112G00771	BORING 543MW12	DRILLING METHOD DPT
DATE BEGUN 6-2-12	DATE COMPLETED	
FIELD GEOLOGIST J. Birkett		DEVELOPMENT METHOD Check valve
GROUND ELEVATION	DATUM	



ELEVATION TOP OF RISER: 0.25' bgs

TYPE OF SURFACE SEAL: Concrete

TYPE OF PROTECTIVE CASING: Steel Flush mount cover

I.D. OF PROTECTIVE CASING: 2"

DIAMETER OF HOLE: 3 1/4"

TYPE OF RISER PIPE: Schedule 40 PVC

RISER PIPE I.D.: 1"

TYPE OF BACKFILL/SEAL: Cement bentonite grout

ELEVATION/DEPTH TOP OF SEAL: / 20'

TYPE OF SEAL: Bentonite Chips

ELEVATION/DEPTH TOP OF SAND: / 25'

ELEVATION/DEPTH TOP OF SCREEN: / 27.5'

TYPE OF SCREEN: 1.7" OD Prepacked Schedule 40 PVC

SLOT SIZE x LENGTH: 0.010" x 5'

TYPE OF SAND PACK: #1 Silica Sand

DIAMETER OF HOLE IN BEDROCK:

ELEVATION / DEPTH BOTTOM OF SCREEN: / 32.5'

ELEVATION / DEPTH BOTTOM OF SAND: / 32.5'

ELEVATION/DEPTH BOTTOM OF HOLE: / 32.5'

BACKFILL MATERIAL BELOW SAND: NA

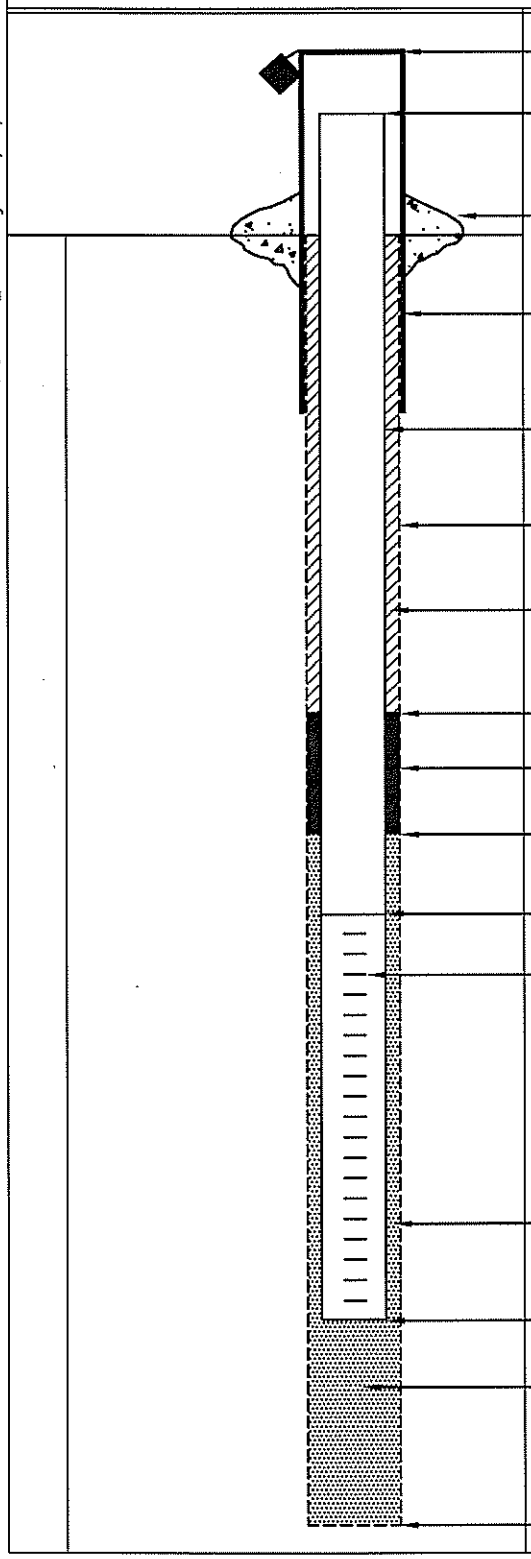
ACAD:FORM_MWFM.dwg 07/20/99 INL

WELL NO.: 543MW13

Tetra Tech NUS, Inc.

OVERBURDEN MONITORING WELL SHEET STICK-UP

PROJECT NSF-Indian Head Site 43 P2 RI	LOCATION 543MW13	DRILLER William Jacks (Virginia)
PROJECT NO. 112G00771	BORING —	DRILLING METHOD DPT (3 1/4" casing)
DATE BEGUN 5-12-12	DATE COMPLETED 5-12-12	
FIELD GEOLOGIST J. Birkett		DEVELOPMENT METHOD Check Value
GROUND ELEVATION	DATUM	



ELEVATION/HEIGHT OF TOP OF SURFACE CASING: / 3'

ELEVATION/HEIGHT OF TOP OF RISER PIPE: / 2.5'

TYPE OF SURFACE SEAL: Concrete

I.D. OF SURFACE CASING: 4"
TYPE OF SURFACE CASING: Protective Steel Casing square

RISER PIPE I.D.: 1"
TYPE OF RISER PIPE: Schedule 40 PVC

BOREHOLE DIAMETER: 3 1/4"

TYPE OF BACKFILL: NA

ELEVATION/DEPTH TOP OF SEAL: / 3'

TYPE OF SEAL: Granular Bentonite (Hydrated)

DEPTH TOP OF SAND PACK: 9'

ELEVATION/DEPTH TOP OF SCREEN: / 11'

TYPE OF SCREEN: Prepacked screen w/ 1.7" OD

SLOT SIZE x LENGTH: 0.010" x 10'

I.D. OF SCREEN: 1" ID

TYPE OF SAND PACK: #1 Silica Sand

ELEVATION/DEPTH BOTTOM OF SCREEN: / 21'

ELEVATION/DEPTH BOTTOM OF SAND PACK: /
BACKFILL MATERIAL BELOW SAND: NA

ELEVATION/DEPTH OF HOLE: / 21'

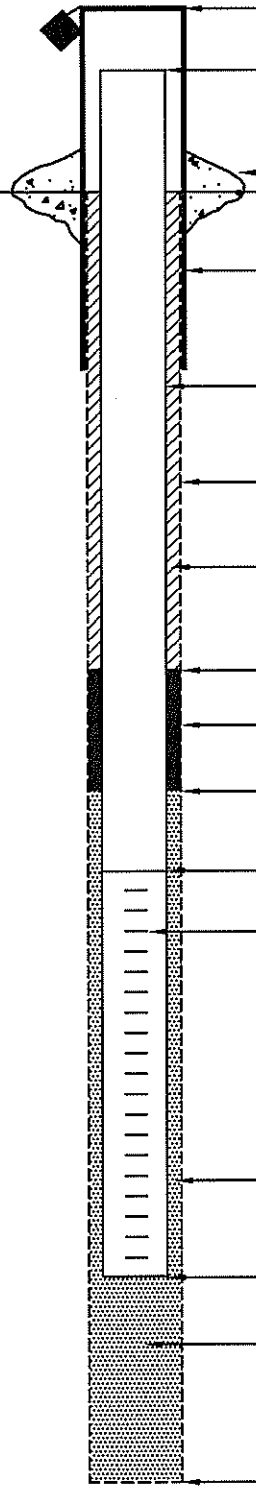
ACAD: FORM_MWSU.dwg 07/20/99 INL

WELL NO.: S43MW14

Tetra Tech NUS, Inc.

OVERBURDEN MONITORING WELL SHEET STICK-UP

PROJECT NSF-TH Site 43 P2 RI	LOCATION S43MW14	DRILLER William Jacks
PROJECT NO. 112G00771	BORING S43MW14	DRILLING METHOD DPT (3¼")
DATE BEGUN 5-12-12	DATE COMPLETED 5-12-12	
FIELD GEOLOGIST J. Birkett		DEVELOPMENT METHOD Check Value
GROUND ELEVATION	DATUM	



ELEVATION/HEIGHT OF TOP OF SURFACE CASING: 13.25'

ELEVATION/HEIGHT OF TOP OF RISER PIPE: 13'

TYPE OF SURFACE SEAL: Concrete

I.D. OF SURFACE CASING: 4"

TYPE OF SURFACE CASING: Protective steel casing ~~round~~ JB 5-12-12 square 4" x 4"

RISER PIPE I.D.: 1"

TYPE OF RISER PIPE: Schedule 40 PVC

BOREHOLE DIAMETER: 3¼"

TYPE OF BACKFILL: NA

ELEVATION/DEPTH TOP OF SEAL: 1 ~~4~~ 3' JB 5-12-13

TYPE OF SEAL: Granular Bentonite (Hydrated)

DEPTH TOP OF SAND PACK: 6'

ELEVATION/DEPTH TOP OF SCREEN: 13'

TYPE OF SCREEN: Prepacked Well screen

SLOT SIZE x LENGTH: 0.010" x 10'

I.D. OF SCREEN: 1" ID 1.7" OD

TYPE OF SAND PACK: #1 Silica Sand

ELEVATION/DEPTH BOTTOM OF SCREEN: 18

ELEVATION/DEPTH BOTTOM OF SAND PACK: /

BACKFILL MATERIAL BELOW SAND: NA

ELEVATION/DEPTH OF HOLE: 25' Boring depth

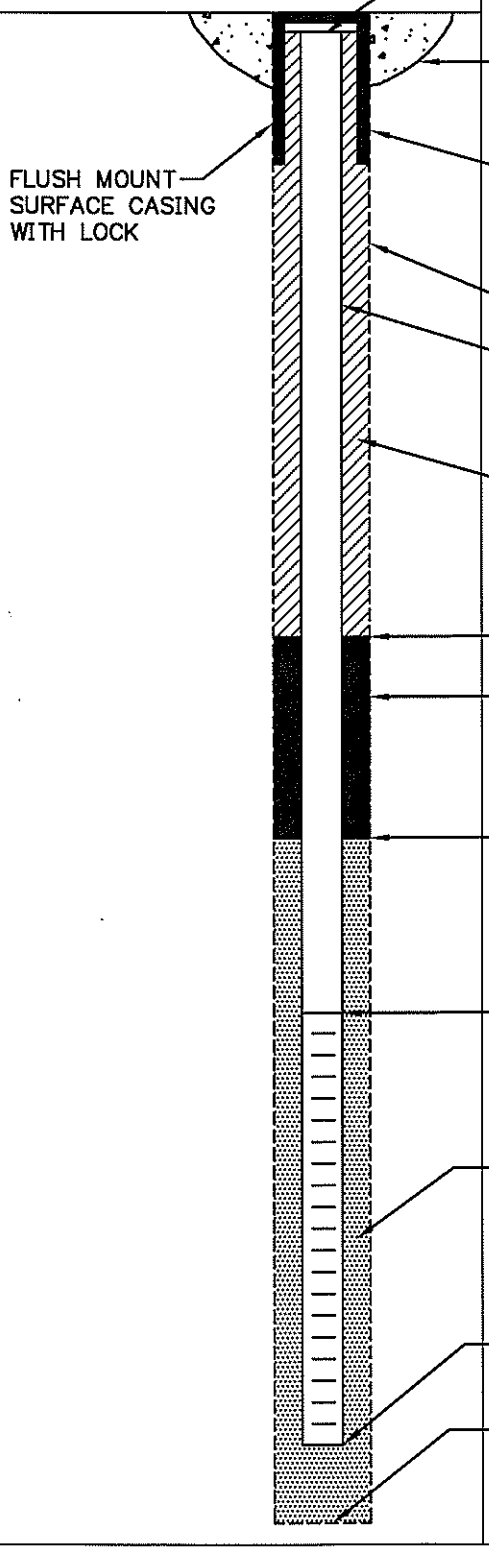
ACAD: FORM_MWSU.dwg 07/20/99 INL

WELL NO.: 543MW15

Tetra Tech NUS, Inc.

OVERBURDEN
MONITORING WELL SHEET
FLUSH - MOUNT

PROJECT NSF-Indian Head Site 43 P2 RI	LOCATION 543MW15	DRILLER William Jacks (Vironex)
PROJECT NO. 112G00771	BORING —	DRILLING METHOD DPT (3¼ casing)
DATE BEGUN 5-12-12	DATE COMPLETED 5-12-12	
FIELD GEOLOGIST J. Birkett		DEVELOPMENT METHOD Check valve
GROUND ELEVATION	DATUM	



ELEVATION TOP OF RISER:

TYPE OF SURFACE SEAL: Concrete

TYPE OF PROTECTIVE CASING: Steel Flush mount

I.D. OF PROTECTIVE CASING: 6"

DIAMETER OF HOLE: 3¼"

TYPE OF RISER PIPE: Schedule 40 PVC

RISER PIPE I.D.: 1"

TYPE OF BACKFILL/SEAL: NA Sand from 2-4' for drainage

ELEVATION/DEPTH TOP OF SEAL: / 4'

TYPE OF SEAL: Bentonite granular (Hydrated)

ELEVATION/DEPTH TOP OF SAND: / 9'

ELEVATION/DEPTH TOP OF SCREEN: 1" ID 1.7" OD / 11'

TYPE OF SCREEN: Prepacked Schedule 40 PVC

SLOT SIZE x LENGTH: 0.010" x 10'

TYPE OF SAND PACK: #1 Silica Sand

DIAMETER OF HOLE IN BEDROCK: NA

ELEVATION / DEPTH BOTTOM OF SCREEN: / 21'

ELEVATION / DEPTH BOTTOM OF SAND: / 21'

ELEVATION/DEPTH BOTTOM OF HOLE: / 21'

BACKFILL MATERIAL BELOW SAND: NA

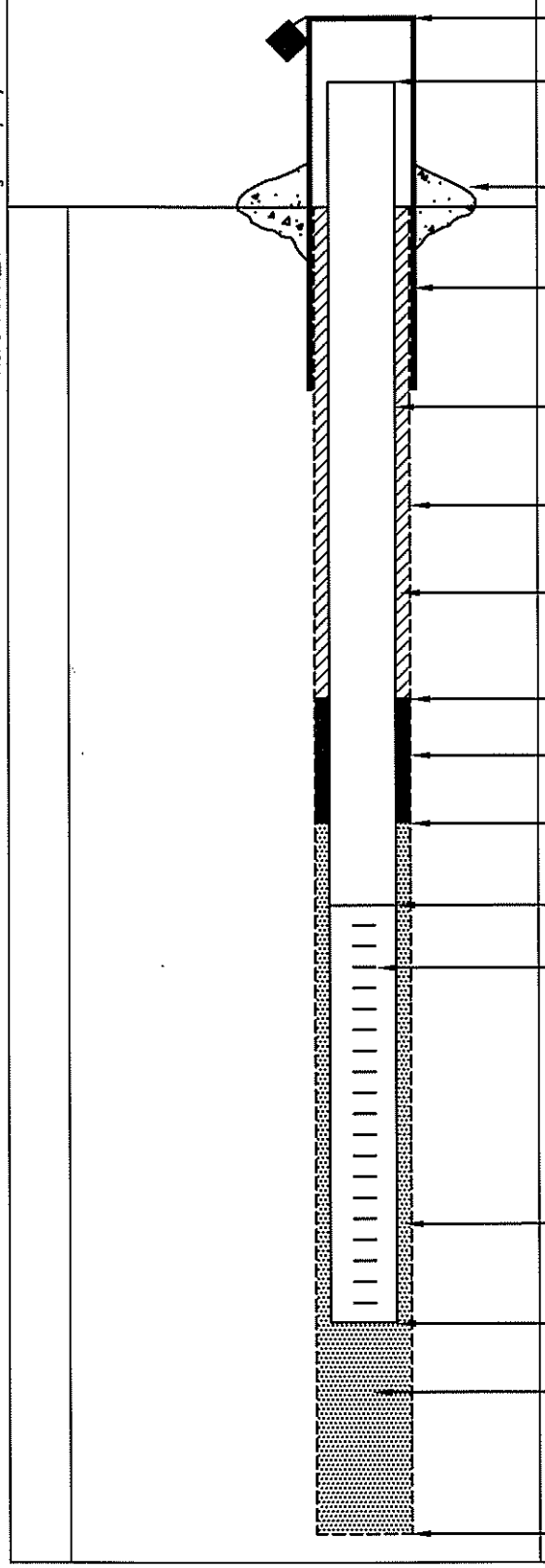
ACAD:FORM_MWFM.dwg 07/20/99 INL

WELL NO.: 543MW16

Tetra Tech NUS, Inc.

OVERBURDEN MONITORING WELL SHEET STICK-UP

PROJECT NSF-Indian Head Site43 P2 RI	LOCATION 543MW16	DRILLER Williams Jacks
PROJECT NO. 112G00771	BORING —	DRILLING METHOD DPT (3¼")
DATE BEGUN 5-12-12	DATE COMPLETED 5-12-12	
FIELD GEOLOGIST J. Birkett		DEVELOPMENT METHOD Check Valve
GROUND ELEVATION	DATUM	



ELEVATION/HEIGHT OF TOP OF SURFACE CASING: 13'

ELEVATION/HEIGHT OF TOP OF RISER PIPE: 12.75'

TYPE OF SURFACE SEAL: Concrete

I.D. OF SURFACE CASING: 4"

TYPE OF SURFACE CASING: Protective Steel Casing ~~Square~~ round JB 5-12-12

RISER PIPE I.D.: 1"

TYPE OF RISER PIPE: Schedule 40 PVC

BOREHOLE DIAMETER: 3¼"

TYPE OF BACKFILL: NA

ELEVATION/DEPTH TOP OF SEAL: 13' JB 5-12-12

TYPE OF SEAL: Granular Bentonite (Hydrated)

DEPTH TOP OF SAND PACK: 9'

ELEVATION/DEPTH TOP OF SCREEN: 11'

TYPE OF SCREEN: Prepacked 1.7" OD Schedule 40 PVC

SLOT SIZE x LENGTH: 0.010" x 10'

I.D. OF SCREEN: 1"

TYPE OF SAND PACK: #1 Silica Sand

ELEVATION/DEPTH BOTTOM OF SCREEN: 21'

ELEVATION/DEPTH BOTTOM OF SAND PACK: 21'

BACKFILL MATERIAL BELOW SAND: NA

ELEVATION/DEPTH OF HOLE: 21'

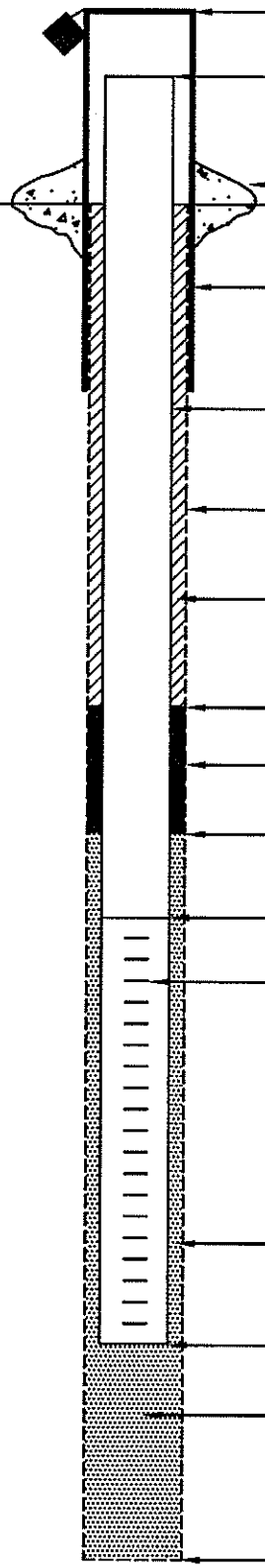
ACAD:FORM_MWSU.dwg 07/20/99 INL

WELL NO.: S43MW17S

Tetra Tech

OVERBURDEN MONITORING WELL SHEET STICK-UP

PROJECT NSF-Indian Head Site43	LOCATION S43MW17S	DRILLER J. Haldiman (Virorex)
PROJECT NO. 112G00771	BORING S43MW17	DRILLING METHOD HSA via DPT rig
DATE BEGUN 7-13-12	DATE COMPLETED 7-13-12	
FIELD GEOLOGIST J. Birkett		DEVELOPMENT METHOD Whale Pump and Manual Surge
GROUND ELEVATION	DATUM	



ELEVATION/HEIGHT OF TOP OF SURFACE CASING: 13.25'

ELEVATION/HEIGHT OF TOP OF RISER PIPE: 13'

TYPE OF SURFACE SEAL: Concrete

I.D. OF SURFACE CASING: 4"
TYPE OF SURFACE CASING: Steel (round

RISER PIPE I.D.: 2"
TYPE OF RISER PIPE: Schedule 40 PVC

BOREHOLE DIAMETER: 6 3/4"

TYPE OF BACKFILL: Bentonite cement grout

ELEVATION/DEPTH TOP OF SEAL: 11'

TYPE OF SEAL: Bentonite Chips

DEPTH TOP OF SAND PACK: 15'

ELEVATION/DEPTH TOP OF SCREEN: 18'

TYPE OF SCREEN: Schedule 40 PVC

SLOT SIZE x LENGTH: 0.010" x 10'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: #1 Silica Sand

ELEVATION/DEPTH BOTTOM OF SCREEN: 28'

ELEVATION/DEPTH BOTTOM OF SAND PACK: 28'
BACKFILL MATERIAL BELOW SAND:

ELEVATION/DEPTH OF HOLE: 28'

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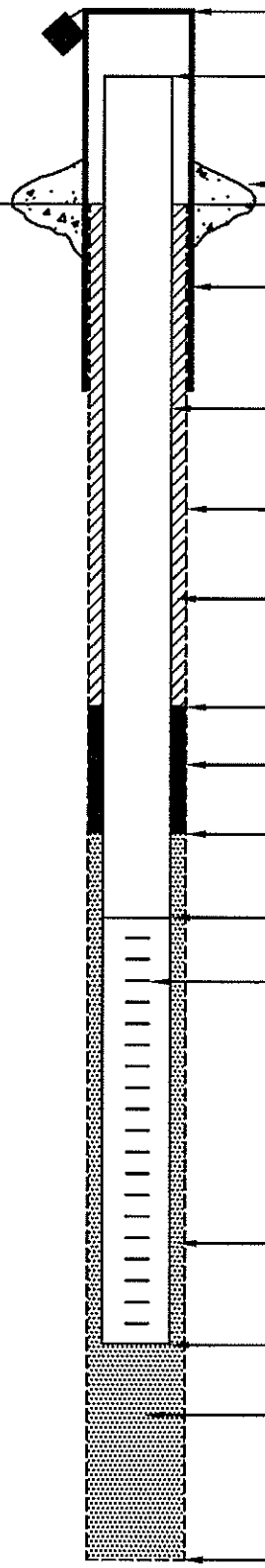
WELL NO.: 543MW17D

Tetra Tech

OVERBURDEN MONITORING WELL SHEET STICK-UP

PROJECT NSF-Indian Head Site 43	LOCATION 543MW17D	DRILLER J. Haldiman (Vironex)
PROJECT NO. 112G00771	BORING 543MW17	DRILLING METHOD HSA via DPT rig
DATE BEGUN 7-12-12	DATE COMPLETED 7-12-12	
FIELD GEOLOGIST J. Birkett		DEVELOPMENT METHOD Whale Pump and Manual surge
GROUND ELEVATION	DATUM	



ELEVATION/HEIGHT OF TOP OF SURFACE CASING: /3'

ELEVATION/HEIGHT OF TOP OF RISER PIPE: /2.75'

TYPE OF SURFACE SEAL: Concrete

I.D. OF SURFACE CASING: 4"
TYPE OF SURFACE CASING: Steel (round)

RISER PIPE I.D.: 2"
TYPE OF RISER PIPE: Schedule 40 PVC

BOREHOLE DIAMETER: 6 3/4"

TYPE OF BACKFILL: Cement bentonite grout

ELEVATION/DEPTH TOP OF SEAL: /25'

TYPE OF SEAL: Bentonite chips

DEPTH TOP OF SAND PACK: 29'

ELEVATION/DEPTH TOP OF SCREEN: /31'

TYPE OF SCREEN: Schedule 40 PVC

SLOT SIZE x LENGTH: 0.010" x 5'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: #1 Silica Sand

ELEVATION/DEPTH BOTTOM OF SCREEN: /36'

ELEVATION/DEPTH BOTTOM OF SAND PACK: /36'
BACKFILL MATERIAL BELOW SAND:

ELEVATION/DEPTH OF HOLE: /36'

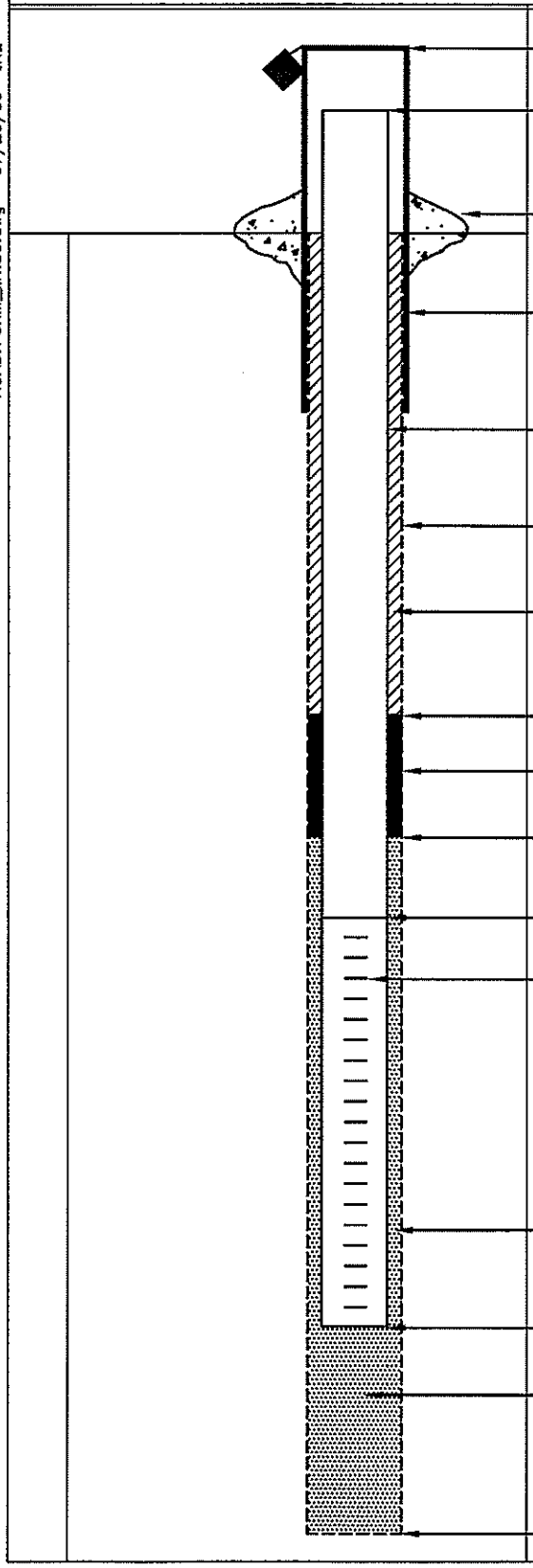
ACAD:FORM_MWSU.dwg 07/20/99 INL

WELL NO.: S43MW18

Tetra Tech

OVERBURDEN MONITORING WELL SHEET STICK-UP

PROJECT NSF-Indian Head Site 43	LOCATION S43 MW18 / TW53	DRILLER J. Haldiman (Vironex)
PROJECT NO. 112G00771	BORING S43MW18 / TW53	DRILLING METHOD HSA via DPT rig
DATE BEGUN 7-10-12	DATE COMPLETED 7-10-12	
FIELD GEOLOGIST J. Birkett		DEVELOPMENT METHOD Whalepump Manual Surge
GROUND ELEVATION	DATUM	



ELEVATION/HEIGHT OF TOP OF SURFACE CASING: / 3.25'

ELEVATION/HEIGHT OF TOP OF RISER PIPE: / 3'

TYPE OF SURFACE SEAL: Concrete

I.D. OF SURFACE CASING: 4"
TYPE OF SURFACE CASING: Steel (round)

RISER PIPE I.D.: 2"
TYPE OF RISER PIPE: Schedule 40 PVC

BOREHOLE DIAMETER: 6 3/4"

TYPE OF BACKFILL: Bentonite Chips

ELEVATION/DEPTH TOP OF SEAL: / 0.75'

TYPE OF SEAL: Bentonite Chips (Hydrated)

DEPTH TOP OF SAND PACK: 4'

ELEVATION/DEPTH TOP OF SCREEN: / 7'

TYPE OF SCREEN: Schedule 40 PVC

SLOT SIZE x LENGTH: 0.010" x 10'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: #1 Silica Sand

ELEVATION/DEPTH BOTTOM OF SCREEN: / 17'

ELEVATION/DEPTH BOTTOM OF SAND PACK: / 17'
BACKFILL MATERIAL BELOW SAND: NA

ELEVATION/DEPTH OF HOLE: / 17'

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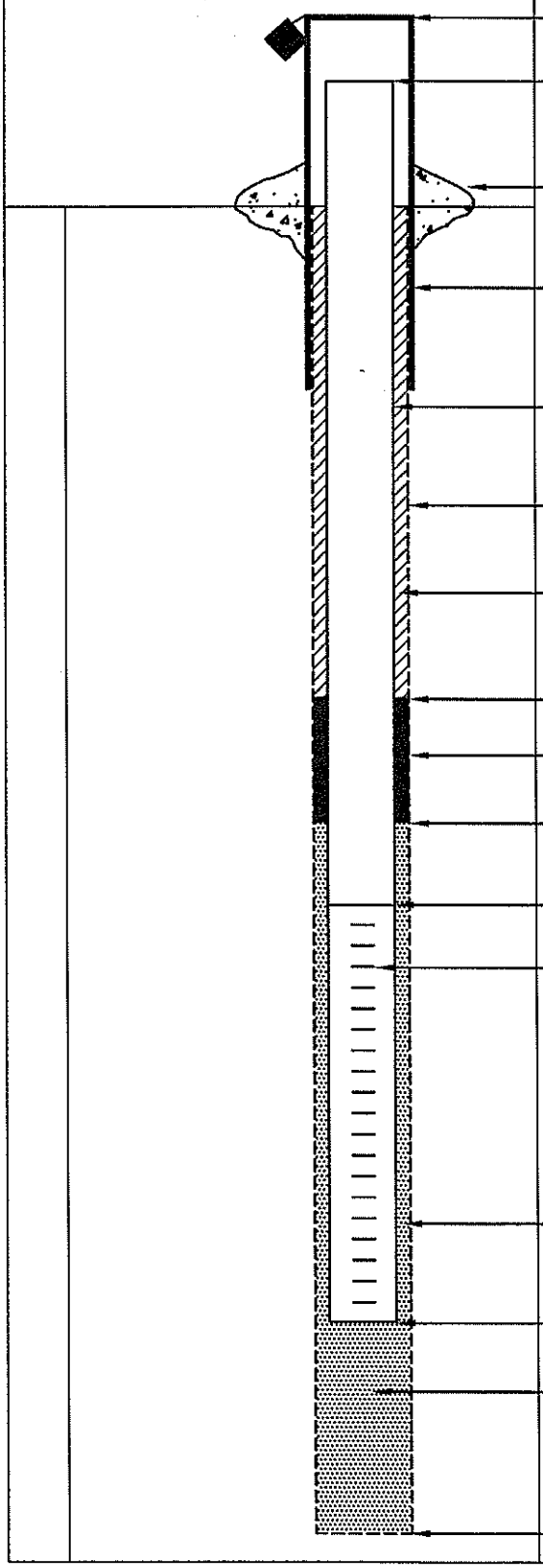
WELL NO.: S43MW19S

Tetra Tech

OVERBURDEN
MONITORING WELL SHEET
STICK-UP

PROJECT NSF-Indian Head Site 43	LOCATION S43MW19	DRILLER J. Haldiman (Vironex)
PROJECT NO. 112G00771	BORING —	DRILLING METHOD HSA via DPT
DATE BEGUN 7-9-12	DATE COMPLETED 7-9-12	
FIELD GEOLOGIST J. Birkett		DEVELOPMENT METHOD Whale pump w/manual surge
GROUND ELEVATION	DATUM	



ELEVATION/HEIGHT OF TOP OF SURFACE CASING: / 3'

ELEVATION/HEIGHT OF TOP OF RISER PIPE: / 2.75'

TYPE OF SURFACE SEAL: Concrete

I.D. OF SURFACE CASING: 4"
TYPE OF SURFACE CASING: ~~Shin~~ Steel (Round)
JS 7-9-12

RISER PIPE I.D.: 2"
TYPE OF RISER PIPE: Schedule 40 PVC

BOREHOLE DIAMETER: 6 3/4"

TYPE OF BACKFILL: Cement Bentonite grout

ELEVATION/DEPTH TOP OF SEAL: / 6'

TYPE OF SEAL: Bentonite Chips (Hydrated)

DEPTH TOP OF SAND PACK: 9.5' bgs

ELEVATION/DEPTH TOP OF SCREEN: / 14'

TYPE OF SCREEN: Schedule 40 PVC

SLOT SIZE x LENGTH: 0.010" x 10'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: #1 Silica Sand

ELEVATION/DEPTH BOTTOM OF SCREEN: / 24'

ELEVATION/DEPTH BOTTOM OF SAND PACK: / 24'
BACKFILL MATERIAL BELOW SAND: NA

ELEVATION/DEPTH OF HOLE: / 24'

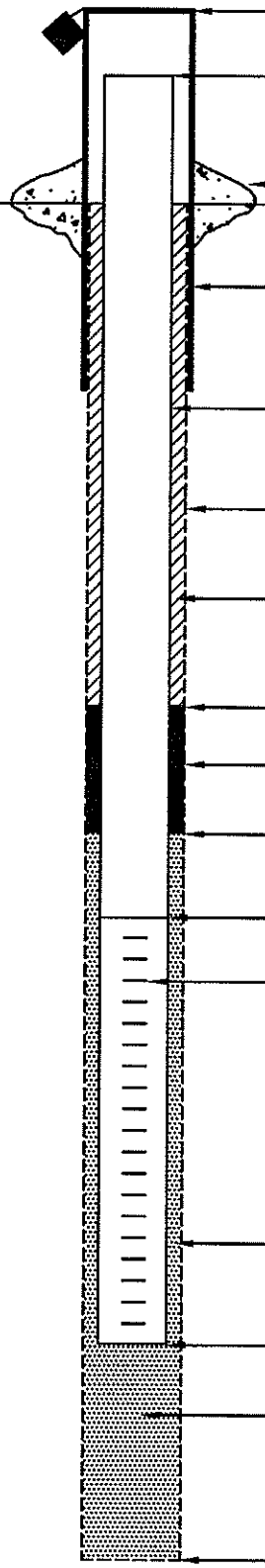
ACAD:FORM_MWSU.dwg 07/20/99 INL

WELL NO.: S43MW19D

Tetra Tech

OVERBURDEN MONITORING WELL SHEET STICK-UP

PROJECT NSF-Indian Head Site43	LOCATION S43MW19	DRILLER J. Haldiman
PROJECT NO. 112G00771	BORING —	DRILLING METHOD HSA via DPT
DATE BEGUN 7-10-12	DATE COMPLETED 7-10-12	
FIELD GEOLOGIST J. Birkett		DEVELOPMENT METHOD Whale Pump and manual surge
GROUND ELEVATION	DATUM	



ELEVATION/HEIGHT OF TOP OF SURFACE CASING: /3'

ELEVATION/HEIGHT OF TOP OF RISER PIPE: /2.75'

TYPE OF SURFACE SEAL: Concrete

I.D. OF SURFACE CASING: 2"
TYPE OF SURFACE CASING: Steel (Round)

RISER PIPE I.D.: 2"
TYPE OF RISER PIPE: Schedule 40 PVC

BOREHOLE DIAMETER: 6 3/4"

TYPE OF BACKFILL: Cement Bentonite grout

ELEVATION/DEPTH TOP OF SEAL: /24'

TYPE OF SEAL: Bentonite chips (Hydrated)

DEPTH TOP OF SAND PACK: 28'

ELEVATION/DEPTH TOP OF SCREEN: /30'

TYPE OF SCREEN: Schedule 40 PVC

SLOT SIZE x LENGTH: 0.010" x 5'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: #1 Silica Sand

ELEVATION/DEPTH BOTTOM OF SCREEN: /35'

ELEVATION/DEPTH BOTTOM OF SAND PACK: /36'
BACKFILL MATERIAL BELOW SAND: NA

ELEVATION/DEPTH OF HOLE: /36'

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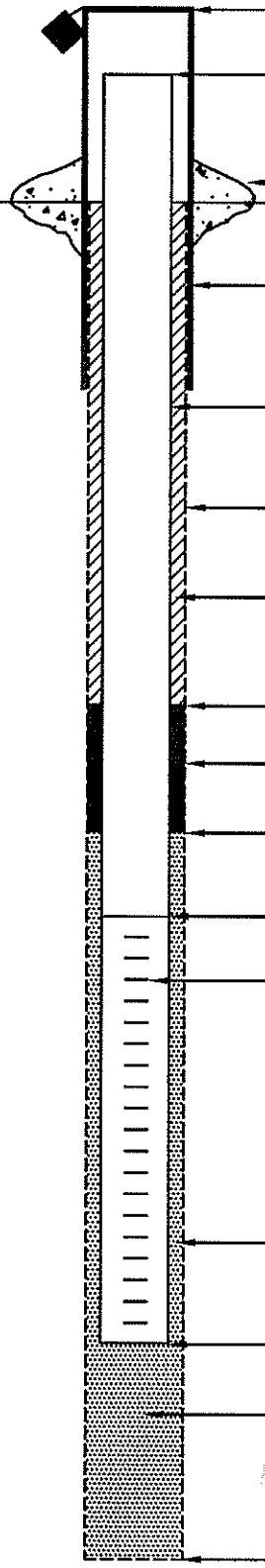
WELL NO.: S43MW20

Tetra Tech

OVERBURDEN MONITORING WELL SHEET STICK-UP

PROJECT NSF-Indian Head Site 43	LOCATION S43MW20	DRILLER J. Haldiman (Vironex)
PROJECT NO. 112G00771	BORING —	DRILLING METHOD HSA via DPT rig
DATE BEGUN 7-11-12	DATE COMPLETED 7-11-12	
FIELD GEOLOGIST J. Birkett		DEVELOPMENT METHOD Whale pump and manual surge
GROUND ELEVATION	DATUM	



ELEVATION/HEIGHT OF TOP OF SURFACE CASING: / 3'

ELEVATION/HEIGHT OF TOP OF RISER PIPE: / 2.75'

TYPE OF SURFACE SEAL: Concrete

I.D. OF SURFACE CASING: 4"
TYPE OF SURFACE CASING: Steel

RISER PIPE I.D.: 2"
TYPE OF RISER PIPE: Schedule 40 PVC

BOREHOLE DIAMETER: 6 3/4"

TYPE OF BACKFILL: Bentonite

ELEVATION/DEPTH TOP OF SEAL: / 0.5'

TYPE OF SEAL: Bentonite Chips (Hydrated)

DEPTH TOP OF SAND PACK: 4'

ELEVATION/DEPTH TOP OF SCREEN: / 6'

TYPE OF SCREEN: Schedule 40 PVC

SLOT SIZE x LENGTH: 0.010" x

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: #1 Silica Sand

ELEVATION/DEPTH BOTTOM OF SCREEN: / 21'

ELEVATION/DEPTH BOTTOM OF SAND PACK: / 21'
BACKFILL MATERIAL BELOW SAND: NA

ELEVATION/DEPTH OF HOLE: / 21'

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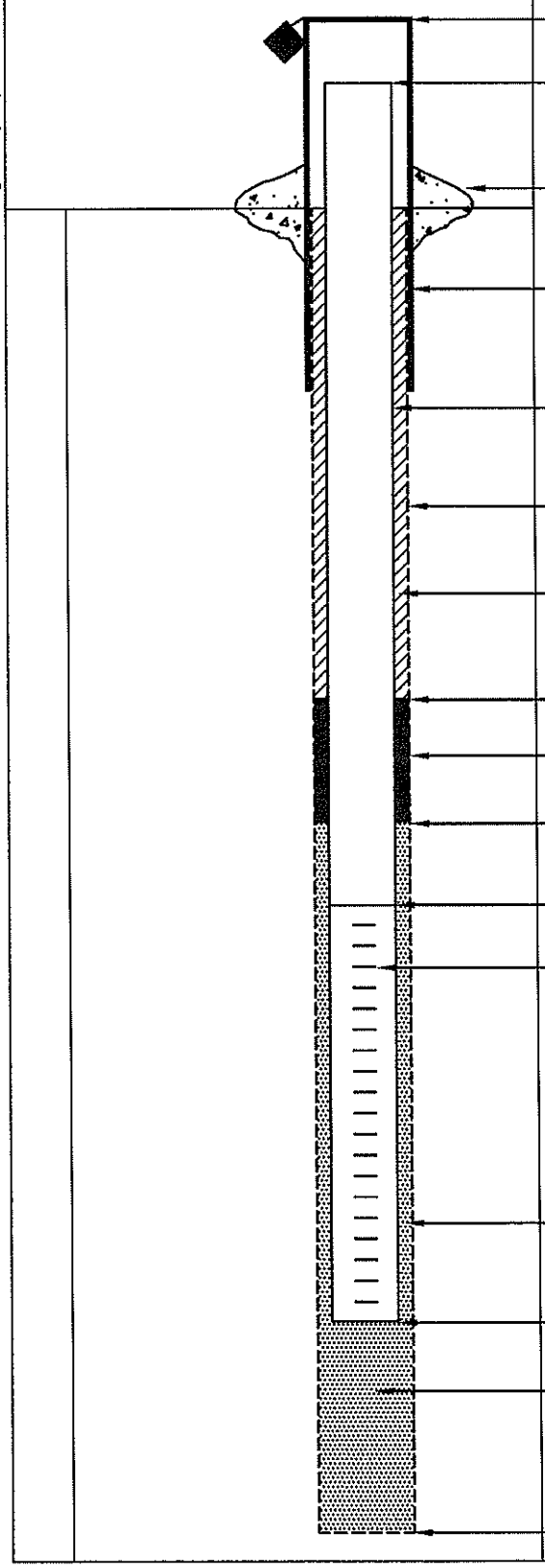
WELL NO.: 543MW21

Tetra Tech

OVERBURDEN MONITORING WELL SHEET STICK-UP

PROJECT NSF-Indian Head Site 43	LOCATION 543MW21	DRILLER J. Haldiman (Vironex)
PROJECT NO. 112G00771	BORING 543TW36	DRILLING METHOD HSA via DPT rig
DATE BEGUN 7-16-12	DATE COMPLETED 7-16-12	
FIELD GEOLOGIST J. Birkett		DEVELOPMENT METHOD Submersible manual surge
GROUND ELEVATION	DATUM	



ELEVATION/HEIGHT OF TOP OF SURFACE CASING: /3.25

ELEVATION/HEIGHT OF TOP OF RISER PIPE: /3

TYPE OF SURFACE SEAL: Concrete

I.D. OF SURFACE CASING: 4"
TYPE OF SURFACE CASING: Steel (round)

RISER PIPE I.D.: 2"
TYPE OF RISER PIPE: Schedule 40 PVC

BOREHOLE DIAMETER: 6 3/4"

TYPE OF BACKFILL: Bentonite cement grout

ELEVATION/DEPTH TOP OF SEAL: /7'

TYPE OF SEAL: Bentonite chips (hydrated)

DEPTH TOP OF SAND PACK: 12'

ELEVATION/DEPTH TOP OF SCREEN: /15'

TYPE OF SCREEN: Schedule 40 PVC

SLOT SIZE x LENGTH: 0.010" x 10'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: #1 Silica Sand

ELEVATION/DEPTH BOTTOM OF SCREEN: /25'

ELEVATION/DEPTH BOTTOM OF SAND PACK: /25'
BACKFILL MATERIAL BELOW SAND:

ELEVATION/DEPTH OF HOLE: /25'

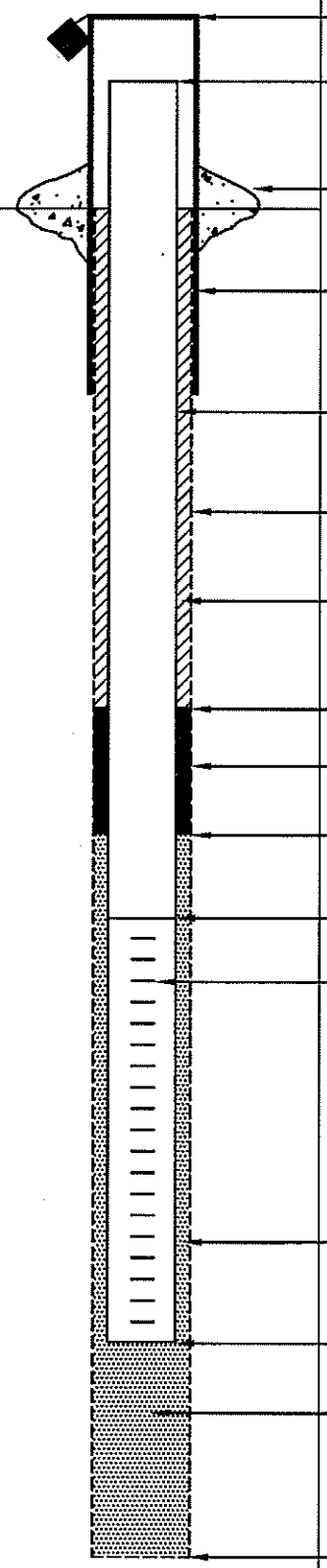
ACAD: FORM_MWSU.dwg 07/20/99 INL

WELL NO.: S43MW22

Tetra Tech

OVERBURDEN MONITORING WELL SHEET STICK-UP

PROJECT ~~Nav~~ GSB 7-11-12 NSF-Indian Head Site 43	LOCATION S43MW22	DRILLER J. Haldiman (Vironex)
PROJECT NO. 112G00771	BORING —	DRILLING METHOD HSA via DPT rig
DATE BEGUN 7-11-12	DATE COMPLETED 7-11-12	
FIELD GEOLOGIST J. Birkett		DEVELOPMENT METHOD Whale Pump and manual surge
GROUND ELEVATION	DATUM	



ELEVATION/HEIGHT OF TOP OF SURFACE CASING: /3.25'

ELEVATION/HEIGHT OF TOP OF RISER PIPE: /3'

TYPE OF SURFACE SEAL: Concrete

I.D. OF SURFACE CASING: 4" Round
TYPE OF SURFACE CASING: Steel

RISER PIPE I.D.: 2"
TYPE OF RISER PIPE: Schedule 40 PVC

BOREHOLE DIAMETER: 6 3/4"

TYPE OF BACKFILL: Bentonite

ELEVATION/DEPTH TOP OF SEAL: /1'

TYPE OF SEAL: Bentonite chips (hydrated)

DEPTH TOP OF SAND PACK: 7'

ELEVATION/DEPTH TOP OF SCREEN: /10'

TYPE OF SCREEN: Schedule 40 PVC

SLOT SIZE x LENGTH: 0.010" x 10'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: #1 Silica Sand

ELEVATION/DEPTH BOTTOM OF SCREEN: /20'

ELEVATION/DEPTH BOTTOM OF SAND PACK: /20'
BACKFILL MATERIAL BELOW SAND:

ELEVATION/DEPTH OF HOLE: /20'

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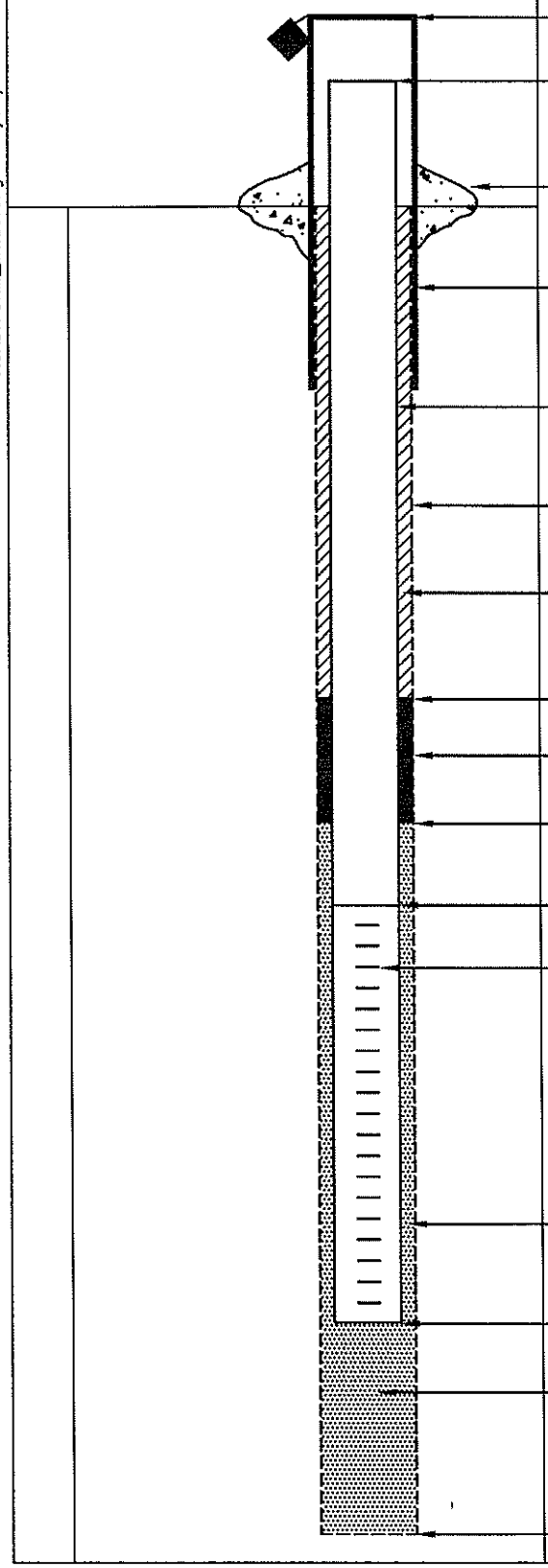
WELL NO.: S43MW23

Tetra Tech

OVERBURDEN
MONITORING WELL SHEET
STICK-UP

PROJECT NSF-Indian Head Site 4 LOCATION S43MW23/TW54	DRILLER J. Haldiman (Vironex)
PROJECT NO. 112G00771 BORING —	DRILLING METHOD HSA via DPT rig
DATE BEGUN 7-9-12 DATE COMPLETED 7-9-12	
FIELD GEOLOGIST J. Birkett	DEVELOPMENT METHOD Whale pump and Manual Surge
GROUND ELEVATION _____ DATUM _____	



ELEVATION/HEIGHT OF TOP OF SURFACE CASING: / 3'

ELEVATION/HEIGHT OF TOP OF RISER PIPE: / 2.75'

TYPE OF SURFACE SEAL: Concrete

I.D. OF SURFACE CASING: 4"
TYPE OF SURFACE CASING: Stainless Steel (Round)

RISER PIPE I.D.: 2"
TYPE OF RISER PIPE: Schedule 40 PVC

BOREHOLE DIAMETER: 6 3/4"

TYPE OF BACKFILL: Cement Bentonite grout

ELEVATION/DEPTH TOP OF SEAL: / 4'

TYPE OF SEAL: Bentonite chips (Hydrated)

DEPTH TOP OF SAND PACK: 8'

ELEVATION/DEPTH TOP OF SCREEN: / 11'

TYPE OF SCREEN: Schedule 40 PVC

SLOT SIZE x LENGTH: 0.010" x 10'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: #1 Silica Sand

ELEVATION/DEPTH BOTTOM OF SCREEN: / 21'

ELEVATION/DEPTH BOTTOM OF SAND PACK: / 21'
BACKFILL MATERIAL BELOW SAND: NA

ELEVATION/DEPTH OF HOLE: / 21'

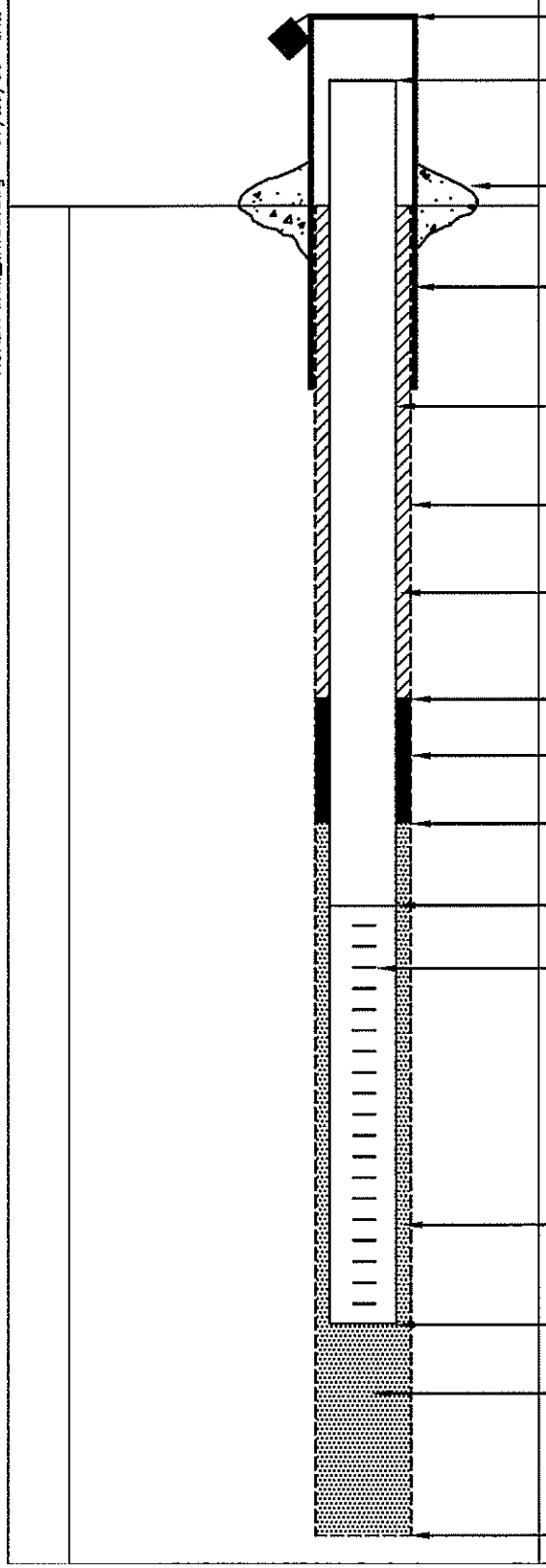
ACAD:FORM_MWSU.dwg 07/20/99 INL

WELL NO.: 543MW24

Tetra Tech

OVERBURDEN MONITORING WELL SHEET STICK-UP

PROJECT NSF-Indian Head Site 43	LOCATION 543MW24 / TW 46	DRILLER J. Haldiman (Virorex)
PROJECT NO. 112G00771	BORING 543TW46	DRILLING METHOD HSA via DPT rig
DATE BEGUN 7-10-12	DATE COMPLETED	
FIELD GEOLOGIST J. Birkett		DEVELOPMENT METHOD whole pump and Manual surge
GROUND ELEVATION	DATUM	



ELEVATION/HEIGHT OF TOP OF SURFACE CASING: /3'

ELEVATION/HEIGHT OF TOP OF RISER PIPE: /2.75'

TYPE OF SURFACE SEAL: Concrete

I.D. OF SURFACE CASING: 4"
TYPE OF SURFACE CASING: Steel (Round)

RISER PIPE I.D.: 2"
TYPE OF RISER PIPE: Schedule 40 PVC

BOREHOLE DIAMETER: 6 3/4"

TYPE OF BACKFILL: Bentonite Chips

ELEVATION/DEPTH TOP OF SEAL: /0.5'

TYPE OF SEAL: Bentonite Chips (Hydrated)

DEPTH TOP OF SAND PACK: 2'

ELEVATION/DEPTH TOP OF SCREEN: /2'

TYPE OF SCREEN: Schedule 40 PVC

SLOT SIZE x LENGTH: 0.010" x 15'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: #1 Silica Sand

ELEVATION/DEPTH BOTTOM OF SCREEN: /17'

ELEVATION/DEPTH BOTTOM OF SAND PACK: /17'
BACKFILL MATERIAL BELOW SAND:

ELEVATION/DEPTH OF HOLE: /20'

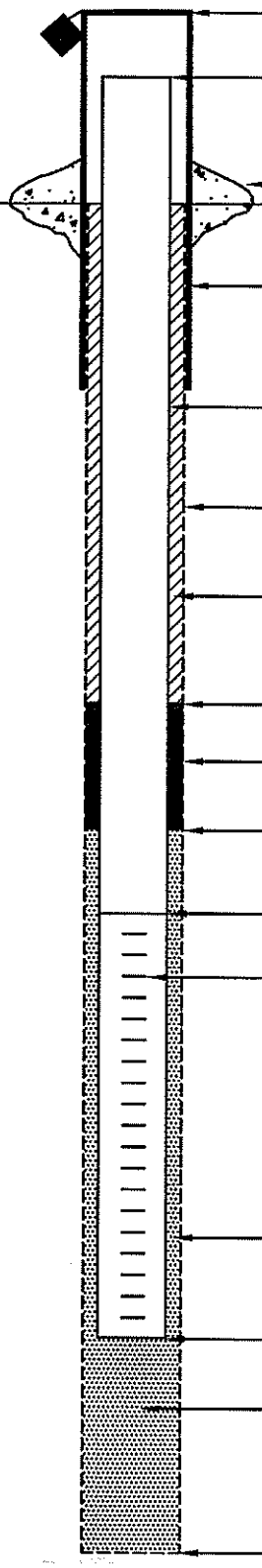
ACAD:FORM_MWSU.dwg 07/20/99 INL

WELL NO.: 543MW25

Tetra Tech

OVERBURDEN MONITORING WELL SHEET STICK-UP

PROJECT NSF-Indian Head Site43	LOCATION 543MW25	DRILLER J. Haldiman (Vironex)
PROJECT NO. 112G00771	BORING —	DRILLING METHOD HSA via DPT rig
DATE BEGUN 7-11-12	DATE COMPLETED 7-11-12	
FIELD GEOLOGIST J. Birkett		DEVELOPMENT METHOD Whale pump and manual surge
GROUND ELEVATION	DATUM	



ELEVATION/HEIGHT OF TOP OF SURFACE CASING: /3'

ELEVATION/HEIGHT OF TOP OF RISER PIPE: /2.75'

TYPE OF SURFACE SEAL: Concrete

I.D. OF SURFACE CASING: 4"
TYPE OF SURFACE CASING: Steel (round)

RISER PIPE I.D.: 2"
TYPE OF RISER PIPE: Schedule 40 PVC

BOREHOLE DIAMETER: 6 3/4"

TYPE OF BACKFILL: Bentonite

ELEVATION/DEPTH TOP OF SEAL: /1'

TYPE OF SEAL: Bentonite Chips (Hydrated

DEPTH TOP OF SAND PACK: 4'

ELEVATION/DEPTH TOP OF SCREEN: /7'

TYPE OF SCREEN: Schedule 40 PVC

SLOT SIZE x LENGTH: 0.010" x 10'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: #1 Silica Sand

ELEVATION/DEPTH BOTTOM OF SCREEN: /17'

ELEVATION/DEPTH BOTTOM OF SAND PACK: /17'
BACKFILL MATERIAL BELOW SAND: NA

ELEVATION/DEPTH OF HOLE: /17'

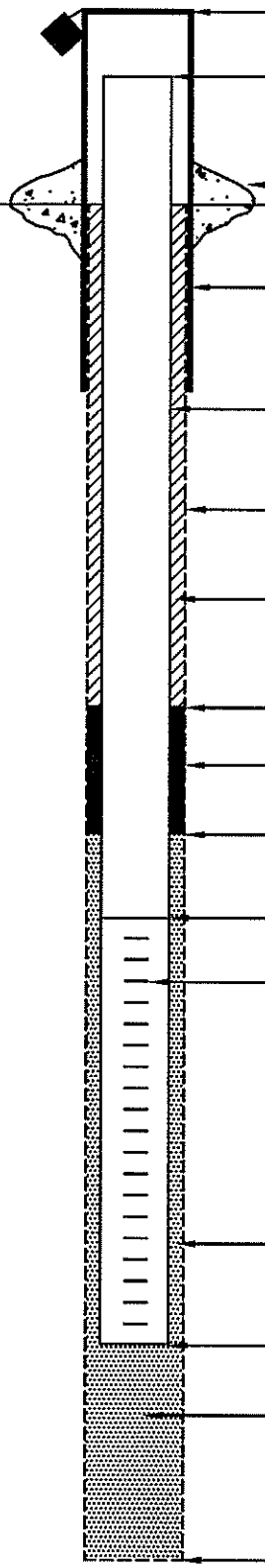
ACAD:FORM_MWSU.dwg 07/20/99 INL

WELL NO.: S43MW26

Tetra Tech

OVERBURDEN MONITORING WELL SHEET STICK-UP

PROJECT NSF-Indian Head Site 43	LOCATION S43MW26	DRILLER J. Haldiman (Vironex)
PROJECT NO. 112G00771	BORING S43MW26/TW57	DRILLING METHOD HSA via DPT rig
DATE BEGUN 7-13-12	DATE COMPLETED 7-13-12	
FIELD GEOLOGIST J. Birkell		DEVELOPMENT METHOD Whale pump and manual surge
GROUND ELEVATION	DATUM	



ELEVATION/HEIGHT OF TOP OF SURFACE CASING: / 3'

ELEVATION/HEIGHT OF TOP OF RISER PIPE: / 2.75'

TYPE OF SURFACE SEAL: Concrete

I.D. OF SURFACE CASING: 4"
TYPE OF SURFACE CASING: Steel Round

RISER PIPE I.D.: 2"
TYPE OF RISER PIPE: Schedule 40 PVC

BOREHOLE DIAMETER: 6 3/4"

TYPE OF BACKFILL: Bentonite Cement Grout

ELEVATION/DEPTH TOP OF SEAL: / 6'

TYPE OF SEAL: Bentonite chips

DEPTH TOP OF SAND PACK: 10'

ELEVATION/DEPTH TOP OF SCREEN: / 13'

TYPE OF SCREEN: Schedule 40 PVC
SLOT SIZE x LENGTH: 0.010" x 10'
I.D. OF SCREEN: 2"

TYPE OF SAND PACK: #1 Silica Sand

ELEVATION/DEPTH BOTTOM OF SCREEN: / 23'

ELEVATION/DEPTH BOTTOM OF SAND PACK: / 23'
BACKFILL MATERIAL BELOW SAND:

ELEVATION/DEPTH OF HOLE: / 23'

ACAD:FORM_MWSU.dwg 07/20/99 INI

Tetra Tech

MONITORING WELL DEVELOPMENT RECORD

Well: S43MW07
Site: 43
Date Installed: 5-20-12
Date Developed: 7-15-12
Dev. Method: Submersible manual surge
Pump Type: Water Spout

Depth to Bottom (ft.):
Static Water Level Before (ft.): 11.16
Static Water Level After (ft.):
Screen Length (ft.): 10'
Specific Capacity:
Casing ID (in.): 2"

Responsible Personnel: J. Birkett
Drilling Co.: Visonex
Project Name: NSF-Indian Head Site 43
Project Number: 112G0077 1

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.)
0836	Start development	0	11.16					
0840	—	5 gal	11.94	18.03	4.22	0.348	OverRange	Gray (silty) Surge every
0848	—	15 gal	11.95	16.81	4.72	0.256	" "	" " 5 min
0856	—	25 gal	11.95	15.99	4.88	0.247	2266	Gray
0906	—	35 gal	11.95	16.27	4.89	0.244	2160	Gray
0910	Pump	cut out	w/42 gal,	try to fix	but unable to	switch to	check value	
0933	—	45 gal	11.22	17.34	4.98	0.242	OverRang	Gray (silty)
0940	—	55 gal	11.27	16.27	4.98	0.248	" "	Gray
0946	—	65 gal	11.21	16.63	4.94	0.251	" "	" "
0959	—	75 gal	11.18	16.35	5.04	0.253	" "	" "
1005	—	85 gal	11.29	16.13	5.04	0.253	"	" "
1024	—	95 gal	11.18	17.58	5.35	0.247	" "	" "
1030	—	100 gal	Flush out	water above	screen			

Tetra Tech NUS, Inc.

MONITORING WELL DEVELOPMENT RECORD

Well: S43MW08
Site: 43
Date Installed: 5-19-12
Date Developed: 5-20-12
Dev. Method: Whale pump + Manual surge
Pump Type: Whale pump

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

Responsible Personnel: J. Birkett
Drilling Co.: Vironex
Project Name: NSF-Indian Head Site 43
Project Number: 112G00771

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.)
1157		3	34	18.91	5.07	0.001		Start pump and surge Dk Brown
1207		25	33	18.01	5.97	0.106	1,000	light gray
1217		55	34	17.70	5.57	0.105	190	
1227		75	32	17.68	5.63	0.106	100	
1237		100	31	17.99	5.43	0.106	55	

Tetra Tech

MONITORING WELL DEVELOPMENT RECORD

Well: 543 MW09S
Site: 43
Date Installed: 7-17-12
Date Developed: 7-18-12
Dev. Method: Surge Block and Check valve
Pump Type: Check Valve

Depth to Bottom (ft.): 19.20
Static Water Level Before (ft.):
Static Water Level After (ft.):
Screen Length (ft.): 10'
Specific Capacity:
Casing ID (in.): 2"

Responsible Personnel: J. Birkett
Drilling Co.: Vironex
Project Name: NSF-Indian Head Site 43
Project Number: 112G00771

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.)
1725	Start	development						Surge w/ surge block First 10 min
1735	—	5	19.05*	24.35	5.05	0.509	3416 AU	Light brown, take surge block off
1753	—	10	19.10*	21.52	4.88	0.480	751 AU	goes dry after 1.5 gal
1835	—	15	19.08*	24.46	4.93	0.477	105.0	tan color
			*Goes dry					

Tetra Tech NUS, Inc.

MONITORING WELL DEVELOPMENT RECORD

Well: 543MW09D
Site: 43
Date Installed: 5-19-12
Date Developed: 5-20-12
Dev. Method: Whale pump + Manual Surge
Pump Type: Whale pump

Depth to Bottom (ft.):
Static Water Level Before (ft.): 10
Static Water Level After (ft.):
Screen Length (ft.): 5'
Specific Capacity:
Casing ID (in.): 2"

Responsible Personnel: J. Birkett
Drilling Co.: Vironex
Project Name: NSF-IH Site 43
Project Number: 112G00771

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.)
0845		5	35	17.20	5.75	0.833	Er3	brown
0854		10	35	16.69	6.15	0.466	" "	" "
0904	Shut off	pump let	well recharge					
0919	Restart pump			16.05	5.08	0.358	" "	light brown
0923	Recharge	Well						
0941	Restart pump							
0942		20	30	15.85	5.65	0.327	" "	Gray
0952		25	30	16.42	5.68	0.329	" "	Gray
1002		30	29	16.59	6.61	0.319	220	
1005	Shut off	pump let, recharge, switchover to MW09S						
1103	Restart pump	31	25	18.95	6.47	0.340	1,000	
1113		36	30	19.72	6.34	0.306	—	
1123		41	35	18.48	6.25	0.315	200	
1138		45	35	18.50	6.24	0.313	200	

Tetra Tech NUS, Inc.

MONITORING WELL DEVELOPMENT RECORD

Well: S43MW10
Site: Site 43
Date Installed: 5-18-12
Date Developed: 5-19-12
Dev. Method: Whale pump + manual surge
Pump Type: Whale pump

Depth to Bottom (ft.): 35
Static Water Level Before (ft.): 11.13
Static Water Level After (ft.):
Screen Length (ft.): 5'
Specific Capacity:
Casing ID (in.): 2"

Responsible Personnel: J. Birkett
Drilling Co.: Vironex
Project Name: NSF-IH Site 43
Project Number: 112G00771

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.)
1056	Start	development	11.13 surge screen					
1059		5	21	23.42	5.93	0.466	OverRange	Light gray
1104		10	35	20.06	6.15	0.366		
1107	Well	goes dry, let recharge						
1114	Restart pump, surge		30	18.96	6.06	0.360		
1119		13	35	18.59	6.01	0.357		
1125		16	35	18.64	5.39	0.370		
1130		20	35	18.56	5.74	0.367	1000	light gray
1135		22	35	18.47	5.48	0.365	800	" "
1139	Well goes dry, let recharge							
1147	Restart pump, surge							
1148		25	30	17.95	5.37	0.358	OverRange	Gray
1155		28	29	18.58	5.40	0.370	450	gray
1201		30	35	18.70	5.41	0.373	240	gray tint
1206	Well goes dry, let recharge							
1218	Restart pump, surge							
1221		31	30	19.24	6.21	0.349	800	Gray
1228		35	35	18.86	6.14	0.367	650	" "

Shut off pump, let recharge

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MONITORING WELL DEVELOPMENT RECORD

Well: S43MW10
Site: Site 43
Date Installed: 5-18-12
Date Developed: 5-19-12
Dev. Method: Whale pump + manual surge
Pump Type: Whale pump

Depth to Bottom (ft.): 35'
Static Water Level Before (ft.): 11.13
Static Water Level After (ft.):
Screen Length (ft.): 5'
Specific Capacity:
Casing ID (in.): 2"

Responsible Personnel: J. Birkett
Drilling Co.: Vironex
Project Name: NSF-IH Site 43
Project Number: 112G00771

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.)
1247	Restart pump, surge							
1248		37	29	19.52	6.21	0.346	550	Gray
1254		43	30	19.13	6.14	0.363	130	gray tint
1312		53 gal	35	20.31	6.16	0.366	50	gray tint

Tetra Tech NUS, Inc.

MONITORING WELL DEVELOPMENT RECORD

Well: 543MW11
Site: 43
Date Installed: 5-20-12
Date Developed: 7-16-12
Dev. Method: Submersible manual surge
Pump Type: SuperPurger

Depth to Bottom (ft.): 39.10
Static Water Level Before (ft.): 13.73
Static Water Level After (ft.):
Screen Length (ft.): 10
Specific Capacity:
Casing ID (in.): 2"

Responsible Personnel: J. Birkett
Drilling Co.: Vironex
Project Name: NSF-Indian Head Site 43
Project Number: 112G0077

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.)
1605	Start development	0 gal	13.73					
1615	—	8 gal	20.90	21.67	5.84	0.216	Over Range	Gray (silty) Surge screen every 5 min
1625	—	20 gal	21.68	18.84	5.37	0.209	2173 NU	Gray (silty)
1635	—	35 gal	21.53	17.70	5.39	0.207	Over Range	" "
1645	—	50 gal	21.45	17.24	5.39	0.207	3960 NU	" "
1655	—	65 gal	21.70	17.39	5.39	0.205	734 NU	Gray
1705	—	80 gal	21.72	17.45	5.36	0.204	2088	Gray Stop surging
1715	—	100 gal	21.66	17.41	5.37	0.205	78.2	Clearish / Gray tint

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MONITORING WELL DEVELOPMENT RECORD

Well: 543-MW12
Site: 43
Date Installed: 6-2-12
Date Developed: 7-15-12
Dev. Method: Check valve manual surge
Pump Type: Check valve

Depth to Bottom (ft.): 30.38
Static Water Level Before (ft.): 14.97
Static Water Level After (ft.):
Screen Length (ft.): 5'
Specific Capacity:
Casing ID (in.): 1"

Responsible Personnel: J. Birkett
Drilling Co.: Vironex
Project Name: NSF-Indian Head Site 43
Project Number: 112G00771

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.)
1133	Start development							
1140	—	1 gal	—	Goes	dry	—	OverRange	Gray Silty
1150	—	1.75 gal	—	Goes	dry	—	" "	" "
1210	—	2.25 gal	—	"	"	—	" "	" "
1225	—	2.5 gal	—	25.82	5.34	0.211	" "	" "
1240	—	3.25 gal	—	Goes dry	—	—	" "	" "
1250	—	3.75 gal	—	Goes dry	—	—	" "	" "

Tetra Tech NUS, Inc.

MONITORING WELL DEVELOPMENT RECORD

Site: NSF-Indian Head Site 43
Well: S43MW13
Date Installed: 5-12-12
Date Developed: 7-11-12
Dev. Method: Check valve manual surge
Pump Type: Check valve

Depth to Bottom (ft.): 23.36
Static Water Level Before (ft.): 16.04
Static Water Level After (ft.): 16.08
Screen Length (ft.): 10
Specific Capacity:
Casing ID (in.): 1"

Project Name: NSF-IH S43 P2 RI
Project Number: 112G00771
Site Geologist: J. Birkell
Drilling Co.: Vivarex

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.)
1740	Start	development						
1745	—	5 gal	—	22.00	4.80	0.460	OverRange	Light brown
1750	—	10 gal	—	19.56	4.71	0.267	" "	" "
1757	—	15 gal	—	19.32	4.65	0.253	" "	" "
1802	—	20 gal	—	18.60	4.60	0.248	3926	Light brown
1807	—	25 gal	—	18.51	4.58	0.246	3301	" "

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MONITORING WELL DEVELOPMENT RECORD

Well: 543MW14
Site: 43
Date Installed:
Date Developed: 6-3-17
Dev. Method: Check value, Surge
Pump Type: Check value

Depth to Bottom (ft.): 20.73
Static Water Level Before (ft.): 13.02
Static Water Level After (ft.):
Screen Length (ft.): 10'
Specific Capacity:
Casing ID (in.): 1"

Responsible Personnel: J. Birkett
Drilling Co.: Vironex
Project Name: NSF-IH Site 43
Project Number: 112G00771

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.)
1423		2 gal	Dry	19.82	5.13	0.240	OverRange	Brown, Well drew down fast
1429		5 gal	—	17.82	4.89	0.214	" "	Brown, " "
1435		7.5 gal	—	17.30	5.00	0.214	" "	Brown, " "
1438		10 gal	—	16.54	5.00	0.217	" "	" "
1443		12.5 gal	—	16.77	4.97	0.216	" "	" "
1447		15 gal	—	16.31	4.95	0.217	" "	" "
1450		17.5 gal	—	16.75	4.91	0.216	" "	" "
1455		20 gal	—	16.49	4.90	0.216	" "	" "

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MONITORING WELL DEVELOPMENT RECORD

Well: 543MW15
Site: 43
Date Installed: 5-12-12
Date Developed: 7-14-12
Dev. Method: Check Valve
Pump Type: Check valve

Depth to Bottom (ft.): 20.65
Static Water Level Before (ft.): 11.78
Static Water Level After (ft.):
Screen Length (ft.): 10'
Specific Capacity:
Casing ID (in.): 1"

Responsible Personnel: J. Birkoff
Drilling Co.: Vironex
Project Name: NSF-Indian Head Site 43
Project Number: 112G00771

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.)
1410	Start development		20.65					
1421	—	5 gal	—	22.48	5.83	0.435	OverRange	light brown
1431	—	10 gal	—	22.06	6.08	0.436	" "	" "
1437	—	15 gal	—	21.32	6.05	0.428	" "	" "
1446	—	20 gal	—	21.36	5.87	0.408	" "	" "

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MONITORING WELL DEVELOPMENT RECORD

Well: S43MW16
Site: 43
Date Installed: 5-12-12
Date Developed: 7-15-12
Dev. Method: Check value
Pump Type: Check value

Depth to Bottom (ft.): 23.96
Static Water Level Before (ft.): 14.80
Static Water Level After (ft.):
Screen Length (ft.): 10'
Specific Capacity:
Casing ID (in.): 1"

Responsible Personnel: J. Birkett
Drilling Co.: Vironex
Project Name: NSF-Indian Head Site 43
Project Number: 12G0077J

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.)
1312	Start development 0		23.96					
1315	Well goes dry	1.5 gal	—	—	—	—	—	Brown
1323	—	5 gal	—	22.41	4.79	0.360	Over Range	Light Brown
1337	—	10 gal	—	21.72	4.33	0.353	" "	" "
1350	—	15 gal	—	20.01	4.37	0.361	" "	" "
1403	—	20 gal	—	20.60	4.40	0.366	" "	" "

Tetra Tech NUS, Inc.

MONITORING WELL DEVELOPMENT RECORD

Well: 543MW17S
Site: 43
Date Installed: 7-13-12
Date Developed: 7-17-12
Dev. Method: Submersible manual surge
Pump Type: Super Purger

Depth to Bottom (ft.):
Static Water Level Before (ft.): 15.06
Static Water Level After (ft.):
Screen Length (ft.): 10'
Specific Capacity:
Casing ID (in.): 2"

Responsible Personnel: J. Birkett
Drilling Co.: Vironex
Project Name: NSF-Indian Head Site 43
Project Number: 112G0077 1

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.)
1215	Start development 0 gal		15.06					Surge entire screen every 5 min
1220	—	5	22.63	18.98	5.92	0.384	OverRange	Silty Light brown
1230	—	16	21.45	17.69	5.71	0.397	" "	" "
1240	—	28	21.47	17.73	5.72	0392	3031	" "
1250	—	40 gal	21.48	17.74	5.70	0.390	3760 AU	" "
1300	—	54 gal	21.48	17.90	5.76	0.389	2001 AU	" "
1310	—	70 gal	21.48	18.02	5.81	0.390	1457 AU	
1320	—	83 gal	21.45	17.46	5.75	0.391	811 AU	" " Stop Surging
1330	—	95 gal	21.50	17.45	5.85	0.377	884	" "

Tetra Tech NUS, Inc.

MONITORING WELL DEVELOPMENT RECORD

Well: S43MW17D
Site: 43
Date Installed: 7-12-12
Date Developed: 7-17-12
Dev. Method: Submersible manual surge
Pump Type: Super Purger

Depth to Bottom (ft.): 39.21
Static Water Level Before (ft.): 19.40
Static Water Level After (ft.):
Screen Length (ft.): 5'
Specific Capacity:
Casing ID (in.): 2"

Responsible Personnel: J. Birkett
Drilling Co.: Vironex
Project Name: NSF-Indian Head Site 43
Project Number: 112G00771

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.)
1110	Start development	0 gal	19.40					Surge Screen every 3 min
1115	—	5 gal	22.90	19.54	5.06	0.624	OverRange	Silty Gray
1125	—	14	24.07	18.05	5.46	0.379	1027 AU	Gray
1135	—	27	24.32	17.82	5.58	0.357	969 AU	Gray
1145	—	40	24.26	18.06	5.70	0.348	664 AU	" "
1155	—	53	24.20	18.26	5.70	0.344	792 AU	" " Stop surging
1205	—	66 gal	24.19	17.68	5.74	0.342	27.1	clear

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MONITORING WELL DEVELOPMENT RECORD

Well: 543MW18
Site: 43
Date Installed: 7-10-12
Date Developed: 7-16-12
Dev. Method: Submersible Pump and Manual Surge
Pump Type: Super Purger

Depth to Bottom (ft.): 19.03
Static Water Level Before (ft.): 13.03
Static Water Level After (ft.):
Screen Length (ft.): 10'
Specific Capacity:
Casing ID (in.): 2"

Responsible Personnel: J. Birkett
Drilling Co.: Vironex
Project Name: NSF-Indian Head Site 43
Project Number: 112G00771

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.)
1330	Start development	0 gal						
1335	—	5 gal	19.01	22.41	6.58	0.694	OverRange	light brown (silty) goes dry after 6 gal
		let recharge up to	15' bgs, surge, turn on pump				and repeat	
1351	—	8.5 gal	19.01	20.70	6.08	0.540	OverRange	light brown
1410	—	12 gal	19.01	—	—	—	—	" "
1420	—	14 gal	19.01	20.00	5.70	0.496	OverRange	" "
1430	—	16 gal	19.01	—	—	—	—	" "
1445	—	18 gal	19.01	19.68	5.42	0.446	796 AU	" "
1456	—	21 gal	19.01	19.84	5.40	0.456	879 AU	" " Stop Surging
1508	—	25 gal	19.01	19.43	5.13	0.447	88.4	Clearish

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MONITORING WELL DEVELOPMENT RECORD

Well: 543MW19S
Site: 43
Date Installed: 7-9-12
Date Developed: 7-16-12
Dev. Method: Submersible pump manual surge
Pump Type: Super Purger

Depth to Bottom (ft.): 26.73
Static Water Level Before (ft.): 15.19
Static Water Level After (ft.):
Screen Length (ft.): 10'
Specific Capacity:
Casing ID (in.): 2"

Responsible Personnel: J. Birkoff
Drilling Co.: Vironex
Project Name: NSF-Indian Head Site 43
Project Number: 112G00771

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.)
0915	Start development 0 gal		15.19					
0920	—	5 gal	15.55	—	—	—	—	Surge MW screen every 5 min
0930	—	18 gal	15.50	20.17	5.15	0.314	OverRange	Brown (silty)
0940	—	30 gal	15.49	20.43	5.17	0.328	" "	" "
0950	—	45 gal	15.46	20.12	5.18	0.330	2 819 NTU	Brown
1000	—	65 gal	15.47	20.45	5.23	0.338	642	light brown
1010	—	82	15.49	20.54	5.22	0.335	16.0	Clear stop surging
1020	—	90 gal	—	—	—	—	18.4	

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MONITORING WELL DEVELOPMENT RECORD

Well: 543MW19D
Site: 43
Date Installed: 7-10-12
Date Developed: 7-14-12 7-16-12
Dev. Method: Submersible manual surge
Pump Type: Water Spout
Super Purger

Depth to Bottom (ft.): 38.28
Static Water Level Before (ft.): 22.47
Static Water Level After (ft.):
Screen Length (ft.): 10'
Specific Capacity:
Casing ID (in.): 2"

Responsible Personnel: J. Birkett
Drilling Co.: Vironex
Project Name: NSF-Indian Head Site 43
Project Number: 112G00771

	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.)
	1357	Surge Well	Start pump 0	22.47					
	1400	—	5	30.15	24.41	5.96	0.402	Over Range	Rich gray (silty) Surge entire
	1410	—	15	25.63	22.12	5.99	0.340	" "	" " screen every 5 min
	1420	—	25	25.14	20.41	5.66	0.300	" "	Gray (silty)
	1430	—	35		20.40	5.58	0.298	" "	" " "
	1440	—	45	26.20	19.68	5.57	0.284	4092 NU	" "
	1445	Pump	stalled	, wires not	properly	sealed			
	1458	Try	to troubleshoot						
7-14-12	1600	Unable	to restart	, offsite					
7-16-12	0815	Restart	dev.	22.48					
	0820	—	50 gal	25.50	20.24	4.84	0.624	Over Range	Gray silty
	0830	—	60	25.94	19.49	5.53	0.298	833 NU	Gray
	0840	—	70	26.31	19.63	5.47	0.284	976 NU	" "
	0850	—	80	26.38	19.40	5.48	0.281	733 NU	" "
	0900	—	90	26.40	19.80	5.50	0.279	674 NU	" " Stop Surging
	0910	—	100 gal	26.37	19.69	5.56	0.277	80.4	Clear

Tetra Tech

MONITORING WELL DEVELOPMENT RECORD

Well: 543MW20
Site: 43
Date Installed: 7-11-12
Date Developed: 7-17-12
Dev. Method: Submersible Manual Surge
Pump Type: Super Purger

Depth to Bottom (ft.):
Static Water Level Before (ft.): 15.87
Static Water Level After (ft.):
Screen Length (ft.): ~~15~~ 15
Specific Capacity: QSB 7-17-12
Casing ID (in.): 2"

Responsible Personnel: J. Birkett
Drilling Co.: Vironex
Project Name: NSF-Indian Head Site 43
Project Number: 112G00771

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.)
1505	Problems w/ pump try to Fix							
1545	Start development			~~26~~				
1555	—	10	16.58	26.61	5.26	0.222	OverRange	light brown Surge every 5 min
1605	—	20	16.08	21.94	4.65	0.214	" "	" "
1615	—	32	16.00	20.26	4.58	0.217	" "	" "
1625	—	43	16.01	18.48	4.70	0.219	4984	" "
1635	—	54	16.03	18.26	4.64	0.218	69.7	clear
1645	—	65	16.01	18.25	4.67	0.218	66.1	clear
1655	—	78 gal	16.05	18.19	4.63	0.218	16.1	clear

Tetra Tech

MONITORING WELL DEVELOPMENT RECORD

Well: S43MW21
Site: 43
Date Installed: 7-16-12
Date Developed: 7-17-12
Dev. Method: Submersible manual surge
Pump Type: Super Purger

Depth to Bottom (ft.):
Static Water Level Before (ft.): 15.70
Static Water Level After (ft.):
Screen Length (ft.): 10'
Specific Capacity:
Casing ID (in.): 2"

Responsible Personnel: J. Birkett
Drilling Co.: Vironex
Project Name: NSF-Indian Head Site 43
Project Number: 112G00771

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.)
1840	Start development 0 gal		15.70					Surge every 5 min
1850	—	6	15.99	22.78	5.27	0.248	OverRange	light brown
1900	—	12	15.89	20.60	4.86	0.221	" "	" "
1910	—	25	15.85	19.56	4.79	0.216	156	tan tint
1920	—	40	15.87	19.01	4.78	0.213	3,465	light brown
1930	—	55	15.87	18.84	4.77	0.210	895	" "
1940	—	70	15.85	19.20	4.80	0.210	153	tan tint
1950	—	85	15.85	18.85	4.80	0.206	888	light brown Stop surging
2000	—	100 gal	15.85	18.94	4.80	0.204	17.9	clear

Tetra Tech

MONITORING WELL DEVELOPMENT RECORD

Well: S43MW22
Site: 43
Date Installed: 7-11-12
Date Developed: 7-18-12
Dev. Method: Submersible man. surge
Pump Type: Super Purger

Depth to Bottom (ft.): 22.30
Static Water Level Before (ft.): 14.67
Static Water Level After (ft.):
Screen Length (ft.): 10'
Specific Capacity:
Casing ID (in.): 2"

Responsible Personnel: J. Birkett
Drilling Co.: Vironex
Project Name: NSF-Indian Head Site 43
Project Number: 112G00771

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.)
1105	Start development	0	14.67					Surge Screen every 5 min
1115	—	8 gal	14.95	19.90	4.18	0.499	Over Range	light brown
1125	—	21	14.74	18.62	4.39	0.376	" "	" "
1135	—	34	14.80	18.35	4.35	0.350	22.2	clear
1145	—	47	14.83	18.68	4.39	0.343	9.45	clear
1155	—	60 gal	14.83	19.05	4.42	0.340	20.8	clear
1205	—	73 gal	14.84	18.62	4.45	0.337	68.6	tan tint stop surging
1210	—	80 gal	14.84	—	—	—	12.0	clear

Tetra Tech

MONITORING WELL DEVELOPMENT RECORD

Well: S43MW23
Site: 43
Date Installed: 7-9-12
Date Developed: 7-14-12
Dev. Method: Submersible Manual Surge
Pump Type: Water Spout

Depth to Bottom (ft.): 24.26'
Static Water Level Before (ft.): 16.53
Static Water Level After (ft.):
Screen Length (ft.): 10'
Specific Capacity:
Casing ID (in.): 2"

Responsible Personnel: J. Birkett
Drilling Co.: Vironex
Project Name: NSF-Indian Head Site 43
Project Number: 112G00771

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.)
1120	—	0	16.53	Start	deve	lopment		
1125	—	10 gal		20.65	5.58	0.166	OverRange	light brown Flow: 2 GPM
1130	Shut off pump, and surge entire screen							Surge well after each reading/5 min
1135	Restart	20	19.33	19.72	5.22	0.163	" "	light brown
1145	—	30	~~19.17~~ 19.69	19.17	5.06	0.154	" "	" " Flow 1 GPM
1155	—	40	19.74	19.08	4.91	0.152	2005	light brown
1202	—	50	19.89	19.10	4.85	0.151	273	tan color
1204	Shut off pump		let recharge	to 17' bgs	, Surge entire screen			
1208	Restart	55 gal	16.83	19.22	4.89	0.153	4028	light brown
1218	—	65 gal	18.54	18.78	4.89	0.157	3335	" "
1228	—	75 gal	18.02	19.02	4.85	0.154	2048	tan color STOP Surging
1238	—	85 gal	18.84	19.36	4.80	0.154	123	tan tint
1243	—	90 gal	18.91	19.13	4.77	0.159	138	tan tint
	Dev.	Complete						

Tetra Tech NUS, Inc.

MONITORING WELL DEVELOPMENT RECORD

Site: NSF-Indian Head Site 43
Well: S43 MW24
Date Installed: 7-10-12
Date Developed: 7-13-12
Dev. Method: Submersible Manual surge
Pump Type: Water Spout

Depth to Bottom (ft.):
Static Water Level Before (ft.): 10.38
Static Water Level After (ft.): 10.40
Screen Length (ft.): 15'
Specific Capacity:
Casing ID (in.): 2"

Project Name: NSF-Indian Head Site 43
Project Number: 112600771
Site Geologist: J. Birkett
Drilling Co.: Vironex

Time	Estimated Sediment Thickness (Ft.)	Cumulative Water Volume (Gal.)	Water Level Readings (Ft. below TOC)	Temperature (Degrees C)	pH	Specific Conductance (Units µS/cm)	Turbidity (NTU)	Remarks (odor, color, etc.)
1435	—	0	Start development					
1458	—	7	13.49	26.43	5.46	0.151	OverRange	light brown
1505	—	10	17.98*	24.27	5.24	0.139	" "	" " MW goes dry after
1510	—	13	↓	22.67	5.04	0.133	" "	" " every 3 gal.
1515	—	16		22.43	5.11	0.136	" "	" " Shut off pump
1520	—	19		22.43	5.07	0.137	" "	" " let recharge, then
1528	—	22		22.31	5.06	0.134	4484	" " surge and restart.
1543	—	25		22.52	5.22	0.149	3490	" "
1550	—	28		22.62	5.27	0.134	1731	" "
1554	—	31		22.34	5.25	0.133	1512	" "
1600	—	34	↓	22.53	5.22	0.130	1559	" "
			Stop surging and just pump					
1606	—	37	17.98*	22.39	5.22	0.132	3918	light brown
1613	—	41	↓	22.85	5.23	0.131	841	tan
1618	—	45		22.42	5.25	0.127	148	tan tint
1625	—	48	↓	22.83	5.36	0.131	60	tan tint

* Resting on top of pump

Tetra Tech

MONITORING WELL DEVELOPMENT RECORD

Well: S43MW25
Site: 43
Date Installed: 7-11-12
Date Developed: 7-14-12
Dev. Method: Submersible manual surge
Pump Type: Water Spout

Depth to Bottom (ft.): 20.21 → cut after measurement
Static Water Level Before (ft.): 10.73
Static Water Level After (ft.):
Screen Length (ft.): 10
Specific Capacity:
Casing ID (in.): 2"

Responsible Personnel: J. Birkett
Drilling Co.: Vironex
Project Name: NSF-Indian Head Site 43
Project Number: 112G00771

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.)
0840	—	—	10.73	Start	development			
0846	—	6 gal	18.98*	19.98	5.23	0.383	241	Tan color Went dry after 6 gal
0913	—	10 gal	19.01*	19.00	5.85	0.305	3400	" " shut off pump and let
0943	—	15 gal	19.03*	18.79	5.83	0.231	1048	tan tint/color recharge. Surge → to 15½' to 19' BTOC
1015	—	19 gal	19.08*	19.22	5.81	0.197	142	tan tint well and restart pump
1055	—	24 gal	19.07*	19.01*	5.86	0.179	49.0	tan tint

Tetra Tech

MONITORING WELL DEVELOPMENT RECORD

Well: S43MW26
Site: 43
Date Installed: 7-13-12
Date Developed: 7-16-12
Dev. Method: Submersible pump manual surge
Pump Type: Super Purger

Depth to Bottom (ft.): 26.43
Static Water Level Before (ft.): 16.01
Static Water Level After (ft.):
Screen Length (ft.): 10'
Specific Capacity:
Casing ID (in.): 2"

Responsible Personnel: J. Birkett
Drilling Co.: Vironex
Project Name: NSF-Indian Head Site 43
Project Number: K2G00771

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.)
1205	Start development		16.01					
1215	—	15	16.83	23.85	5.39	0.105	OverRange	light brn/gray Surge screen every 5min
1230	—	32	16.83	21.27	4.91	0.130	2077 AU	light gray
1240	—	45	16.81	21.37	4.98	0.140	3465 AU	" "
1250	—	60	16.92	21.74	5.03	0.155	1967 AU	" "
1300	—	75	16.90	21.39	5.05	0.160	3252	" " Stop surging
1310	—	95	16.87	21.53	5.06	0.163	130	gray tint
1313	—	100	—	—	—	—	828	clearish

2013

Monitoring Well Construction Logs and Development Records

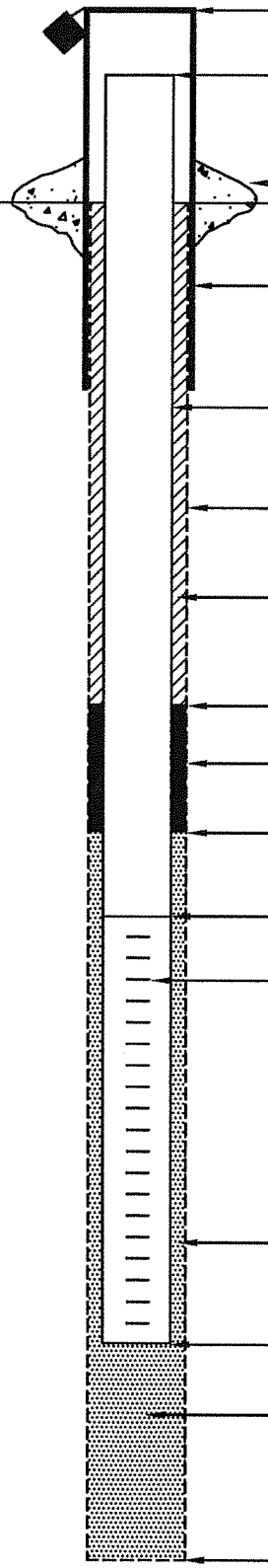
WELL NO.: S43PZ01

Tetra Tech

OVERBURDEN MONITORING WELL SHEET STICK-UP

PROJECT NSF Indian Head Site43	LOCATION S43PZ01	DRILLER J. Haldiman
PROJECT NO. 112G00771	BORING S43PZ01	DRILLING METHOD DPT
DATE BEGUN 5-1-13	DATE COMPLETED 5-1-13	
FIELD GEOLOGIST J. Birkett		DEVELOPMENT METHOD Check valve ~~Waterra and Typhoon pumps~~
GROUND ELEVATION	DATUM	

5-3-



ELEVATION/HEIGHT OF TOP OF SURFACE CASING: / NA

ELEVATION/HEIGHT OF TOP OF RISER PIPE: / 3'

TYPE OF SURFACE SEAL: Bentonite

I.D. OF SURFACE CASING: NA
TYPE OF SURFACE CASING: NA

RISER PIPE I.D.: 1"
TYPE OF RISER PIPE: Schedule 40 PVC

BOREHOLE DIAMETER: 3 1/4"

TYPE OF BACKFILL: NA

ELEVATION/DEPTH TOP OF SEAL: / 0'

TYPE OF SEAL: Bentonite Chips

DEPTH TOP OF SAND PACK: 3'

ELEVATION/DEPTH TOP OF SCREEN: / 5'

TYPE OF SCREEN: Prepacked 1.7" Φ OD Schedule 40 PVC

SLOT SIZE x LENGTH: 0.010" x 10'

I.D. OF SCREEN: 1"

TYPE OF SAND PACK: #1 Silica Sand

ELEVATION/DEPTH BOTTOM OF SCREEN: / 15'

ELEVATION/DEPTH BOTTOM OF SAND PACK: / 15'
BACKFILL MATERIAL BELOW SAND: Natural Collapse

ELEVATION/DEPTH OF HOLE: / 15'

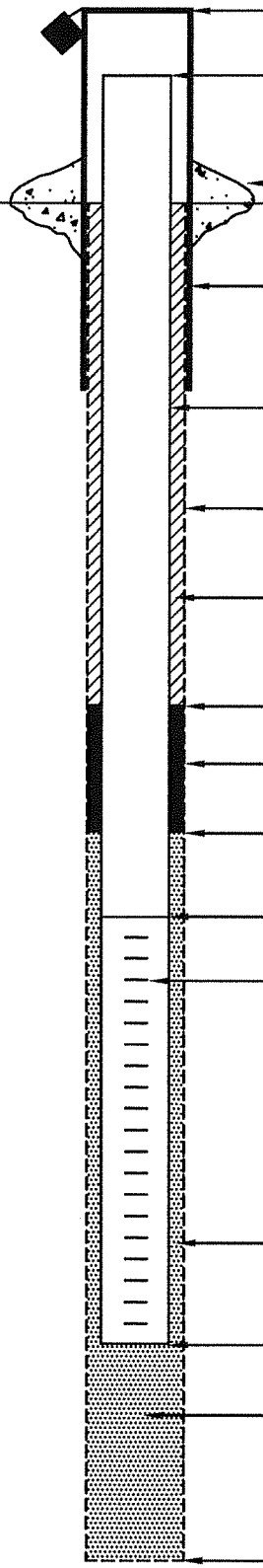
ACAD: FORM_MWSU.dwg 07/20/99 INL

WELL NO.: S43PZ02

Tetra Tech

OVERBURDEN MONITORING WELL SHEET STICK-UP

PROJECT NSF Indian Head Site 43	LOCATION S43PZ02	DRILLER J. Halliman
PROJECT NO. 112G00771	BORING S43PZ02	DRILLING METHOD DPT
DATE BEGUN 5-1-13	DATE COMPLETED 5-1-13	
FIELD GEOLOGIST J. Birkett		DEVELOPMENT METHOD Check Valve
GROUND ELEVATION	DATUM	



ELEVATION/HEIGHT OF TOP OF SURFACE CASING: / NA

ELEVATION/HEIGHT OF TOP OF RISER PIPE: / 3'

TYPE OF SURFACE SEAL: Bentonite

I.D. OF SURFACE CASING: NA
TYPE OF SURFACE CASING: NA

RISER PIPE I.D.: 1"
TYPE OF RISER PIPE: Schedule 40 PVC

BOREHOLE DIAMETER: 3 1/4"

TYPE OF BACKFILL: NA

ELEVATION/DEPTH TOP OF SEAL: / 0'

TYPE OF SEAL: Bentonite Chips

DEPTH TOP OF SAND PACK: 3'

ELEVATION/DEPTH TOP OF SCREEN: / 5'

TYPE OF SCREEN: Prepacked 1.7" OD Schedule 40 PVC

SLOT SIZE x LENGTH: 0.010" x 10'

I.D. OF SCREEN: 1"

TYPE OF SAND PACK: #1 Silica Sand

ELEVATION/DEPTH BOTTOM OF SCREEN: / 15'

ELEVATION/DEPTH BOTTOM OF SAND PACK: / 15'
BACKFILL MATERIAL BELOW SAND: Natural Collapse

ELEVATION/DEPTH OF HOLE: / 15'

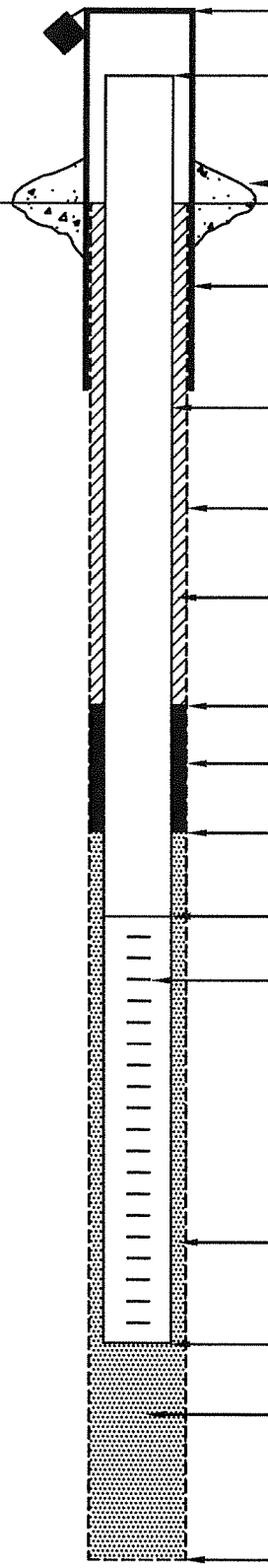
ACAD: FORM_MWSU.dwg 07/20/99 INL

WELL NO.: S43PZ03

Tetra Tech

OVERBURDEN MONITORING WELL SHEET STICK-UP

PROJECT NSF Indian Head Site 43	LOCATION S43PZ03	DRILLER J. Haldiman
PROJECT NO. 112G00771	BORING S43PZ03	DRILLING METHOD DPT
DATE BEGUN 5-1-13	DATE COMPLETED 5-1-13	
FIELD GEOLOGIST ~~J. Haldiman~~ J. Birkett		DEVELOPMENT METHOD Check Valve
GROUND ELEVATION	DATUM	



ELEVATION/HEIGHT OF TOP OF SURFACE CASING: / NA

ELEVATION/HEIGHT OF TOP OF RISER PIPE: / 3'

TYPE OF SURFACE SEAL: Bentonite

I.D. OF SURFACE CASING: NA
TYPE OF SURFACE CASING: NA

RISER PIPE I.D.: 1"
TYPE OF RISER PIPE: Schedule 40 PVC

BOREHOLE DIAMETER: 3 1/4"

TYPE OF BACKFILL: NA

ELEVATION/DEPTH TOP OF SEAL: / 0'

TYPE OF SEAL: Bentonite Chips

DEPTH TOP OF SAND PACK: 3'

ELEVATION/DEPTH TOP OF SCREEN: / 5'

TYPE OF SCREEN: Prepacked 1.7" OD Schedule 40 PVC

SLOT SIZE x LENGTH: 0.010" x 10'

I.D. OF SCREEN: 1"

TYPE OF SAND PACK: #1 Silica Sand

ELEVATION/DEPTH BOTTOM OF SCREEN: / 15'

ELEVATION/DEPTH BOTTOM OF SAND PACK: / 15'
BACKFILL MATERIAL BELOW SAND:
Natural Collapse

ELEVATION/DEPTH OF HOLE: / 15'

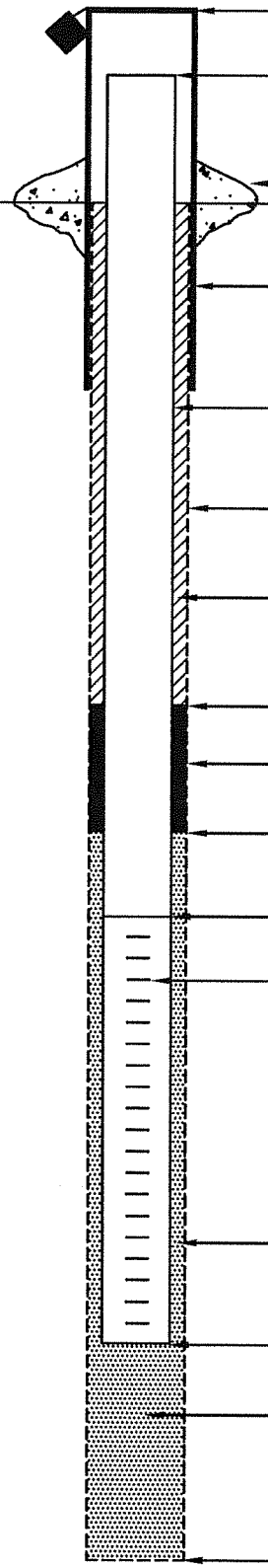
ACAD: FORM_MWSU.dwg 07/20/99 INL

WELL NO.: S43PZ04

Tetra Tech

OVERBURDEN MONITORING WELL SHEET STICK-UP

PROJECT NSF Indian Head Site43	LOCATION S43PZ04	DRILLER J. Haddman
PROJECT NO. 112G00771	BORING S43PZ04	DRILLING METHOD DPT
DATE BEGUN 5-1-13	DATE COMPLETED 5-1-13	
FIELD GEOLOGIST J. Birkett		DEVELOPMENT METHOD Check Valve
GROUND ELEVATION	DATUM	



ELEVATION/HEIGHT OF TOP OF SURFACE CASING: / NA

ELEVATION/HEIGHT OF TOP OF RISER PIPE: / 3'

TYPE OF SURFACE SEAL: Bentonite

I.D. OF SURFACE CASING: NA
TYPE OF SURFACE CASING: NA

RISER PIPE I.D.: 1"
TYPE OF RISER PIPE: Schedule 40 PVC

BOREHOLE DIAMETER: 3 1/4"

TYPE OF BACKFILL: NA

ELEVATION/DEPTH TOP OF SEAL: / 0'

TYPE OF SEAL: Bentonite Chips

DEPTH TOP OF SAND PACK: 3'

ELEVATION/DEPTH TOP OF SCREEN: / 5'

TYPE OF SCREEN: Prepacked 1.7" OD Schedule 40 PVC

SLOT SIZE x LENGTH: 0.010" x 10'

I.D. OF SCREEN: 1"

TYPE OF SAND PACK: #1 Silica Sand

ELEVATION/DEPTH BOTTOM OF SCREEN: / 15'

ELEVATION/DEPTH BOTTOM OF SAND PACK: / 15'
BACKFILL MATERIAL BELOW SAND: Natural Collapse

ELEVATION/DEPTH OF HOLE: / 15'

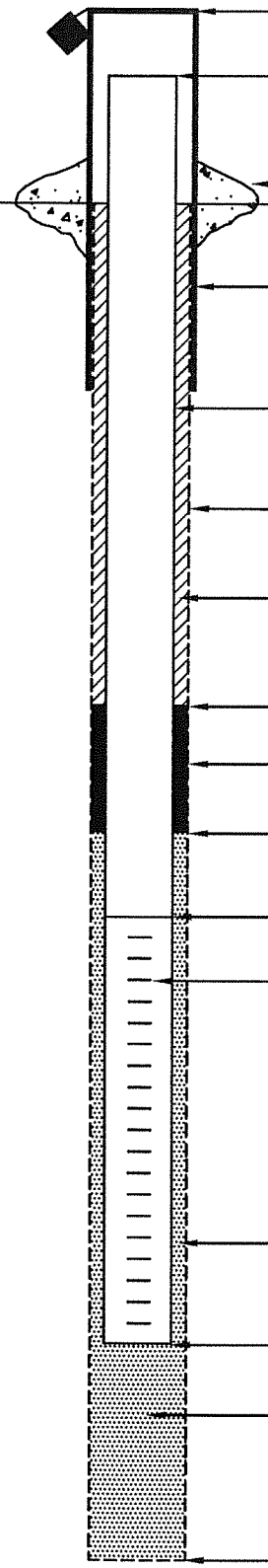
ACAD:FORM_MWSU.dwg 07/20/99 INL

WELL NO.: S43MW27

Tetra Tech

OVERBURDEN MONITORING WELL SHEET STICK-UP

PROJECT NSF Indian Head Site 43	LOCATION S43MW27	DRILLER J. Haldiman
PROJECT NO. 112G00771	BORING S43MW27	DRILLING METHOD Geoprobe HSA
DATE BEGUN 4-30-13	DATE COMPLETED 4-30-13	
FIELD GEOLOGIST J. Birkett		DEVELOPMENT METHOD Waterra and Typhoon pumps
GROUND ELEVATION	DATUM	



ELEVATION/HEIGHT OF TOP OF SURFACE CASING: /

ELEVATION/HEIGHT OF TOP OF RISER PIPE: /

TYPE OF SURFACE SEAL: Concrete

I.D. OF SURFACE CASING: 4"
TYPE OF SURFACE CASING: Steel (Round)

RISER PIPE I.D.: 2"
TYPE OF RISER PIPE: Schedule 40 PVC

BOREHOLE DIAMETER: 7½"

TYPE OF BACKFILL: NA

ELEVATION/DEPTH TOP OF SEAL: / 1'

TYPE OF SEAL: Bentonite Chips (Hydrated)

DEPTH TOP OF SAND PACK: 9'

ELEVATION/DEPTH TOP OF SCREEN: / 12'

TYPE OF SCREEN: Schedule 40 PVC

SLOT SIZE x LENGTH: 0.010" x 10'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: #1 Silica Sand

ELEVATION/DEPTH BOTTOM OF SCREEN: / 22'

ELEVATION/DEPTH BOTTOM OF SAND PACK: / 22'
BACKFILL MATERIAL BELOW SAND: Natural Collapse

ELEVATION/DEPTH OF HOLE: / 22'

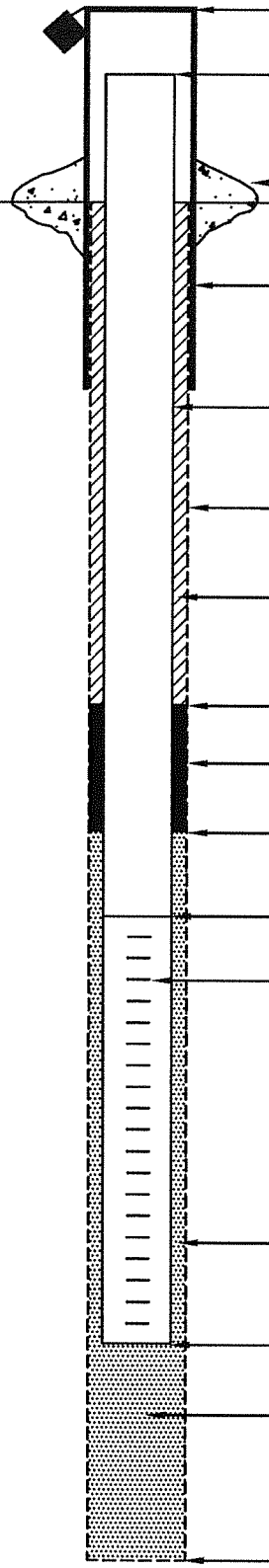
ACAD: FORM_MWSU.dwg 07/20/99 INL

WELL NO.: S43MW28

Tetra Tech

OVERBURDEN MONITORING WELL SHEET STICK-UP

PROJECT NSF-Indian Head Site43	LOCATION S43MW28	DRILLER J. Haldiman
PROJECT NO. 112G00771	BORING S43MW28	DRILLING METHOD Geoprobe HSA
DATE BEGUN 4-30-13	DATE COMPLETED 4-30-13	
FIELD GEOLOGIST J. Birkett		DEVELOPMENT METHOD Waterra and Typhoon Pumps
GROUND ELEVATION	DATUM	



ELEVATION/HEIGHT OF TOP OF SURFACE CASING: / 3.25'

ELEVATION/HEIGHT OF TOP OF RISER PIPE: / 3'

TYPE OF SURFACE SEAL: Concrete

I.D. OF SURFACE CASING: 4"
TYPE OF SURFACE CASING: Steel (Round)

RISER PIPE I.D.: 2"
TYPE OF RISER PIPE: Schedule 40 PVC

BOREHOLE DIAMETER: 7 1/2"

TYPE OF BACKFILL: NA

ELEVATION/DEPTH TOP OF SEAL: / 1'

TYPE OF SEAL: Bentonite Chips (Hydrated)

DEPTH TOP OF SAND PACK: 4'

ELEVATION/DEPTH TOP OF SCREEN: / 7'

TYPE OF SCREEN: Schedule 40 PVC

SLOT SIZE x LENGTH: 0.010" x 10'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: #1 Silica Sand

ELEVATION/DEPTH BOTTOM OF SCREEN: / 17'

ELEVATION/DEPTH BOTTOM OF SAND PACK: / 17'
BACKFILL MATERIAL BELOW SAND: Natural Collapse

ELEVATION/DEPTH OF HOLE: / 17'

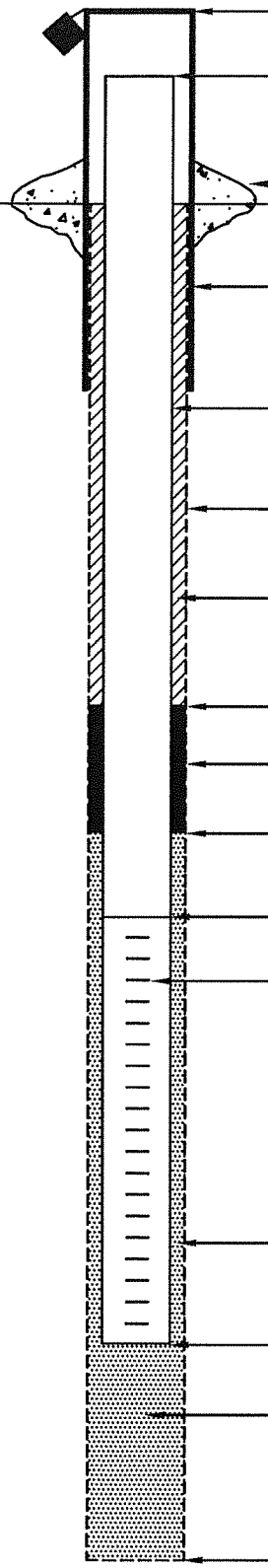
ACAD:FORM_MWSU.dwg 07/20/99 INL

WELL NO.: 543MW29

Tetra Tech

OVERBURDEN MONITORING WELL SHEET STICK-UP

PROJECT NSF Indian Head Site 43	LOCATION 543MW29	DRILLER J. Haldiman
PROJECT NO. 112G00771	BORING 543MW29	DRILLING METHOD Geoprobe HSA
DATE BEGUN 4-28-13	DATE COMPLETED 4-28-13	
FIELD GEOLOGIST J. Birkett		DEVELOPMENT METHOD Waterra and Typhoon Pumps
GROUND ELEVATION	DATUM	



ELEVATION/HEIGHT OF TOP OF SURFACE CASING: / 3.25'

ELEVATION/HEIGHT OF TOP OF RISER PIPE: / 3'

TYPE OF SURFACE SEAL: Concrete

I.D. OF SURFACE CASING: 4"
TYPE OF SURFACE CASING: Steel Round

RISER PIPE I.D.: 2"
TYPE OF RISER PIPE: Schedule 40 PVC

BOREHOLE DIAMETER: 7 1/2"

TYPE OF BACKFILL: NA

ELEVATION/DEPTH TOP OF SEAL: / 1'

TYPE OF SEAL: Bentonite Chips (Hydrated

DEPTH TOP OF SAND PACK: 7'

ELEVATION/DEPTH TOP OF SCREEN: / 9'

TYPE OF SCREEN: Schedule 40 PVC

SLOT SIZE x LENGTH: 0.010" x 10'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: #1 Silica Sand

ELEVATION/DEPTH BOTTOM OF SCREEN: / 19'

ELEVATION/DEPTH BOTTOM OF SAND PACK: / 19'
BACKFILL MATERIAL BELOW SAND:
Natural Collapse

ELEVATION/DEPTH OF HOLE: / 20'

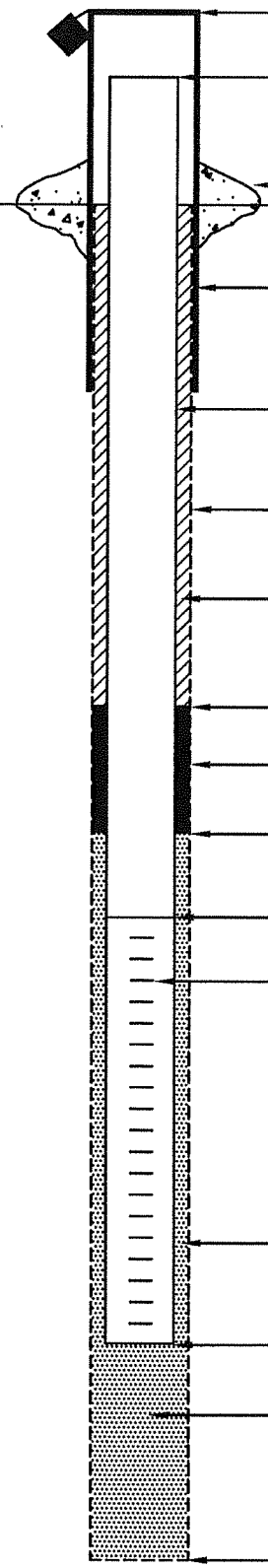
ACAD: FORM_MWSU.dwg 07/20/99 INL

WELL NO.: 543MW30

Tetra Tech

OVERBURDEN MONITORING WELL SHEET STICK-UP

PROJECT NSF Indian Head Site 43	LOCATION 543MW30	DRILLER J. Haldiman
PROJECT NO. 112G00771	BORING 543MW30	DRILLING METHOD DPT HSA
DATE BEGUN 5-2-13	DATE COMPLETED 5-2-13	
FIELD GEOLOGIST J. Birkett		DEVELOPMENT METHOD Waterra and Typhoon Pumps
GROUND ELEVATION	DATUM	



ELEVATION/HEIGHT OF TOP OF SURFACE CASING: / 3.25'

ELEVATION/HEIGHT OF TOP OF RISER PIPE: / 3'

TYPE OF SURFACE SEAL: Concrete

I.D. OF SURFACE CASING: 4"
TYPE OF SURFACE CASING: Steel (round)

RISER PIPE I.D.: 2"
TYPE OF RISER PIPE: Schedule 40 PVC

BOREHOLE DIAMETER: 7½"

TYPE OF BACKFILL: Bentonite Cement Grout

ELEVATION/DEPTH TOP OF SEAL: / 29'

TYPE OF SEAL: Bentonite chips (Hydrated

DEPTH TOP OF SAND PACK: 32'

ELEVATION/DEPTH TOP OF SCREEN: / 34'

TYPE OF SCREEN: Schedule 40 PVC

SLOT SIZE x LENGTH: 0.010" x 5'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: #1 Silica Sand

ELEVATION/DEPTH BOTTOM OF SCREEN: / 39'

ELEVATION/DEPTH BOTTOM OF SAND PACK: / 39'
BACKFILL MATERIAL BELOW SAND: NA

ELEVATION/DEPTH OF HOLE: / 39'

ACAD: FORM_MWSU.dwg 07/20/99 INL

Tetra Tech NUS, Inc.

MONITORING WELL DEVELOPMENT RECORD

Well: S43P2001
Site: Site 43
Date Installed: 5-1-13
Date Developed: 5/6/13 5/7/13
Dev. Method: Surge Purge
Pump Type: Wattera Method

Depth to Bottom (ft.): 17.90'
Static Water Level Before (ft.): 7.51/7.45
Static Water Level After (ft.): 7.69'
Screen Length (ft.): 10'
Specific Capacity:
Casing ID (in.): 1"

Responsible Personnel: CM
Drilling Co.: Vironix
Project Name: Indian Head Site 43
Project Number: 112600771

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.)	
1135	None	1 gal	7.51	14.09	6.19	0.549	<1000	Dry after 1 gallon Lt Brown No odor sheen	17 ORP
1030	None	1 gal	7.45	15.78	6.67	0.373	<1000	Dry after 1 gallon Lt Brown No odor or sheen	-50 ORP
1100	None	1 gal		15.18	6.74	0.376	973	Dry after 1 gallon Light Brown No odor or sheen	-44 ORP
1130	None	1 gal		14.78	6.71	0.405	968	Dry after 1 gallon Light Brown No odor or sheen	-46 ORP
1200	None	1 gal		15.11	6.68	0.397	<1000	Dry after 1 gallon Light Brown no odor or sheen	-50 ORP

Tetra Tech NUS, Inc.

MONITORING WELL DEVELOPMENT RECORD

Well: S43PZ002
Site: Site 43
Date Installed: 5-1-13
Date Developed: 5/7/13
Dev. Method: Surge + Purge
Pump Type: Wattera

Depth to Bottom (ft.): 16.70
Static Water Level Before (ft.): 6.81
Static Water Level After (ft.): 7.13
Screen Length (ft.): 10'
Specific Capacity:
Casing ID (in.): 1"

Responsible Personnel: Chuck Meyer
Drilling Co.: Vironex
Project Name: Indian Head Site 43 Toluene Spill
Project Number: 112G00771

Time	Estimated Sediment Thickness (Ft.)	Cumulative Water Volume (Gal.)	Water Level Readings (Ft. below TOC)	Temperature (Degrees C)	pH	Specific Conductance (Units _____)	Turbidity (NTU)	Remarks (odor, color, etc.)	ORP
1230	None	1gal	6.81	15.10	6.64	0.546	<1000	Light Brown with no odor or sheen 1 gallon purged	-49
1253	None	1gal		15.99	6.59	0.423	<1000	Light Brown with no odor or sheen 1 gallon purged	-28
0830	None	1gal	6.80	14.32	6.37	0.487	<1000	Light Brown with no odor or sheen purged dry after 1gal	-5
0950	None	1gal	9.21	15.49	6.40	0.432	<1000	Light Gray Brown no odor or sheen purged dry after 1gal	-18

Tetra Tech NUS, Inc.

MONITORING WELL DEVELOPMENT RECORD

Well: S43PZ003
Site: Site 43
Date Installed: 5-1-13
Date Developed: 5/8/13
Dev. Method: Surge + Purge
Pump Type: Waterra

Depth to Bottom (ft.): 17.27
Static Water Level Before (ft.): 3.40
Static Water Level After (ft.): 5.37
Screen Length (ft.): 10'
Specific Capacity:
Casing ID (in.): 1"

Responsible Personnel: Chuck Meyer
Drilling Co.: Vironex
Project Name: Indian Head Site 43 Toluene Spill
Project Number: 112G00271

Time	Estimated Sediment Thickness (Ft.)	Cumulative Water Volume (Gal.)	Water Level Readings (Ft. below TOC)	Temperature (Degrees C)	pH	Specific Conductance (Units _____)	Turbidity (NTU)	Remarks (odor, color, etc.)	ORP
0850		1 gal	3.40	14.08	6.5	0.283	<1000	Gray brown no odor or sheen purged dry after 1 gallon	-63
1015		2.5 gal	3.40	14.63	6.35	0.253	<1000	Gray no odor or sheen purged dry after 2 gallons	

Tetra Tech NUS, Inc.

MONITORING WELL DEVELOPMENT RECORD

Well: S43PZ004
Site: Site 43
Date Installed: 5-1-13
Date Developed: 5/8/13 and 5-3-13
Dev. Method: Surge + Purge
Pump Type: Wattera

Depth to Bottom (ft.): 17.11
Static Water Level Before (ft.): 11.91
Static Water Level After (ft.):
Screen Length (ft.): 10'
Specific Capacity:
Casing ID (in.): 1"

Responsible Personnel: Chuck Meyer
Drilling Co.: Vironix
Project Name: Site 43 Toluene Spill Area
Project Number: 112G00771

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.)
1045	None	0.5	11.91	15.57	6.71	0.504	<1000	Light Brown No odor at start purged 0.5 gallons by hand ORP 57
		On 5-3-13 pulled 1.5 gal water w/ check valve w/o parameter (Silty light brown)						

Tetra Tech

MONITORING WELL DEVELOPMENT RECORD

Well: S43MW27
Site: 43
Date Installed: 4-30-13
Date Developed: 5-8-13
Dev. Method: Manual surge
Pump Type: Surge Block/Check Valve Typhoon Pump

Depth to Bottom (ft.): 25.03
Static Water Level Before (ft.): 8.93
Static Water Level After (ft.): 7.52
Screen Length (ft.): 10'
Specific Capacity:
Casing ID (in.): 2"

Responsible Personnel: J. Birkett
Drilling Co.: Vironex
Project Name: NSF-Indian Head Site 43
Project Number: 112G00771

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.)
0830	Start	developing	8.93	w/surge block and check valve by hand				
0840		5 gal	—	15.48	4.79	0.256	OverRange	light brown silt
0848		10 gal	9.43	14.63			" "	" "
	Discontinue ~~Waterra~~, switch surge block/check valve to typhoon pump							
0858		15 gal	12.25	14.01	5.29	0.142	" "	" "
0903		30 gal		13.13	5.46	0.137	" "	" "
0915		50 gal		13.08	5.47	0.127	7.192	" "

Tetra Tech

MONITORING WELL DEVELOPMENT RECORD

2000 5-13-13

Well: S43MW 28
Site: 43
Date Installed: 4-30-13
Date Developed: 5-7-13
Dev. Method: Waterra
Pump Type: Waterra and Typhoon

Depth to Bottom (ft.): ~~10.84~~
Static Water Level Before (ft.): 11.57
Static Water Level After (ft.): 10.84
Screen Length (ft.): 10'
Specific Capacity:
Casing ID (in.): 2

Responsible Personnel: J. Birkett
Drilling Co.: Vironex
Project Name: NSF-Indian Head Site 43
Project Number: 112G00771

	Time	Estimated Sediment Thickness (Ft.)	Cumulative Water Volume (Gal.)	Water Level Readings (Ft. below TOC)	Temperature (Degrees C)	pH	Specific Conductance (Units _____)	Turbidity (NTU)	Remarks (odor, color, etc.)
	0920	Start	development						
	0935	~1 GPM	~10 gal	19.*	14.94	5.99	0.706	11185	tan color Start pumping at
	1000	>1 GPM	~15 gal	19.*	14.46	6.29	0.579	8108	top of water column but the well went dry too fast
5-7-13			lower pump progressively at 0945 shut off pump let recharge. Restart at 0955.						
— —			But well goes dry again. Discontinue waterra, will Finish off by hand						
5-8-13	0958		20 gal	17.43	13.75	6.00	0.495	2170	tan tint
	1005	Dry	25 gal	19*	—	—	—	—	" "

19* sitting on check valve

Tetra Tech

MONITORING WELL DEVELOPMENT RECORD

Well: S43MW 29
Site: 43
Date Installed: 4-28-13
Date Developed: 5-7-13
Dev. Method: Waterra
Pump Type: Waterra and Typhoon

Depth to Bottom (ft.): 21.31
Static Water Level Before (ft.): 10.86
Static Water Level After (ft.): 10.05
Screen Length (ft.): 10'
Specific Capacity:
Casing ID (in.): 2"

Responsible Personnel: J. Birkett
Drilling Co.: Vironex
Project Name: NSF-Indian Head Site 43
Project Number: 112G00771

Time	Estimated Sediment Thickness (Ft.)	Cumulative Water Volume (Gal.)	Water Level Readings (Ft. below TOC)	Temperature (Degrees C)	pH	Specific Conductance (Units _____)	Turbidity (NTU)	Remarks (odor, color, etc.)
1020	Start	development w/ check valve at top of water column, move down every 5-10 min						
1040		6 gal	—	14.96	5.70	0.155	OverRange	Brown/Gray muddy (silty
1055		13 gal	—	14.49	5.29	0.129	" "	light brown/gray
1120		23 gal	—	14.40	5.23	0.107	" "	" "
1140		36 gal	—	14.31	5.30	0.105	" "	" "
1200		50 gal	—	14.13	5.30	0.110	" "	" "
	Remove Waterra and use typhoon pump							
1220	Start	purge						
1225		70 gal	12.73	14.56	5.17	0.088	" "	" "
1230		90 gal	12.05	14.29	5.14	0.093	2664	
1235		105 gal	12.59	14.52	5.30	0.097	1467	" "

Tetra Tech

MONITORING WELL DEVELOPMENT RECORD

Well: S43MW30
Site: 43
Date Installed: 5-2-13
Date Developed: 5-7-13
Dev. Method: Waterra Check Valve/Typhoon
Pump Type: " "

Depth to Bottom (ft.): 41.49
Static Water Level Before (ft.): 26.8
Static Water Level After (ft.): 26.79
Screen Length (ft.): 5'
Specific Capacity:
Casing ID (in.): 2"

Responsible Personnel: J. Birkell
Drilling Co.: Vironex
Project Name: NSF-Indian Head Site 43
Project Number: 112G00771

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.)
1500	Start	development w/ waterra						
1515		10 gal	26.93	21.71	6.49	0.253	OverRange	DK Gray silty
1530		20 gal		20.18	6.41	0.230	216!	Gray color
1545		30 gal		19.02	6.46	0.236	OverRange	DK Gray silty
1600	Stop Waterra, use typhoon	40 gal				JB 5-7-13		
1615		65 gal		20.51	6.27	~~20.45~~ 0.224	292	light gray
1630		85 gal		19.68	6.33	0.219	OverRange	light gray 25 ~~65~~ NTU 1min after
1640		105 gal		19.16	6.30	0.217	253	light gray

Appendix F

Monitoring Well Groundwater Sample and Low Flow Purge Data Sheets

2011

Monitoring Well Groundwater Sample and Low Flow Purge Data Sheets

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43 MW01 03
Sample Location: MW01
Sampled By: K. SIMPSON
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 6.17.11	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1040	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Low Flow - Peristaltic	LT cloudy	5.59	0.288	17.0	52	1.25	0	110

PURGE DATA:

Date: 6.17.11	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): —								
Well Casing Diameter & Material								
Type: 2" PVC FM	See Low Flow Purge Sheet for Details							
Total Well Depth (TD): 18.75								
Static Water Level (WL): 6.70								
One Casing Volume (gal/L): 2.0								
Start Purge (hrs): 0930								
End Purge (hrs): 1040								
Total Purge Time (min): 70								
Total Vol. Purged (gal/L): 4.7								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	✓
Total Metals	HNO3	1 - 250mL poly bottle	✓
Filtered Metals 0.45 uM	HNO3	1 - 250mL poly bottle	✓
Total CN	NaOH	1 - 250mL poly bottle	✓
Explosives	--	2 - 1L Amber glass	✓
Filtered Perchlorate 0.2 uM	--	1 - 250mL poly bottle	✓
Anions (Cl-, NO3, NO2, SO4), Alkalinity	--	1 - 250mL poly bottle	✓
MEE	HCl	3 - 40mL glass vials	✓
Sulfide	Zn Acetate	1 - 250mL poly bottle	✓
Dissolved TOC (Field Filtered) 0.45 uM	H2SO4	2 - 40mL glass vials	✓

OBSERVATIONS / NOTES:

Field Test Kits
Ferrous Iron = 1.0 mg/L
~~Nitrate~~
~~Nitrite~~

RED O DYE NO OIL NOTED

PUMP INLET (TUBING) SET 5' OFF BTM

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	

Signature(s): [illegible]

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771

WELL ID.: MW01
DATE: 6.17.11

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments START PURGE
0930	6.70	250								CLOUDY NO ODOR
0940			6.21	0.331	263	4.30	19.2	0	0	
0950			5.83	0.318	149	3.23	18.2	89		
1000			5.87	0.304	155	2.91	17.6	111		
1010			5.82	0.313	100	1.43	17.2	102		
1020			5.67	0.304	80	1.28	17.1	108		CLEARING
1030			5.61	0.290	61	1.27	16.9	112		
1040			5.59	0.288	52	1.25	17.0	110		

SIGNATURE(S): [illegible]

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43 MW02 03
Sample Location: MW02
Sampled By: K. SIMPSON
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 6-17-11	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1245	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Low Flow - Peristaltic	CLEAR	4.39	0.326	18.5	0.4	2.12	0	350

PURGE DATA:

Date: 6-17-11	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): —								
Well Casing Diameter & Material.								
Type: 2" PVC FM	See Low Flow Purge Sheet for Details							
Total Well Depth (TD): 21.40								
Static Water Level (WL): 11.00								
One Casing Volume (gal/L): 1.6								
Start Purge (hrs): 1145								
End Purge (hrs): 1245								
Total Purge Time (min): 60								
Total Vol. Purged (gal/L): 4.0								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs TCE ONLY	HCl	3 - 40mL glass vials	✓
Total Metals	HNO3	COLBALT 1 - 250mL poly bottle	✓
Filtered Metals .45 um	HNO3	ONLY 1 - 250mL poly bottle	✓
Total CN	NaOH	1 - 250mL poly bottle	✓
~~Explosives~~	—	~~2 - 1L Amber glass~~	
~~Filtered Perchlorate .2 um~~	--	~~1 - 250mL poly bottle~~	
Anions (Cl-, NO3, NO2, SO4), Alkalinity	--	1 - 250mL poly bottle	✓
MEE	HCl	3 - 40mL glass vials	✓
Sulfide	Zn Acetate	1 - 250mL poly bottle	✓
Dissolved TOC (Field Filtered) .45 um	H2SO4	2 - 40mL glass vials	✓

OBSERVATIONS / NOTES:

Field Test Kits
Ferrous Iron =
~~Nitrate~~
~~Nitrite~~ RED O DYE = NO OIL NOTED

PUMP INLET (TUBING) SET 5' OFF BTM

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771

WELL ID.: S43 MW 02
DATE: 6-17-11

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % ~~Dr ppt~~	Comments START PURGE
1145	11.00	250								CLEAR, NO ODOR
1155	11.06		4.51	0.322	40	2.84	18.7	178	0	
1205	11.06		4.46	0.339	9.4	2.11	18.0	291		
1215			4.44	0.323	1.7	2.20	18.6	322		
1225			4.39	0.326	1.3	2.16	18.6	341		
1231			4.38	0.326	0.9	2.14	18.6	352		
1245			4.39	0.326	0.4	2.12	18.5	350		

SIGNATURE(S): [illegible]

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43MW00301
Sample Location: S43MW03
Sampled By: J Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 6-17-11	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1357	(Visual)	(S.U.)	(mS/cm)	(°C)	(NTU)	(mg/l)	(%)	(mV)
Method: Low Flow - Peristaltic	clear	5.84	0.278	17.65 ~~4.52~~ JB	4.02	0.99	0.0	-28

PURGE DATA:

Date: 6-17-11	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm):								
Well Casing Diameter & Material Type: 2" PVC	See Low Flow Purge Sheet for Details							
Total Well Depth (TD): 36.72								
Static Water Level (WL): 16.14								
One Casing Volume(gal/L):								
Start Purge (hrs): 1300								
End Purge (hrs): 1357								
Total Purge Time (min): 57								
Total Vol. Purged (gal/L): 5 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	9 ~~8~~ - 40mL glass vials	yes
Total Metals	HNO3	3 ~~1~~ - 250mL poly bottle	yes
Filtered Metals	HNO3	3 ~~1~~ - 250mL poly bottle	yes
Total CN	NaOH	3 ~~1~~ - 250mL poly bottle	yes
Explosives	--	6 ~~2~~ - 1L Amber glass	yes
Filtered Perchlorate	--	3 ~~1~~ - 250mL poly bottle	yes
Anions (Cl-, NO3, NO2, SO4), Alkalinity	--	1 - 250mL poly bottle	no
MEE	HCl	3 - 40mL glass vials	no
Sulfide	Zn Acetate	1 - 250mL poly bottle	no
Dissolved TOC (Field Filtered)	H2SO4	2 - 40mL glass vials	no

OBSERVATIONS / NOTES:

Field Test Kits
Ferrous Iron = 5.0 ppm
Nitrate
Nitrite

Oil Red O dye: No indication of DNAPL

Circle if Applicable:

MS/MSD	Duplicate ID No.:
Yes	

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771

WELL ID.: S43MW03
DATE: 6-17-11

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
1300	~~PK~~ 16.14									
1305	16.40	300	6.06	0.192	53.6	2.44	16.86	-11	0.0	clear
1310	16.45	300	6.04	0.219	8.35	1.68	16.62	-24	0.0	
1315	16.47	300	6.02	0.234	2.77	1.40	16.82	-27	0.0	
1320	16.50	300	5.98	0.247	1.29	1.21	16.91	-29	0.0	
1325	16.52	300	5.98	0.258	0.00	1.13	16.95	-30	0.0	
1330	16.55	300	5.96	0.278	0.00	1.07	17.21	-31	0.0	
1335	16.57	300	5.93	0.287	0.38	0.99	17.29	-30	0.0	
1340	16.56	300	5.87	0.280	0.38	0.97	17.59	-28	0.0	2 3/4 gal
1345	16.56	300	5.87	0.280	2.60	0.98	17.64	-28	0.0	
1350	16.56	300	5.84	0.263	4.01	0.98	17.65	-28	0.0	
1355	16.56	300	5.84	0.278	4.02	0.99	17.65	-28	0.0	
1357	Collect sample									

SIGNATURE(S): [signature]

PAGE 1 OF 1

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43 MW00401
Sample Location: S43MW04
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 6-17-11	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 0918	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Low Flow - Peristaltic	Clear	4.53	0.211	15.86	0.50	1.28	0.0	115

PURGE DATA:

Date: 6-17-11	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm):								
Well Casing Diameter & Material								
Type: 2" PVC	See Low Flow Purge Sheet for Details							
Total Well Depth (TD):								
Static Water Level (WL): 9.51								
One Casing Volume(gal/L):								
Start Purge (hrs): 0825								
End Purge (hrs): 0918								
Total Purge Time (min): 53								
Total Vol. Purged (gal/L): 5 1/4 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes
Total Metals	HNO3	1 - 250mL poly bottle	yes
Filtered Metals	HNO3	1 - 250mL poly bottle	yes
Total CN	NaOH	1 - 250mL poly bottle	yes
Explosives	--	2 - 1L Amber glass	yes
Filtered Perchlorate	--	1 - 250mL poly bottle	yes
Anions (Cl-, NO3, NO2, SO4), Alkalinity	--	1 - 250mL poly bottle	yes
MEE	HCl	3 - 40mL glass vials	yes
Sulfide	Zn Acetate+NaOH	1 - 250mL poly bottle	yes
Dissolved TOC (Field Filtered)	H2SO4	2 - 40mL glass vials	yes

OBSERVATIONS / NOTES:

Field Test Kits
Ferrous Iron = 2.8 ppm
Nitrate
Nitrite

Oil Red O dye = no indication of DNAPL

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	S43MW00401-D

Signature(s): [signature]

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771

WELL ID.: S43MW04
DATE: 6-17-11

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
0825	9.51									Start purge
0826	9.73	350	5.06	0.136	0.99	5.09	17.20	146	0.0	clear
0831	9.80	350	4.80	0.159	0.00	2.10	15.77	118	0.0	
0836	9.83	350	4.52	0.171	0.07	1.83	15.59	126	0.0	
0841	9.85	350	4.43	0.173	0.00	1.65	15.54	127	0.0	
0846	9.87	350	4.42	0.161	0.22	1.63	15.54	125	0.0	
0851	9.88	350	4.43	0.159	0.22	1.51	15.59	124	0.0	
0856	9.88	350	4.44	0.159	0.39	1.40	15.63	122	0.0	3 gal
0901	9.86	350	4.47	0.162	1.12	1.35	15.64	119	0.0	
0906	9.85	350	4.51	0.211	0.43	1.30	15.79	117	0.0	4 gal
0911	9.85	350	4.53	0.214	0.39	1.25	15.88	116	0.0	
0916	9.85	350	4.53	0.211	0.50	1.28	15.86	115	0.0	5 gal
0918	Collect sample									

SIGNATURE(S): [illegible]

PAGE 1 OF 1

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43 MW05-01
Sample Location: MW05
Sampled By: R. SIMPSON
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (^{0}C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Date: 6.17.11								
Time: 1530								
Method: Low Flow - Peristaltic	LT. CLOUDY	5.30	0.116	17.0	67	1.07	0	64

PURGE DATA:

	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Date: 6.17.11								
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): —								
Well Casing Diameter & Material. Type: 2" PVC FM	See Low Flow Purge Sheet for Details							
Total Well Depth (TD): 30.50								
Static Water Level (WL): 8.02								
One Casing Volume (gal/l):								
Start Purge (hrs): 1420								
End Purge (hrs): 1530								
Total Purge Time (min): 70								
Total Vol. Purged (gal/l): 4.6								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	✓
Total Metals	HNO3	1 - 250mL poly bottle	✓
Filtered Metals .45 uM	HNO3	1 - 250mL poly bottle	✓
Total CN	NaOH	1 - 250mL poly bottle	✓
Explosives	--	2 - 1L Amber glass	✓
Filtered Perchlorate .2 uM	--	1 - 250mL poly bottle	✓
~~Anions (Cl, NO3, NO2, SO4), Alkalinity~~	--	~~1 - 250mL poly bottle~~	—
~~MEE~~	~~HCl~~	~~3 - 40mL glass vials~~	—
~~Sulfide~~	~~Zn Acetate~~	~~1 - 250mL poly bottle~~	—
~~Dissolved TOC (Field Filtered)~~	H2SO4	~~2 - 40mL glass vials~~	—

OBSERVATIONS / NOTES:

Field Test Kits
Ferrous Iron = 2.5 mg/L
~~Nitrate~~
~~Nitrite~~
RED O DYE NO OIL NOTED

PUMP INLET (TUBING) SET 5' OFF BTM

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771

WELL ID.: MW05
DATE: 6.17.11

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % ~~or ppt~~	Comments START PURGE
1420	8.02	250								CLEAR, NO ODOR
1430			5.57	0.117	6.3	2.77	17.1	67	0	
1440			5.24	0.112	8.1	1.34	16.4	84		
1450			5.20	0.113	90	1.19	16.5	83		CLOUDY
1500			5.16	0.115	211	1.13	16.5	84		
1510			5.26	0.115	149	1.10	17.0	76		
1520			5.29	0.115	84	1.08	17.0	69		
1530			5.30	0.116	67	1.07	17.0	64		

SIGNATURE(S): [illegible]

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43MW00601
Sample Location: S43MW006
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 6-17-11	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1130	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Low Flow - Peristaltic	tan tint	5.80	0.290	16.75	610	0.96	0.0	13

PURGE DATA:

Date: 6-17-11	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm):								
Well Casing Diameter & Material:								
Type: 2" PVC	See Low Flow Purge Sheet for Details							
Total Well Depth (TD):								
Static Water Level (WL): 6.67								
One Casing Volume(gal/L):								
Start Purge (hrs): 1029								
End Purge (hrs): 61								
Total Purge Time (min): 1130								
Total Vol. Purged (gal/L): 5 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes
Total Metals	HNO3	1 - 250mL poly bottle	yes
Filtered Metals	HNO3	1 - 250mL poly bottle	yes
Total CN	NaOH	1 - 250mL poly bottle	yes
Explosives	--	2 - 1L Amber glass	yes
Filtered Perchlorate	--	1 - 250mL poly bottle	yes
Anions (Cl-, NO3, NO2, SO4), Alkalinity	--	1 - 250mL poly bottle	yes
MEE	HCl	3 - 40mL glass vials	yes
Sulfide	NaOH Zn Acetate	1 - 250mL poly bottle	yes
Dissolved TOC (Field Filtered)	H2SO4	2 - 40mL glass vials	yes

OBSERVATIONS / NOTES:

Field Test Kits
Ferrous Iron = 4.2 ppm
Nitrate
Nitrite

Oil Red O dye = No indication of DNAPL

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771

WELL ID.: S43MW06
DATE: 6-17-11

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
1029	6.67	Start purge								
1030	8.23	300	5.92	0.270	17.2	2.19	17.02	11	0.0	clear
1035	8.96	300	5.86	0.271	15.8	1.56	16.95	7	0.0	
1040	9.45	300	5.79	0.311	14.4	1.26	16.79	9	0.0	
1045	9.76	300	5.72	0.341	15.9	1.16	16.70	12	0.0	1 3/4 gal
1050	9.91	300	5.68	0.353	22.0	1.10	16.66	14	0.0	Turbid tan water at 1052
1058	10.10	300	5.59	0.367	2854	1.03	16.65	14	0.0	tan (silty)
1103	9.99	300	5.61	0.361	1505	1.01	16.79	11	0.0	tan (silty)
1108	9.94	300	5.64	0.346	830	1.00	16.69	7	0.0	
1113	9.95	300	5.68	0.334	575	0.99	16.69	3	0.0	3 gal
1118	9.95	300	5.74	0.319	292	0.98	16.70	-3	0.0	
1123	9.96	300	5.76	0.306	214	0.97	16.70	-6	0.0	
1128	9.96	300	5.80	0.290	610	0.96	16.75	13	0.0	
1130	Collect sampler									

SIGNATURE(S): [signature]

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2012

Monitoring Well Groundwater Sample and Low Flow Purge Data Sheets

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43MW0104
Sample Location: MW 01
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[] Low Concentration
[X] High Concentration

SAMPLING DATA:

Date: 7-22-12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1430	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Low Flow - Peristaltic	Clear	5.05	0.277	19.74	7.30	0.75	0.1	75

PURGE DATA:

Date: 7-22-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): —								
Well Casing Diameter & Material Type: 2" PVC	See Low Flow Purge Sheet for Details							
Total Well Depth (TD): 18.75								
Static Water Level (WL): 8.46								
One Casing Volume(gal/L):								
Start Purge (hrs): 1343								
End Purge (hrs): 1430								
Total Purge Time (min): 47								
Total Vol. Purged (gal/L): 3½ gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes
Total Metals	HNO3	1 - 250mL poly bottle	yes
Filtered Metals	HNO3	1 - 250mL poly bottle	yes
Explosives	--	2 - 1L Amber glass	yes

OBSERVATIONS / NOTES:

Field Test Kits
Ferrous Iron = — ppm

Oil red O dye No.

Pull tubing 1' off bottom
"-F" added to sample ID for filtered sample

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	S43MW0104-D 1431

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771

WELL ID.: S43MW01
DATE: 7-22-12

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
1343	8.46									
1348	8.49	300	5.36	0.250	40.9	4.92	20.92	38	0.1	clear
1353	8.49	300	5.25	0.255	35.4	3.47	20.19	50	0.1	clear
1358	8.49	300	5.04	0.268	28.4	2.03	19.81	65	0.1	clear 1 gal
1403	8.49	300	5.02	0.267	16.2	1.40	19.55	69	0.1	clear
1408	8.49	300	5.01	0.269	12.5	1.14	19.48	72	0.1	clear
1413	8.49	275	5.02	0.271	10.44	1.03	19.50	72	0.1	clear
1418	8.49	275	5.03	0.273	9.61	0.86	19.57	71	0.1	clear 2 1/2 gal
1423	8.49	275	5.04	0.276	8.36	0.79	19.73	74	0.1	clear
1428	8.49	275	5.05	0.277	7.30	0.75	19.74	75	0.1	clear
1430	Collect sample									

SIGNATURE(S): [signature]

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Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head, Site 43
Project No.: 112G00711

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

Sample ID No.: S43MW02-04
Sample Location: S43MW02
Sampled By: JB/RS/RW
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 7/22/12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 1150	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	ORP
Method: low flow	Clear	4.24	0.277	21.45	26.2	0.0	0.1	320

PURGE DATA:

Date: 7/22/12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Method: low flow	See	low	flow	purge	logsheet			
Monitor Reading (ppm):								
Well Casing Diameter & Material								
Type: 2-inch PVC								
Total Well Depth (TD): 21.40								
Static Water Level (WL): 11.68								
One Casing Volume(gal/L):								
Start Purge (hrs): 1120								
End Purge (hrs): 1150								
Total Purge Time (min): 30								
Total Vol. Purged (gal/L): 3								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
~~VOCs~~ TCE	HCL	(3) 40 mmL glass vials	yes
~~Energetics~~	-	~~(2) 1 Liter Amber Glass~~	
Total ~~Metals~~ Co	HNO3	500 mL Poly	yes
Filtered ~~Metals~~ (0.45 micro field filter) Co	HNO3	500 mL Poly	yes

OBSERVATIONS / NOTES:

Filter Co sample ID - S43MW02-04F

Circle if Applicable:

MS/MSD	Duplicate ID No.:	Signature(s):
—	S43MW02-04D / S43MW02-04FD	

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Indian Head, Site 43
PROJECT NUMBER: 112G00771

WELL ID.: S43MW 02
DATE: 7/22/12

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
1120	11.68	175-200	4.33	0.352	274	1.17	21.82	222	0.2	
1125	11.71	" "	4.24	0.312	23.5	0.00	20.56	282	0.1	
1130	11.71	" "	4.23	0.289	21.1	0.00	21.01	315	0.1	
1135	11.71	" "	4.26	0.275	23.7	0.00	21.34	319	0.1	
1140	11.71	" "	4.25	0.277	24.5	0.00	21.45	319	0.1	
1145	11.71	" "	4.24	0.277	26.5	0.0	21.45	320	0.1	
1150	11.71	" "	4.24	0.277	26.2	0.0	21.45	320	0.1	

SIGNATURE(S): for Ernie Wu

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Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head, Site 43
Project No.: 112G00711

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

Sample ID No.: S43MW0302
Sample Location: MW03
Sampled By: JB/RS/EW
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 7/22/12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 1155	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	
Method: low flow	clear	5.75	0.404	21.08	3.48	0.0	0.2	

PURGE DATA:

Date: 7/22/12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Method: low flow	See	low	flow	purge	logsheet			
Monitor Reading (ppm): 0								
Well Casing Diameter & Material								
Type: 2-inch PVC								
Total Well Depth (TD): 34 → 36.72 ft	BTOC							
Static Water Level (WL): 16.76								
One Casing Volume(gal/L): 2.81								
Start Purge (hrs): 1050								
End Purge (hrs): 1155								
Total Purge Time (min): 65								
Total Vol. Purged (gal/L): 2.5 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCL	(3) 40 mmL glass vials	yes
Energetics	-	(2) 1 Liter Amber Glass	yes
Total Metals	HNO3	500 mL Poly	yes
Filtered Metals (0.45 micro field filter)	HNO3	500 mL Poly	yes

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD — Duplicate ID No.:

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Indian Head, Site 43
PROJECT NUMBER: 112G00771
WELL ID.: S43MW03
DATE: 7/22/12

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
1100	17.08	260	5.54	0.372	21.2	0.12	21.27	-16	0.2	
1105	17.08	200	5.64	0.381	21.2	0.0	20.73	-37	0.2	
1110	17.08	200	5.70	0.385	K ~~20.5~~ 13.2	0.0	20.42	-45	0.2	
1115	17.08	200	5.71	0.386	9.19	0.0	20.45	-46	0.2	
1120	17.09	180	5.72	0.387	6.95	0.0	20.49	-48	0.2	
1125	17.13	180	5.73	0.394	6.62	0.0	20.67	-50	0.2	
1130	17.14	180	5.74	0.398	6.43	0.0	20.72	-53	0.2	
1135	17.16	180	5.75	0.404	3.52	0.0	20.89	-56	0.2	
1140	17.17	180	5.75	0.403	3.51	0.0	20.93	-56	0.2	
1145	17.17	180	5.75	0.404	3.50	0.0	21.00	-57	0.2	
1150	17.17	180	5.75	0.404	3.48	0.0	21.08	-57	0.2	

SIGNATURE(S): [signature]
For Rob Sok

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: INDIAN HEAD Site 43
Project No.:

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

Sample ID No.: 543MW04-02
Sample Location: 543MW04
Sampled By: EW
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 7/22/12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 1510	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	ORP
Method: low flow	clear	4.87	0.129	21.36	24.6	0.0	0.1	38

PURGE DATA:

Date: 7/22/12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Method: low flow	see	low	flow	purge	log	sheet		
Monitor Reading (ppm):								
Well Casing Diameter & Material								
Type: 2" PVC								
Total Well Depth (TD): 35								
Static Water Level (WL): 11.20								
One Casing Volume(gal/L):								
Start Purge (hrs): 1435								
End Purge (hrs): 1510								
Total Purge Time (min): 35								
Total Vol. Purged (gal/L): 3 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOC	HCL	(3) 40 ml Glass Vial	yes
ENERGETICS	—	(2) 1 L AMBER	yes
TOTAL METALS	HNO_3	(1) POLY 500ml	yes
FILTER METALS	HNO_3	(1) " "	yes

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
YES	—

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: INDIAN HEAD Site 43
PROJECT NUMBER:

WELL ID.: S43MW04
DATE: 7/22/12

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
1435	11.20	200	4.49	0.133	102	9.23	19.06	84	0.0	
1440	11.46	200	5.41	0.132	362	0.79	22.31	36	0.0	
1445	11.46	200	5.18	0.123	285	0.00	20.98	37	0.0	
1450	11.46	200	5.04	0.125	222	0.0	20.76	37	0.1	
1455	11.46	200	4.96	0.127	212	0.0	20.73	38	0.1	
1500	11.46	200	4.90	0.128	80.3	0.0	20.76	39	0.1	
1505	11.46	200	4.89	0.129	41.8	0.0	21.24	37	0.1	
1510	11.46	200	4.87	0.129	24.6	0.0	21.36	38	0.1	

SIGNATURE(S):

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head, Site 43
Project No.: 112G00711

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

Sample ID No.: S43MW0502
Sample Location: MW05
Sampled By: JB/RS/EW
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 7/22/12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 1025	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	
Method: low flow	clear	4.44	0.173	18.22	2.0	0.8	0.1	

PURGE DATA:

Date: 7/22/12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Method: low flow	See	low	flow	purge	logsheet			
Monitor Reading (ppm): 0								
Well Casing Diameter & Material								
Type: 2-inch PVC								
Total Well Depth (TD): 31 → 30.5' BTOC								
Static Water Level (WL): 9.05								
One Casing Volume(gal/L): 3.57								
Start Purge (hrs): 0930								
End Purge (hrs): 1030								
Total Purge Time (min): 60								
Total Vol. Purged (gal/L): 3 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCL	(3) 40 mmL glass vials	yes
Energetics	-	(2) 1 Liter Amber Glass	yes
Total Metals	HNO3	500 mL Poly	yes
Filtered Metals (0.45 micro field filter)	HNO3	500 mL Poly	yes

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Indian Head, Site 43
PROJECT NUMBER: 112G00771

WELL ID.: S43MW05
DATE: 7/22/12

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
0935	9.08	280	4.49	0.227	8.3	0.43	20.36	147	0.1	
0940	9.09	280	4.76	0.208	6.9	0.10	19.58	115	0.1	
0945	9.09	230	4.77	0.192	4.1	0.0	18.81	115	0.1	
0950	9.09	200	4.74	0.187	5.4	0.0	18.70	117	0.1	
0955	9.09	200	4.68	0.183	8.2	0.0	18.65	120	0.1	
1000	9.09	200	4.64	0.182	8.9	0.0	18.65	123	0.1	
1005	9.10	200	4.55	0.177	12.4	0.0	18.49	127	0.1	
1010	9.10	200	4.48	0.174	10.0	0.0	18.25	132	0.1	
1015	9.10	200	4.46	0.174	4.3	0.0	18.23	132	0.1	
1020	9.10	200	4.45	0.173	2.2	0.0	18.21	133	0.1	
1025	9.10	200	4.44	0.173	2.0	0.0	18.22	133	0.1	

SIGNATURE(S): [illegible]

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43MW0602
Sample Location: MW06
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 7-21-12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1803	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Low Flow - Peristaltic	slight brown tint	5.71	0.537	18.24	9.1	0.97	0.2	-25

PURGE DATA:

Date: 7-21-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): —								
Well Casing Diameter & Material								
Type: 2" PVC	See Low Flow Purge Sheet for Details							
Total Well Depth (TD): 27								
Static Water Level (WL): 8.07								
One Casing Volume(gal/L):								
Start Purge (hrs): 1656								
End Purge (hrs): 1803								
Total Purge Time (min): 67								
Total Vol. Purged (gal/L): 4 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes
Total Metals	HNO3	1 - 250mL poly bottle	yes
Filtered Metals	HNO3	1 - 250mL poly bottle	yes
Explosives	--	2 - 1L Amber glass	yes

OBSERVATIONS / NOTES:

Field Test Kits
Ferrous Iron = 6.6 ppm

Pull tubing 2' off bottom

Oil red O dye None

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771

WELL ID.: S43MW06
DATE: 7-21-12

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
1656	8.07									
1701	9.83	400	5.29	0.514	OverRange	10.61	19.83	34	0.2	brown/red
1706	10.06	400	5.69	0.523	912	3.96	18.77	35	0.2	" "
1711	9.95	300	5.73	0.539	825	2.77	18.63	17	0.2	slight brown color 1gal
1716	9.95	300	5.74	0.540	793	2.24	18.55	7	0.2	" "
1721	9.94	300	5.76	0.544	525	2.10	18.14	-2	0.2	" "
1726	9.91	300	5.83	0.540	611	2.14	18.27	-14	0.2	" " 2gal
1731	9.76	250	5.75	0.540	213	1.54	18.25	-13	0.2	" "
1736	9.74	225	5.75	0.540	188	1.41	18.27	-14	0.2	" "
1741	9.74	225	5.73	0.539	106.7	1.26	18.24	-17	0.2	" " 2 3/4 gal
1746	9.74	225	5.72	0.538	101.4	1.13	18.27	-20	0.2	tan tint
1751	9.74	225	5.72	0.539	94.1	1.05	18.38	-22	0.2	" "
1756	9.74	225	5.71	0.539	86.9	1.01	18.24	-24	0.2	" "
1801	9.74	225	5.71	0.539	91.1	0.97	18.24	-25	0.2	" "
1803	Collect sample								0.2	

SIGNATURE(S): [signature]

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43MW 0701
Sample Location: MW07
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 7-22-12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1608	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Low Flow - Peristaltic	Clear	4.36	0.264	16.31	1.63	0.37	0.1	108

PURGE DATA:

Date: 7-22-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): –								
Well Casing Diameter & Material Type: 2" PVC	See Low Flow Purge Sheet for Details							
Total Well Depth (TD):								
Static Water Level (WL): 11.37								
One Casing Volume(gal/L):								
Start Purge (hrs): 1519								
End Purge (hrs): 1608								
Total Purge Time (min): 49								
Total Vol. Purged (gal/L): 3½ gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes
Total Metals	HNO3	1 - 250mL poly bottle	yes
Filtered Metals	HNO3	1 - 250mL poly bottle	yes
Explosives	--	2 - 1L Amber glass	yes

OBSERVATIONS / NOTES:

Field Test Kits
Ferrous Iron = ——— ppm

Pull tubing 1' off bottom

Oil red O dye No

Circle if Applicable:

MS/MSD	Duplicate ID No.:
–	———

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771

WELL ID.: S43MW 07
DATE: 7-22-12

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
1519	11.37									
1521	11.40	300	4.80	0.238	—	6.21	20.71	104	0.1	clear
1526	11.40	300	4.78	0.257	3.72	4.37	17.87	113	0.1	clear
1531	11.40	300	4.68	0.268	2.96	2.06	16.44	120	0.1	clear 1 gal
1536	11.40	300	4.69	0.268	2.24	1.70	16.40	119	0.1	clear
1541	11.40	300	4.69	0.268	1.98	1.46	16.30	119	0.1	clear
1546	11.40	300	4.71	0.267	3.21	1.20	16.35	117	0.1	clear
1551	11.40	300	4.77	0.268	1.82	1.09	16.36	113	0.1	clear 2 1/4 gal
1556	11.40	300	4.84	0.267	0.83	0.96	16.30	109	0.1	clear
1601	11.40	300	4.86	0.266	1.59	0.90	16.73	108	0.1	clear
1606	11.40	300	4.86	0.264	1.63	0.87	16.81	108	0.1	clear 3 1/4 gal
1608	Collect sample									

SIGNATURE(S):

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Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head, Site 43
Project No.: 112G00711

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

Sample ID No.: S43MW08-1
Sample Location: S43MW08
Sampled By: JB/RS/EW
C.O.C. No.:
Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 7/21/12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 1735	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	ORP
Method: low flow	Clear	4.82	0.055	19.01	5.3	0.00		23

PURGE DATA:

Date: 7/21/12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Method: low flow	See	low	flow	purge	logsheet			
Monitor Reading (ppm):								
Well Casing Diameter & Material								
Type: ~~2~~-inch PVC 1-inch								
Total Well Depth (TD):								
Static Water Level (WL): 12.56								
One Casing Volume(gal/L):								
Start Purge (hrs): 1700								
End Purge (hrs): 1735								
Total Purge Time (min): 35								
Total Vol. Purged (gal/L): 2.75 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCL	(3) 40 mmL glass vials	✓
Energetics	-	(2) 1 Liter Amber Glass	✓
Total Metals	HNO3	500 mL Poly	✓
Filtered Metals (0.45 micro field filter)	HNO3	500 mL Poly	✓

OBSERVATIONS / NOTES:

Filter Metal ID- "S43MW08-D1F"

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Indian Head, Site 43
PROJECT NUMBER: 112G00771
WELL ID.: S43MW08
DATE: 7/21/12

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
1700	12.56	200	4.65	0.061	~~18.75~~	1.71	19.82	116		TURB 170 NTU
1705		200	4.91	0.050	209	0.27	19.16	79		
1710	12.61	200	4.95	0.051	73	0.00	19.08	47		
1715	12.61	200	4.97	0.058	22	0.00	18.99	24		
1720		200	4.93	0.056	13.7	0.00	18.93	21		
1725	12.61	200	4.86	0.056	9.5	0.00	19.09	25		
1730	12.61	200	4.83	0.055	6.9	0.00	18.99	23		
1735	12.61	200	4.82	0.055	5.3	0.00	19.01	23		

SIGNATURE(S):

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43MW09S01
Sample Location: MW 09S
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 7-22-12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1010	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Low Flow - Peristaltic	clear	4.28	0.474	19.08	2.75	3.60	0.2	233

PURGE DATA:

Date: 7-22-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): —								
Well Casing Diameter & Material Type: 2" PVC	See Low Flow Purge Sheet for Details							
Total Well Depth (TD): 19.41								
Static Water Level (WL): 10.28								
One Casing Volume(gal/L):								
Start Purge (hrs): 0920								
End Purge (hrs): 1010								
Total Purge Time (min): 50								
Total Vol. Purged (gal/L): 3½ gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes
Total Metals	HNO3	1 - 250mL poly bottle	yes
Filtered Metals	HNO3	1 - 250mL poly bottle	yes
Explosives	--	2 - 1L Amber glass	yes

OBSERVATIONS / NOTES:

Field Test Kits
Ferrous Iron = — ppm

Oil red O dye None

Pulled tubing 1' off bottom

Note for Filtered metal sample
Sample ID is S43MW09S01F

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771

WELL ID.: S43MW09S
DATE: 7-22-12

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
0920	10.28									
0923	10.63	300	4.06	0.622	—	14.10	20.56	242	0.3	clear
0928	11.01	300	4.36	0.471	7.99	8.73	18.24	218	0.2	clear
0933	11.19	250	4.36	0.472	5.19	7.85	18.51	219	0.2	clear 1 gal
0938	11.23	250	4.36	0.474	5.28	6.41	18.82	220	0.2	clear
0943	11.31	225	4.34	0.475	4.12	5.16	19.01	224	0.2	clear
0948	11.35	225	4.33	0.475	3.96	4.76	19.03	225	0.2	clear 2 gal
0953	11.38	225	4.32	0.474	2.79	4.38	19.01	228	0.2	clear
0958	11.42	225	4.30	0.474	3.05	4.02	19.04	230	0.2	clear
1003	11.45	225	4.29	0.474	2.73	3.76	19.07	232	0.2	clear 3 gal
1008	11.46	225	4.28	0.474	2.75	3.60	19.08	233	0.2	clear
1010	Collect sample									

SIGNATURE(S):

PAGE 1 OF 1

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43MW09D01
Sample Location: MW09D
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 7.22.17	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1132	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Low Flow - Peristaltic	clear	6.09	0.415	17.45	11.12	0.63	0.2	-87

PURGE DATA:

Date: 7.22.17	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): ~								
Well Casing Diameter & Material Type: 2" PVC	See Low Flow Purge Sheet for Details							
Total Well Depth (TD):								
Static Water Level (WL):								
One Casing Volume(gal/L):								
Start Purge (hrs): 1027								
End Purge (hrs): 1132								
Total Purge Time (min): 65								
Total Vol. Purged (gal/L): 4 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes
Total Metals	HNO3	1 - 250mL poly bottle	yes
Filtered Metals	HNO3	1 - 250mL poly bottle	yes
Explosives	--	2 - 1L Amber glass	yes

OBSERVATIONS / NOTES:

Field Test Kits
Ferrous Iron = —— ppm

Pulled tubing 1' off bottom
Filtered sample has "-F" added to ID

Oil red O dye None

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771

WELL ID.: S43MW09D
DATE: 7-22-12

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
1027	9.86									
1035	12.45	250	6.04	0.482	—	1.82	17.65	-7	0.2	clear
1040	13.40	250	6.20	0.478	14.3	1.18	17.76	-35	0.2	clear (1 gal)
1045	13.75	250	6.22	0.462	11.0	0.91	17.37	-54	0.2	clear
1050	14.63	250	6.16	0.451	11.51	0.86	17.58	-60	0.2	clear
1055	14.98	250	6.14	0.444	11.33	0.81	17.49	-64	0.2	clear (2 gal)
1100	15.34	250	6.11	0.440	11.7	0.77	17.36	-67	0.2	clear
1105	15.63	250	6.09	0.431	12.8	0.72	17.56	-70	0.2	clear
1110	15.82	250	6.11	0.426	12.6	0.68	17.87	-76	0.2	clear (2 3/4 gal)
1115	15.97	250	6.07	0.421	18.0	0.65	17.81	-78	0.2	clear
1120	16.09	250	6.07	0.420	13.5	0.69	17.21	-80	0.2	clear
1125	16.11	250	6.08	0.416	11.1	0.65	17.42	-84	0.2	clear
1130	16.11	250	6.09	0.415	11.12	0.63	17.45	-87	0.2	clear (4 gal)
1132	Collect sample									

SIGNATURE(S):

PAGE___OF___

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43MW1001
Sample Location: MW 10
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 7-22-12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1310	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Low Flow - Peristaltic	clear	6.02	0.421	19.09	12.4	0.71	0.2	-87

PURGE DATA:

Date: 7-22-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): —								
Well Casing Diameter & Material								
Type: 2" PVC	See Low Flow Purge Sheet for Details							
Total Well Depth (TD):								
Static Water Level (WL): 11.68								
One Casing Volume(gal/L):								
Start Purge (hrs): 1203								
End Purge (hrs): 1310								
Total Purge Time (min): 67								
Total Vol. Purged (gal/L): 4 3/4 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes
Total Metals	HNO3	1 - 250mL poly bottle	yes
Filtered Metals	HNO3	1 - 250mL poly bottle	yes
Explosives	--	2 - 1L Amber glass	yes

OBSERVATIONS / NOTES:

Field Test Kits
Ferrous Iron = — ppm

Pulled tubing 1' off bottom

Oil red O dye None

"-F" added to end of sample ID for filtered sample

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771

WELL ID.: S43MW 10
DATE: 7-22-12

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
1203	11.68									
1208	13.26	300	6.39	0.391	17.3	3.22	23.18	-43	0.2	clear
1213	14.19	300	6.40	0.378	19.3	1.85	22.85	-25	0.2	clear
1218	14.53	300	6.13	0.387	19.6	1.45	22.35	7	0.2	clear 1 gal
1223	14.70	300	5.96	0.403	20.9	1.11	20.71	-31	0.2	clear
1228	15.08	300	5.90	0.421	28.3	1.09	18.60	-39	0.2	clear
1233	15.28	300	5.96	0.423	23.0	0.99	18.54	-56	0.2	clear 2 gal
1238	15.40	250	5.98	0.424	21.9	0.92	18.57	-67	0.2	clear
1243	15.49	250	6.01	0.427	21.9	0.84	18.35	-73	0.2	clear
1248	15.68	250	6.03	0.423	20.7	0.82	18.59	-77	0.2	clear 3 gal
1253	15.78	250	5.99	0.423	18.3	0.75	18.64	-78	0.2	clear
1258	15.90	225	6.03	0.422	13.2	0.72	18.75	-85	0.2	clear
1303	15.93	225	6.00	0.422	14.2	0.71	18.94	-87	0.2	clear 4 gal
1308	15.93	225	6.02	0.421	12.4	0.71	19.09	-87	0.2	clear
1310	Collect sample									

SIGNATURE(S): [signature]

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43MW1101
Sample Location: MW 11
Sampled By: J. Birkell
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 7-21-12	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (^{0}C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Time: 0948								
Method: Low Flow - Peristaltic	clear	5.33	0.215	15.92	0.53	5.77	0.1	36

PURGE DATA:

Date: 7-21-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): —								
Well Casing Diameter & Material Type: 2" PVC	See Low Flow Purge Sheet for Details							
Total Well Depth (TD):								
Static Water Level (WL): 13.81								
One Casing Volume(gal/L):								
Start Purge (hrs): 0900								
End Purge (hrs): 0948								
Total Purge Time (min): 48								
Total Vol. Purged (gal/L): 3/4 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	9 ~~8~~ - 40mL glass vials	yes
Total Metals	HNO3	3 ~~1~~ - 250mL poly bottle	yes
Filtered Metals	HNO3	3 ~~1~~ - 250mL poly bottle	yes
Explosives	--	6 ~~2~~ - 1L Amber glass	yes

OBSERVATIONS / NOTES:

Field Test Kits
Ferrous Iron = 6.0 ppm

Pull tubing 1' off bottom

Oil red O dye None

Circle if Applicable:

MS/MSD	Duplicate ID No.:
yes	—

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771

WELL ID.: S43MW 11
DATE: 7-21-12

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
0900	13.81									
0905	13.88	300	4.53	0.209	1.72	7.75	17.21	145	0.1	clear
0910	14.21	300	4.91	0.209	0.87	7.96	16.13	96	0.1	clear
0915	14.20	275	5.12	0.212	0.73	7.75	16.07	75	0.1	clear 1 gal
0920	14.20	275	5.26	0.214	0.84	7.05	15.90	56	0.1	clear
0925	14.21	275	5.32	0.215	0.98	6.60	15.89	47	0.1	clear
0930	14.21	275	5.33	0.215	0.61	6.39	15.86	44	0.1	clear 2 gal
0935	14.21	275	5.33	0.215	0.57	6.39	15.83	41	0.1	clear
0940	14.21	275	5.33	0.215	0.74	5.94	15.79	38	0.1	clear
0945	14.21	275	5.33	0.215	0.53	5.77	15.92	36	0.1	clear 3 gal
0948	Collect sample									

SIGNATURE(S):

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head, Site 43
Project No.: 112G00711

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

Sample ID No.: S43MW 1201
Sample Location: MW12
Sampled By: JB/RS/EW
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 7/22/12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 1345	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	
Method: low flow	clear	5.90	0.183	20.95	8.85	0.0	0.1	

PURGE DATA:

Date: 7/22/12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Method: low flow	See	low	flow	purge	logsheet			
Monitor Reading (ppm):								
Well Casing Diameter & Material								
Type: ~~2-inch~~ 1-inch PVC								
Total Well Depth (TD): 32.5								
Static Water Level (WL): 14.90								
One Casing Volume(gal/L): 0.86								
Start Purge (hrs): 1240								
End Purge (hrs): 1345								
Total Purge Time (min): 65								
Total Vol. Purged (gal/L): 2.75								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCL	(3) 40 mmL glass vials	yes
Energetics	-	(2) 1 Liter Amber Glass	yes
Total Metals	HNO3	500 mL Poly	yes
Filtered Metals (0.45 micro field filter)	HNO3	500 mL Poly	yes

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Indian Head, Site 43
PROJECT NUMBER: 112G00771
WELL ID.: S43MW 12
DATE: 7/22/12

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
1245	15.38	250	5.79	0.174	139	1.24	24.80	-52	0.1	Cloudy
1250	15.34	200	5.87	0.178	140	0.03	22.79	-73	0.1	Cloudy
1255	15.41	200	5.90	0.185	142	0.0	21.80	-81	0.1	Cloudy
1300	15.34	180	5.91	0.185	135	0.0	21.48	-83	0.1	Cloudy
1305	15.32	180	5.91	0.185	131	0.0	21.53	-84	0.1	Cloudy, clearing a bit
1310	15.31	180	5.91	0.184	125	0.0	21.62	-85	0.1	slightly cloudy
1315	15.33	180	5.91	0.183	64	0.30	21.46	-85	0.1	clearing up, less cloudy
1320	15.38	180	5.91	0.183	38.7	0.0	21.39	-86	0.1	clearing up
1325	15.46	180	5.91	0.184	28.4	0.0	21.31	-86	0.1	"
1330	15.46	180	5.91	0.182	21.8	0.0	21.15	-86	0.1	"
1335	15.46	180	5.91	0.182	13.1	0.0	21.02	-87	0.1	"
1340	15.46	180	5.91	0.183	10.7	0.0	20.97	-87	0.1	"
1345	15.46	180	5.90	0.183	8.85	0.0	20.95	-87	0.1	

SIGNATURE(S): [illegible]

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head, Site 43
Project No.: 112G00711

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

Sample ID No.: S43MW13-01
Sample Location: S43MW13
Sampled By: JB/RS/EW
C.O.C. No.:
Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 7/22/12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 1100	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	ORP
Method: low flow	clear	4.35	0.201	19.26	23.8	0.0	0.1	224

PURGE DATA:

Date: 7/22/12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Method: low flow	See	low	flow	purge	logsheet			
Monitor Reading (ppm):								
Well Casing Diameter & Material								
Type: ~~2~~ 1-inch PVC								
Total Well Depth (TD):								
Static Water Level (WL): 16.18								
One Casing Volume(gal/L):								
Start Purge (hrs): 1025								
End Purge (hrs): 1100								
Total Purge Time (min): 35								
Total Vol. Purged (gal/L): 2.75								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
~~VOCs~~ TCE	HCL	(3) 40 mmL glass vials	✓
~~Energetics~~	-	~~(2) 1 Liter Amber Glass~~	
Total ~~Metals~~ CO	HNO3	500 mL Poly	✓
Filtered ~~Metals~~ (0.45 micro field filter) Co	HNO3	500 mL Poly	✓

OBSERVATIONS / NOTES:

Filter Co Sample ID "S43MW13-01F"

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Indian Head, Site 43
PROJECT NUMBER: 112G00771
WELL ID.: S43MW13
DATE: 7/22/12

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
1025	16.18	175-200	4.49	0.220	788	0.31	19.78	216	0.1	
1035		" "	4.44	0.204	50.0	0.00	19.12	215	0.1	
1040	~~19.31~~ see *	" "	4.43	0.204	44.1	0.00	19.11	216	0.1	
1045	~~19.31~~	" "	4.38	0.201	15.2	0.00	19.25	221	0.1	
1050		" "	4.36	0.201	21.3	0.00	19.25	223	0.1	
1055		" "	4.35	0.201	26.4	0.00	19.24	223	0.1	
1100		" "	4.35	0.201	23.8	0.00	19.26	224	0.1	

SIGNATURE(S): [signature] for Ernie Wu

PAGE 1 OF 1

* 3/8" OD tubing, unable to get good WL measurement during purge

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head, Site 43
Project No.: 112G00711

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

Sample ID No.: S43MW14-01
Sample Location: S43MW14
Sampled By: JB/RS/EW
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 7/22/12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 0955	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	ORP
Method: low flow	clear	4.44	0.148	18.89	36.5	0.00	0.1	147

PURGE DATA:

Date: 7/22/12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Method: low flow	See	low	flow	purge	logsheet			
Monitor Reading (ppm):								
Well Casing Diameter & Material								
Type: ~~2-inch PVC~~ 1" PVC								
Total Well Depth (TD):								
Static Water Level (WL): 13.56								
One Casing Volume(gal/L):								
Start Purge (hrs): 0925								
End Purge (hrs): 0950								
Total Purge Time (min): ~~50~~ 25								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
~~VOCs~~ TCE	HCL	(3) 40 mmL glass vials	✓
~~Energetics~~	-	(2) 1 Liter Amber Glass	
~~Total Metals~~ Co	HNO3	500 mL Poly	✓
Filtered ~~Metals~~ (0.45 micro field filter)	HNO3	500 mL Poly	✓
Co			
TCL VOC	HCL	(3) 40 ml glass vials	✓

OBSERVATIONS / NOTES:

TCL VOC only → sample ID "S431041 VOC"

Filter Co Sample ID - "S43MW14-01F"

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Indian Head, Site 43
PROJECT NUMBER: 112G00771
WELL ID.: S43MW14
DATE: 7/22/12

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
0925	13.56	175-200	4.34	0.152	915	0.37	19.12	152	0.1	
0930	13.73	" "	4.41	0.149	103	0.11	19.04	146	0.1	
0935	13.73	" "	4.44	0.149	32.1	0.00	19.04	144	0.1	
0940	13.73	" "	4.45	0.149	41.8	0.00	18.95	146	0.1	
0945	13.73	" "	4.44	0.148	57.4	0.00	18.90	147	0.1	
0950	13.73	" "	4.44	0.148	36.5	0.00	18.89	147	0.1	

SIGNATURE(S): [signature]
for Ernie Wu

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head, Site 43
Project No.: 112G00711

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

Sample ID No.: S43MW15-01
Sample Location: S43MW15
Sampled By: JB/RS/EW
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 7/22/12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 1355	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	ORP
Method: low flow	Clear	5.70	0.322	21.55	3.9	0.0	0.2	56

PURGE DATA:

Date: 7/22/12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Method: low flow	See	low	flow	purge	logsheet			
Monitor Reading (ppm):								
Well Casing Diameter & Material								
Type: ~~2~~-inch PVC 1-inch								
Total Well Depth (TD):								
Static Water Level (WL): 11.89								
One Casing Volume(gal/L):								
Start Purge (hrs): 1320								
End Purge (hrs): 1355								
Total Purge Time (min): 35								
Total Vol. Purged (gal/L): 3								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
~~VOCs~~ TCE	HCL	(3) 40 mmL glass vials	yes
~~Energetics~~	-	~~(2) 1 Liter Amber Glass~~	—
Co Total ~~Metals~~ Co	HNO3	500 mL Poly	yes
Filtered ~~Metals~~ (0.45 micro field filter)	HNO3	500 mL Poly	yes

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Indian Head, Site 43
PROJECT NUMBER: 112G00771
WELL ID.: S43MW15
DATE: 7/22/12

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
1320	11.89	175-200	5.66	0.306	966	0.0	21.89	63	0.1	
1325		" "	5.74	0.320	96.6	0.0	21.70	58	0.2	
1330		" "	5.75	0.322	40.5	0.0	21.66	59	0.2	
1335		" "	5.74	0.323	21.5	0.0	21.61	60	0.2	
1340		" "	5.73	0.323	13.2	0.0	21.65	60	0.2	
1345		" "	5.72	0.323	11.4	0.0	21.66	59	0.2	
1350		" "	5.70	0.322	4.3	0.0	21.57	56	0.2	
1355		" "	5.70	0.322	3.9	0.0	21.55	56	0.2	

SIGNATURE(S): [signature]

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head, Site 43
Project No.: 112G00711

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

Sample ID No.: S43MW16-01
Sample Location: S43MW016
Sampled By: JB/RS/EW
C.O.C. No.:
Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 7/22/12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 1300	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	ORP
Method: low flow	Clear	4.02	0.277	20.91	40.4	0.0	0.1	389

PURGE DATA:

Date: 7/22/12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Method: low flow	See	low	flow	purge	logsheet			
Monitor Reading (ppm):								
Well Casing Diameter & Material								
Type: ~~2~~-inch PVC 1-inch								
Total Well Depth (TD):								
Static Water Level (WL): 14.92								
One Casing Volume(gal/L):								
Start Purge (hrs): 1230								
End Purge (hrs): 1300								
Total Purge Time (min): 30								
Total Vol. Purged (gal/L): 2.75								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
~~VOCs~~ TCE	HCL	(3) 40 mmL glass vials	yes
~~Energetics~~	-	~~(2) 1 Liter Amber Glass~~	—
Co Total ~~Metals~~ Co	HNO3	500 mL Poly	yes
Filtered ~~Metals~~ (0.45 micro field filter)	HNO3	500 mL Poly	yes

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Indian Head, Site 43
PROJECT NUMBER: 112G00771

WELL ID.: S43MW16
DATE: 7/22/12

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
1230	14.92	175-200	4.31	0.278	840	2.09	24.44	279	0.1	
1235		" "	4.14	0.276	459	0.0	21.23	335	0.1	
1240		" "	4.12	0.294	426	0.0	21.16	338	0.1	
1245		" "	4.10	0.274	360	0.0	21.02	343	0.1	
1250		" "	4.06	0.275	235	0.0	20.96	350	0.1	
1255		" "	4.03	0.277	43.6	0.0	20.83	346	0.1	
1300		" "	4.02	0.277	40.4	0.0	20.91	339	0.1	

SIGNATURE(S): [signature]

PAGE 1 OF 1

1" PVC MW : 3/8" OD PE tubing, no way to measure WL w/ meter

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43MW 175-01
Sample Location: MW 175
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 7-21-12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1237	(Visual)	(S.U.)	(mS/cm)	(°C)	(NTU)	(mg/l)	(%)	(mV)
Method: Low Flow - Peristaltic	clear	5.50	0.394	15.71	2.27	0.01	0.2	3

PURGE DATA:

Date: 7-21-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): —								
Well Casing Diameter & Material								
Type: 2" PVC	See Low Flow Purge Sheet for Details							
Total Well Depth (TD):								
Static Water Level (WL): 1515								
One Casing Volume(gal/L):								
Start Purge (hrs): 1150								
End Purge (hrs): 1237								
Total Purge Time (min): 47								
Total Vol. Purged (gal/L): 3/4 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes
Total Metals	HNO3	1 - 250mL poly bottle	yes
Filtered Metals	HNO3	1 - 250mL poly bottle	yes
Explosives	--	2 - 1L Amber glass	yes

OBSERVATIONS / NOTES:

Field Test Kits
Ferrous Iron = — ppm

Pull tubing 1' off bottom

Oil red O dye None

"-F" Added to ID for filtered sample

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771

WELL ID.: S43MW17S
DATE: 7-21-12

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
1150	15.45									
1155	15.48	300	5.47	0.396	21.2	2.09	16.31	15	0.2	clear
1201	15.57	300	5.52	0.393	6.96	0.06	15.92	14	0.2	clear
1205	15.58	300	5.52	0.393	5.53	0.04	15.85	12	0.2	clear 1 gal
1210	15.58	300	5.52	0.393	3.71	0.03	15.84	11	0.2	clear
1215	15.58	300	5.52	0.393	2.75	0.02	15.88	10	0.2	clear
1220	15.58	300	5.51	0.393	2.48	0.02	15.79	9	0.2	clear 2 gal
1225	15.58	300	5.50	0.393	2.94	0.01	15.78	9	0.2	clear
1230	15.58	300	5.50	0.393	1.91	0.01	15.75	8	0.2	clear
1235	15.58	300	5.50	0.394	2.27	0.01	15.71	8	0.2	clear 3 gal
1237	Collect sample									

SIGNATURE(S): [illegible]

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43MW 17D-01
Sample Location: MW 17D
Sampled By: J. Birkeff
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 7-21-12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1135	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Low Flow - Peristaltic	clear	5.53	0.402	16.15	1.92	2.19	0.2	-2

PURGE DATA:

Date: 7-21-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): —								
Well Casing Diameter & Material								
Type: 2" PVC	See Low Flow Purge Sheet for Details							
Total Well Depth (TD):								
Static Water Level (WL): 19.37								
One Casing Volume(gal/L):								
Start Purge (hrs): 1049								
End Purge (hrs): 1135								
Total Purge Time (min): 46								
Total Vol. Purged (gal/L): 3¼ gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes
Total Metals	HNO3	1 - 250mL poly bottle	yes
Filtered Metals	HNO3	1 - 250mL poly bottle	yes
Explosives	--	2 - 1L Amber glass	yes

OBSERVATIONS / NOTES:

Field Test Kits
Ferrous Iron = 5.2 ppm

Pull tubing 1' off bottom

Oil red O dye None

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771

WELL ID.: S43MW 17 D
DATE: 7-21-12

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
1049	19.39									
1053	19.61	300	5.52	0.389	—	14.42	17.09	42	0.2	clear
1058	19.67	300	5.62	0.399	602 AU	5.73	16.25	21	0.2	tan color
1103	19.69	300	5.62	0.402	36.0	4.15	16.11	12	0.2	clear 1 gal
1108	19.69	300	5.60	0.402	15.7	3.65	16.19	8	0.2	clear
1113	19.70	300	5.57	0.402	9.50	3.37	16.29	6	0.2	clear
1118	19.70	300	5.54	0.403	6.28	3.02	16.07	4	0.2	clear 2 gal
1123	19.70	300	5.53	0.402	4.44	2.77	16.27	3	0.2	clear
1128	19.70	300	5.53	0.402	2.89	2.45	16.23	0	0.2	clear
1133	19.70	300	5.53	0.402	1.92	2.19	16.15	-2	0.2	clear 3 gal
1135	Collect sample									

SIGNATURE(S): [signature]

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head, Site 43
Project No.: 112G00711

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

Sample ID No.: S43MW 1801
Sample Location: MW 18
Sampled By: JB/RS/EW
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	Other ORP
Date: 7/21/12								
Time: 1310								
Method: low flow	clear	5.22	0.361	18.84	1.0	0.99	0.2	203

PURGE DATA:

	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Date: 7/21/12								
Method: low flow	See	low	flow	purge	logsheet			
Monitor Reading (ppm):								
Well Casing Diameter & Material								
Type: 2-inch PVC								
Total Well Depth (TD): 17								
Static Water Level (WL): 13.24								
One Casing Volume(gal/L): 0.61								
Start Purge (hrs): ~~1215~~ 1220								
End Purge (hrs): 1310								
Total Purge Time (min): 50								
Total Vol. Purged (gal/L): 3.5gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCL	(3) 40 mmL glass vials	yes
Energetics	-	(2) 1 Liter Amber Glass	yes
Total Metals	HNO3	500 mL Poly	yes
Filtered Metals (0.45 micro field filter)	HNO3	500 mL Poly	yes

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

for Rob Sok

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Indian Head, Site 43
PROJECT NUMBER: 112G00771

WELL ID.: S43MW18
DATE: 7/21/12

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
1228	13.50	220	5.77	0.385	3.2	3.0	18.50	121	0.2	
1230	13.55	200	5.45	0.368	4.9	1.86	18.53	171	0.2	
1235	13.54	180	5.36	0.365	3.2	1.39	18.68	189	0.2	
1240	13.55	180	5.33	0.363	2.4	1.28	18.68	192	0.2	
1245	13.53	150	5.31	0.362	1.7	1.13	18.71	194	0.2	
1250	13.50	150	5.28	0.362	1.6	1.10	18.78	196	0.2	
1255	13.50	150	5.27	0.362	1.3	1.10	18.84	198	0.2	
1300	13.49	150	5.26	0.362	1.0	1.05	18.86	201	0.2	
1305	13.49	150	5.22	0.361	1.0	0.99	18.84	203	0.2	

SIGNATURE(S): TP

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Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head, Site 43
Project No.: 112G00711

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

Sample ID No.: S43MW019S01
Sample Location: MW19
Sampled By: JB/RS/EW
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 7/21/12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 1005	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	
Method: low flow	clear	4.28	0.268	18.95	0.7	0	0.1	

PURGE DATA:

Date: 7/21/12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Method: low flow	See	low	flow	purge	logsheet			
Monitor Reading (ppm): Ø								
Well Casing Diameter & Material								
Type: 2-inch PVC								
Total Well Depth (TD): 24								
Static Water Level (WL): 15.29								
One Casing Volume(gal/L): 1.42								
Start Purge (hrs): 0912								
End Purge (hrs): 1024								
Total Purge Time (min): 72								
Total Vol. Purged (gal/L): 4 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCL	(3) 40 mmL glass vials	yes
Energetics	-	(2) 1 Liter Amber Glass	yes
Total Metals	HNO3	500 mL Poly	yes
Filtered Metals (0.45 micro field filter)	HNO3	500 mL Poly	yes

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
No	S43MW19010

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Indian Head, Site 43
PROJECT NUMBER: 112G00771

WELL ID.: S43MW0195
DATE: 7/21/12

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
0919	15.31	300	4.01	0.302	4.3	~~[illegible]~~ 0.71	19.81	171	0.1	Clear
0924	15.30	"	4.07	0.287	5.2	0.50	19.55	168	0.1	
0930	15.30	"	4.14	0.284	4.3	0.25	19.25	162	0.1	
0935	15.30	"	4.16	0.273	3.2	0.19	19.18	162	0.1	
0940	15.30	"	4.22	0.271	3.3	0.12	19.10	157	0.1	~2 gal purged
0945	15.30	"	4.26	0.269	2.9	0.06	19.05	157	0.1	
0950	15.30	"	4.26	0.269	1.7	0.01	19.01	157	0.1	
0955	15.30	"	4.27	0.269	1.2	0.00	18.99	157	0.1	
1000	15.30	"	4.28	0.268	0.7	0.00	18.95	157	0.1	

SIGNATURE(S): [signature]

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head, Site 43
Project No.: 112G00711

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

Sample ID No.: S43MW19D01
Sample Location: MW19D
Sampled By: JB/RS/EW
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 7/21/12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 1140	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	
Method: low flow	clear	5.33	0.233	18.80	4.8	0.0	0.1	

PURGE DATA:

Date: 7/21/12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Method: low flow	See	low	flow	purge	logsheet			
Monitor Reading (ppm): 0								
Well Casing Diameter & Material								
Type: 2-inch PVC								
Total Well Depth (TD): 35								
Static Water Level (WL): 22.58								
One Casing Volume(gal/L): 2.02								
Start Purge (hrs): 1050								
End Purge (hrs): 1155								
Total Purge Time (min): 65								
Total Vol. Purged (gal/L): 3gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCL	(3) 40 mmL glass vials	yes
Energetics	-	(2) 1 Liter Amber Glass	yes
Total Metals	HNO3	500 mL Poly	yes
Filtered Metals (0.45 micro field filter)	HNO3	500 mL Poly	yes

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Indian Head, Site 43
PROJECT NUMBER: 112G00771
WELL ID.: S43MW019001
DATE: 7/21/12

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
1055	22.79	200	5.54	0.247	11.0	0.29	19.54	-42	0.1	Clear; few air bubbles in tubing
1100	22.79	170	5.52	0.248	10.7	0.05	19.17	-45	0.1	
1105	22.81	160	5.45	0.245	9.5	0.0	18.90	-44	0.1	
1110	22.81	160	5.42	0.242	9.7	0.0	18.83	-44	0.1	
1115	22.83	160	5.36	0.240	9.5	0.0	18.76	-43	0.1	
1120	22.81	150	5.33	0.238	9.3	0.0	18.76	-43	0.1	No air bubbles in tubing
1125	22.81	150	5.32	0.237	9.1	0.0	18.78	-43	0.1	
1130	22.82	150	5.32	0.236	7.1	0.0	18.81	-44	0.1	~2gals purged; clear
1135	22.82	150	5.33	0.233	4.8	0.0	18.80	-46	0.1	

SIGNATURE(S): TT (RMS)

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43MW20-01
Sample Location: MW 20
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 7-19-12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1044	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Low Flow - Peristaltic	clear	4.51	0.247	17.40	8.47	3.19	0.0	185

PURGE DATA:

Date: 7-19-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): —								
Well Casing Diameter & Material								
Type: 2" PVC	See Low Flow Purge Sheet for Details							
Total Well Depth (TD):								
Static Water Level (WL): 15.87								
One Casing Volume(gal/L):								
Start Purge (hrs): 0954								
End Purge (hrs): 1044								
Total Purge Time (min): 50								
Total Vol. Purged (gal/L): 4 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes
Total Metals	HNO3	1 - 250mL poly bottle	yes
Filtered Metals	HNO3	1 - 250mL poly bottle	yes
Explosives	--	2 - 1L Amber glass	yes

OBSERVATIONS / NOTES:

Field Test Kits

Ferrous Iron = 1.4 ppm

Oil red O dye

None

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771

WELL ID.: S43MW 20
DATE: 7-19-12

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
0954	15.87	Start purge								
0957	15.88	300	4.39	0.242	672 AU	4.73	27.01	238	0.1	tan color
1002	15.88	300	4.36	0.255	30.6	5.12	17.06	220	0.1	clear
1007	15.88	300	4.43	0.252	14.8	4.51	16.83	252	0.1	clear 1 gal
1012	15.88	300	4.46	0.248	12.27	4.08	17.03	205	0.1	clear
1017	15.88	300	4.48	0.245	11.19	3.90	17.10	198	0.1	clear
1022	15.88	300	4.47	0.245	5.17	3.73	17.11	195	0.1	clear 2 1/4 gal
1027	15.88	300	4.48	0.246	4.73	3.58	17.27	192	0.1	clear
1032	15.88	300	4.49	0.247	2.65	3.45	17.19	189	0.1	clear 3 gal
1037	15.88	300	4.50	0.247	18.4	3.26	17.37	187	0.1	clear
1042	15.88	300	4.51	0.247	8.47	3.19	17.40	185	0.1	clear 4 gal
1044	Collect sample									

SIGNATURE(S): [signature]

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Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head, Site 43
Project No.: 112G00711

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

Sample ID No.: S43MW02101
Sample Location: MW21
Sampled By: JB/RS/EW
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 7/21/12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 1805	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	ORP
Method: low flow	clear	5.55	0.165	18.99	7.3	0.23	0.1	71

PURGE DATA:

Date: 7/21/12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Method: low flow	See	low	flow	purge	logsheet			
Monitor Reading (ppm):								
Well Casing Diameter & Material								
Type: 2-inch PVC								
Total Well Depth (TD): 25								
Static Water Level (WL): 15.77								
One Casing Volume(gal/L): 1.5								
Start Purge (hrs): 1707								
End Purge (hrs): 1810								
Total Purge Time (min): 63								
Total Vol. Purged (gal/L): 39gl								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCL	(3) 40 mmL glass vials	yes
Energetics	-	(2) 1 Liter Amber Glass	yes
Total Metals	HNO3	500 mL Poly	yes
Filtered Metals (0.45 micro field filter)	HNO3	500 mL Poly	

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): for Rob Sok

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Indian Head, Site 43
PROJECT NUMBER: 112G00771
WELL ID.: S43MW021
DATE: 7/21/12

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
1710	15.77	240	5.71	0.184	18.0	1.92	19.48	38	0.1	
1715	15.77	200	5.73	0.181	17.5	0.97	19.25	43	0.1	
1720	15.77	220	5.68	0.178	16.1	0.66	19.12	54	0.1	
1725	15.77	200	5.61	0.174	15.9	0.57	19.09	66	0.1	
1730	15.77	200	5.59	0.172	13.3	0.53	19.08	67	0.1	
1735	15.77	200	5.57	0.168	10.6	0.34	19.03	69	0.1	
1740	15.77	200	5.56	0.167	8.1	0.34	19.00	71	0.1	
1745	15.77	200	5.55	0.166	6.9	0.30	18.99	72	0.1	
1750	15.77	200	5.55	0.166	7.5	0.28	18.99	71	0.1	
1755	15.77	200	5.54	0.165	8.7	0.27	19.00	72	0.1	
1800	15.77	200	5.55	0.165	7.3	0.23	18.99	71	0.1	

SIGNATURE(S):

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43MW22-01
Sample Location: MW22
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 7-19-12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1214	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Low Flow - Peristaltic	clear	4.30	0.366	16.50	1.45	2.33	0.2	153

PURGE DATA:

Date: 7-19-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): —								
Well Casing Diameter & Material								
Type: 2" PVC	See Low Flow Purge Sheet for Details							
Total Well Depth (TD): 22.30								
Static Water Level (WL): 14.63								
One Casing Volume(gal/L):								
Start Purge (hrs): 1125								
End Purge (hrs): 1214								
Total Purge Time (min): 49								
Total Vol. Purged (gal/L): 3¼ gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes
Total Metals	HNO3	1 - 250mL poly bottle	yes
Filtered Metals	HNO3	1 - 250mL poly bottle	yes
Explosives	--	2 - 1L Amber glass	yes

OBSERVATIONS / NOTES:

Field Test Kits

Ferrous Iron = 1.2 ppm

Oil red O dye none

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771

WELL ID.: S43MW 22
DATE: 7-19-12

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
1125	14.63	Start	purge							
1127	14.66	300	4.42	0.360	11.2	14.30	18.81	107	0.2	clear
1132	14.67	300	4.06	0.364	15.4	5.61	16.74	196	0.2	clear
1137	14.67	300	4.17	0.361	10.13	3.80	16.60	182	0.2	clear 1 gal
1142	14.67	300	4.24	0.358	5.96	3.53	16.40	174	0.2	clear
1147	14.67	300	4.27	0.358	3.83	3.50	16.39	167	0.2	clear
1152	14.67	300	4.30	0.362	2.67	3.30	16.48	161	0.2	clear 2 gal
1157	14.67	300	4.32	0.365	1.49	3.12	16.45	157	0.2	clear
1202	14.67	300	4.32	0.366	1.22	3.01	16.49	154	0.2	clear
1207	14.67	300	4.31	0.365	1.27	2.68	16.62	152	0.2	clear 3 gal
1212	14.67	300	4.30	0.366	1.45	2.33	16.50	153	0.2	clear
1214	Collect sample									

SIGNATURE(S): [signature]

PAGE 1 OF 1

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43MW 23-01
Sample Location: MW 23
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 7-20-12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1210	(Visual)	(S.U.)	(mS/cm)	(°C)	(NTU)	(mg/l)	(%)	(mV)
Method: Low Flow - Peristaltic	clear	4.83	0.164	18.89	0.61	4.44	0.1	155

PURGE DATA:

Date: 7-20-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): —								
Well Casing Diameter & Material Type: 2" PVC	See Low Flow Purge Sheet for Details							
Total Well Depth (TD):								
Static Water Level (WL): 16.58								
One Casing Volume(gal/L):								
Start Purge (hrs): 1120								
End Purge (hrs): 1210								
Total Purge Time (min): 50								
Total Vol. Purged (gal/L): 3½ gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 ~~8~~ ~~8~~ - 40mL glass vials	yes
Total Metals	HNO3	1 ~~3~~ ~~1~~ - 250mL poly bottle	yes
Filtered Metals	HNO3	1 ~~3~~ ~~1~~ - 250mL poly bottle	yes
Explosives	--	2 ~~6~~ ~~2~~ - 1L Amber glass	yes

OBSERVATIONS / NOTES:

Field Test Kits
Ferrous Iron = 1.0 ppm

Oil red O dye None

Pulled tubing 1 foot off bottom

Circle if Applicable:

MS/MSD ~~YES~~ NO
Duplicate ID No.: —

Signature(s):

7-20-12

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771

WELL ID.: S43MW 23
DATE: 7-20-12

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
1120	16.58									
1123	16.68	300	5.56	0.234	—	11.03	20.06	70	0.1	clear
1128	16.70	300	5.20	0.197	5.94	5.32	19.22	104	0.1	clear
1133	16.71	300	5.15	0.181	11.08	4.95	19.79	112	0.1	clear
1138	16.71	300	4.91	0.173	4.28	4.61	19.64	137	0.1	clear 1½ gal
1143	16.71	300	4.86	0.171	5.15	4.70	19.13	144	0.1	clear
1148	16.71	300	4.81	0.167	2.05	4.53	18.93	154	0.1	clear
1153	16.71	300	4.82	0.167	2.07	4.47	18.89	156	0.1	clear 2¼ gal
1158	16.71	300	4.82	0.165	1.74	4.43	18.92	158	0.1	clear
1203	16.71	300	4.83	0.164	0.64	4.45	18.93	159	0.1	clear 3 gal
1208	16.71	300	4.83	0.164	0.61	4.44	18.89	159	0.1	clear
1210	Collect sample									

SIGNATURE(S):

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43MW24-01
Sample Location: MW 24
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 7-20-12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 0917	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Low Flow - Peristaltic	clear	5.61	0.260	23.72	5.41	1.50	0.1	160

PURGE DATA:

Date: 7-20-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): —								
Well Casing Diameter & Material								
Type: 2" PVC	See Low Flow Purge Sheet for Details							
Total Well Depth (TD): 19.52								
Static Water Level (WL): 10.05								
One Casing Volume(gal/L):								
Start Purge (hrs): 0823								
End Purge (hrs): 0917								
Total Purge Time (min): 54								
Total Vol. Purged (gal/L): 33/4 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes
Total Metals	HNO3	1 - 250mL poly bottle	yes
Filtered Metals	HNO3	1 - 250mL poly bottle	yes
Explosives	--	2 - 1L Amber glass	yes

OBSERVATIONS / NOTES:

Field Test Kits
Ferrous Iron = 0.2 ppm

Oil red O dye none

Pull tubing 1' off bottom
MW next to generator for steam line which produces quite a bit of heat

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
WELL ID.: S43MW24
DATE: 7-20-12

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
0823	10.05	Start purge								
0825	10.30	300	5.21	0.408	934	4.99	23.55	215	0.2	tan color
0830	10.34	300	5.59	0.350	262	2.76	22.77	191	0.2	tan tint
0835	10.36	300	5.65	0.374	137	2.22	23.26	182	0.2	tan tint
0840	10.37	300	5.62	0.319	57.7	1.76	23.57	179	0.2	clear 1 1/4 gal
0845	10.37	300	5.67	0.315	36.5	1.68	23.63	176	0.2	clear
0850	10.38	300	5.69	0.311	21.9	1.65	23.76	173	0.1	clear
0855	10.38	300	5.70	0.301	15.6	1.52	23.61	170	0.1	clear 2 1/4 gal
0900	10.38	300	5.67	0.285	12.3	1.51	23.66	168	0.1	clear
0905	10.38	300	5.63	0.271	9.15	1.52	23.69	165	0.1	clear
0910	10.38	300	5.62	0.264	6.69	1.49	23.74	162	0.1	clear 3 1/4 gal
0917	Collect Sample	300	5.61	0.260	5.41	1.50	23.72	160	0.1	clear

SIGNATURE(S):

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43MW25-01
Sample Location: MW 25
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 7-20-12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1053	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Low Flow - Peristaltic	clear	5.46	0.218	17.66	0.84	6.63	0.1	107

PURGE DATA:

Date: 7-20-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): —								
Well Casing Diameter & Material Type: 2" PVC	See Low Flow Purge Sheet for Details							
Total Well Depth (TD): 19.98								
Static Water Level (WL): 11.55								
One Casing Volume(gal/L):								
Start Purge (hrs): 0943								
End Purge (hrs): 1053								
Total Purge Time (min): 70								
Total Vol. Purged (gal/L): 5 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes
Total Metals	HNO3	1 - 250mL poly bottle	yes
Filtered Metals	HNO3	1 - 250mL poly bottle	yes
Explosives	--	2 - 1L Amber glass	yes

OBSERVATIONS / NOTES:

Field Test Kits
Ferrous Iron = 1.6 ppm

Pulled tubing 1' off bottom

Oil red O dye None

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): J. Birkett

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771

WELL ID.: S43MW 25
DATE: 7-20-12

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
0943	11.55	Start	purge							
0945	12.03	350	5.66	0.192	5.46	7.58	24.41	167	0.1	clear
0950	12.17	300	5.58	0.190	5.32	5.49	22.79	144	0.1	clear
0955	12.38	250	5.52	0.188	5.19	5.24	21.83	136	0.1	clear
1000	12.50	225	5.49	0.189	4.53	5.07	21.72	128	0.1	clear 1 1/4 gal
1005	12.73	225	5.47	0.189	4.26	5.29	21.52	126	0.1	clear
1010	12.84	225	5.47	0.189	2.75	5.42	21.29	125	0.1	clear
1015	12.98	225	5.46	0.205	1.91	5.46	18.61	122	0.1	clear
1020	13.06	225	5.45	0.208	3.46	6.67	18.26	120	0.1	clear 2 3/4 gal
1025	13.11	225	5.45	0.211	1.72	6.71	18.23	118	0.1	clear
1030	13.17	225	5.46	0.213	1.63	6.86	18.20	116	0.1	clear
1035	13.28	225	5.46	0.221	0.99	6.99	17.34	114	0.1	clear
1040	13.34	225	5.46	0.223	1.43	7.04	17.36	112	0.1	clear 4 gal
1045	13.38	225	5.46	0.219	0.96	7.11	17.42	109	0.1	clear
1050	13.39	225	5.46	0.218	0.84	6.63	17.66	107	0.1	clear
1053	Collect sample									

SIGNATURE(S):

Tetra Tech, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43MW26-01
Sample Location: MW 26
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 7-18-12	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1505	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Low Flow - Peristaltic	Clear	3.77	0.056	21.57	3.12	2.99	0.0	298

PURGE DATA:

Date: 7-18-12	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): —								
Well Casing Diameter & Material								
Type: 2" PVC	See Low Flow Purge Sheet for Details							
Total Well Depth (TD): 26.43								
Static Water Level (WL): 16.05								
One Casing Volume(gal/L):								
Start Purge (hrs): 1420								
End Purge (hrs): 1505								
Total Purge Time (min): 45								
Total Vol. Purged (gal/L): 3 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes
Total Metals	HNO3	1 - 250mL poly bottle	yes
Filtered Metals	HNO3	1 - 250mL poly bottle	yes
Explosives	--	2 - 1L Amber glass	yes

OBSERVATIONS / NOTES:

Field Test Kits

Ferrous Iron = 0.4 ppm

Oil red O dye none

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771

WELL ID.: S43MW 26
DATE: 7-18-12

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
1420	16.05	Start purge								
1425	16.09	350	4.29	0.076	33.4	6.35	22.78	235	0.0	clear
1430	16.08	350	3.73	0.060	6.68	4.44	21.62	285	0.0	clear
1435	16.08	350	4.26	0.060	24.2	4.13	21.68	270	0.0	clear 1 gal tubing capacity in ground
1440	16.08	350	4.34	0.059	12.81	3.96	21.74	260	0.0	clear
1445	16.08	300	4.04	0.057	7.87	3.86	21.52	277	0.0	clear
1450	16.08	300	3.93	0.056	3.94	4.05	21.66	284	0.0	clear 2 1/4 gal
1455	16.08	300	3.91	0.056	3.44	3.43	21.62	290	0.0	clear
1500	16.08	300	3.81	0.056	3.67	3.12	21.63	296	0.0	clear
Collect sample 1505	16.08	300	3.77	0.056	3.12	2.99	21.57	298	0.0	clear 3 gal

SIGNATURE(S): [signature]

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2013

Monitoring Well Groundwater Sample and Low Flow Purge Data Sheets

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF-Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Piezometer
[] QA Sample Type:

Sample ID No.: ~~S43MW0~~ S43PZ001
Sample Location: ~~S43MW0~~ S43PZ01
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (^{0}C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Date: 5-14-13								
Time: 1210								
Method: Low Flow - Peristaltic	Clear	6.37	0.535	12.41	8.72	0.00	0.3	-88

PURGE DATA:

	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Date: 5-14-13								
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): --								
Well Casing Diameter & Material								
Type: 1 " PVC								
Total Well Depth (TD): 17.83								
Static Water Level (WL): 7.69								
One Casing Volume(gal/L):								
Start Purge (hrs): 1100								
End Purge (hrs): 1210								
Total Purge Time (min): 70								
Total Vol. Purged (gal/L): 3 gal								

See low flow log for details

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes
Total Metals	HNO3	1 250-mL poly bottle	yes
Filtered Metals	HNO3	1 250-mL poly bottle	no

OBSERVATIONS / NOTES:

Pull tubing 1" off bottom

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771

WELL ID.: S43~~MW0~~ PZ01
DATE: 5-14-13

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
1100	7.69									
1103	7.94	150	6.03	0.579	—	0.24	12.46	-54	0.3	Brown silty
1108	7.90	150	6.34	0.573	2753	0.00	12.30	-84	0.3	" " dump horiba
1113	7.90	150	6.41	0.566	2521	0.00	12.14	-79	0.3	" "
1118	7.90	150	6.43	0.555	932	0.00	12.26	-87	0.3	tan color
1123	7.90	150	6.45	0.551	273	0.00	12.30	-96	0.3	tan tint 3/4 gal
1128	7.90	150	6.43	0.549	195	0.00	12.33	-96	0.3	" "
1133	7.90	150	6.40	0.546	182	0.00	12.31	-96	0.3	" "
1138	7.90	150	6.38	0.544	102.1	0.00	12.36	-95	0.3	" "
1143	7.90	150	6.37	0.543	81.5	0.00	12.39	-95	0.3	clearish
1148	7.90	150	6.36	0.541	50.3	0.00	12.39	-95	0.3	clearish dump horiba
1153	7.90	150	6.36	0.540	18.4	0.00	12.38	-95	0.3	clear " 2 1/4 gal
1158	7.90	150	6.39	0.537	17.9	0.00	12.41	-83	0.3	clear
1203	7.90	150	6.36	0.536	13.7	0.00	12.38	-87	0.3	clear
1208	7.90	150	6.37	0.535	8.72	0.00	12.41	-88	0.3	clear 2 3/4 gal
1210	Collect sample									

SIGNATURE(S):

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF-Indian Head Site 43
Project No.: 112G00771

[] Domestic Well Data
[] Monitoring Well Data
[X] Other Well Type: Piezometer
[] QA Sample Type:

Sample ID No.: S43PZ02 ~~S43MW0~~
Sample Location: ~~S43MW0~~ S43PZ02
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (^{0}C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Date: 5-14-13								
Time: 1522								
Method: Low Flow - Peristaltic	clear	5.94	0.459	15.00	33.8	4.93	0.2	48

PURGE DATA:

	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Date: 5-14-13								
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): --								
Well Casing Diameter & Material								
Type: 1" PVC								
Total Well Depth (TD): 16.72								
Static Water Level (WL): 7.13								
One Casing Volume(gal/L):								
Start Purge (hrs): 1220								
End Purge (hrs): 1522								
Total Purge Time (min): 45								
Total Vol. Purged (gal/L): 2 gal								

See low flow log for details

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes
Total Metals	HNO3	1 250-mL poly bottle	yes
Filtered Metals	HNO3	1 250-mL poly bottle	yes

OBSERVATIONS / NOTES:

Pull tubing 1' off bottom
Well dry at 1252. Let recharge to 75% Static before sampling

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771

WELL ID.: ~~S43MW0~~ S43PZ02
DATE: 5-14-13

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
1220	7.13									
1222	9.62	200	6.28	0.523	—	1.70	12.10	-17	0.3	clear
1227	11.31	200	5.96	0.541	51.2	0.93	12.32	-14	0.3	clear
1232	12.22	200	5.81	0.554	37.3	0.64	12.51	55	0.3	clear 1/2 gal
1237	14.31	150	5.83	0.565	17.8	0.00	12.18	67	0.3	clear
1242	15.93	100	6.00	0.545	28.0	0.00	12.03	48	0.3	clear
1247	16.36	75	6.15	0.538	33.6	0.00	12.26	23	0.3	clear 1 1/4 gal
1252	16.72*	75	6.17	0.515	133	2.30	12.18	15	0.3	tan color, *Dry 1 1/2 gal
1253	Went dry	Shut off pump								
1510	9.88	Start purge					18.90	-15	0.3	
1511	10.43	75	6.13	0.513	300	3.27	↓	↓	↓	tan color
1516	11.90	75	6.06	0.474	89.8	3.54	15.90	20	0.3	tan tint
1521	13.40	75	5.94	0.459	33.8	4.93	15.00	48	0.2	tan tint
1522	Collect sample									

SIGNATURE(S): [signature]

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Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Site 43 Toluene Disposal Area
Project No.: 112G00771

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

Sample ID No.: S43 PZ003
Sample Location: PZ03
Sampled By: CM
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5/14/13	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	TBD
Time: 1350	Visual	Standard	mS/cm	°C	NTU	mg/l	mV	
Method: Peristaltic Pump	clear	8.78	0.205	18.60	5.40	0.51	-7	

PURGE DATA:

Date: 5/14/13	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	ORP	TBD
Method: Peristaltic Pump								
Monitor Reading(ppm): —								
Well Casing Diameter & Material								
Type: 1" PVC	(See Low Flow Purge Data Sheet)							
Total Well Depth (TD): 17.30								
Static Water Level (WL): 5.37								
One Casing Volume(gal/L):								
Start Purge (hrs): 1240								
End Purge (hrs): 1345								
Total Purge Time (min): 65								
Total Vol. Purged (gal/L): 2.5								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOC	HCl	40 ml VOA Vials	3
Total Metals	HNO3	250 ml Poly	1
Dissolved Metals	HNO3	250 ml Poly	N/A

OBSERVATIONS / NOTES:

Initialy water Light Brown sulfur odor no sheen
Final water clear slight Sulfur odor no sheen

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

TBD: To Be Determined

Tetra Tech

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Site 43 Toluene Disposal Area
PROJECT NUMBER: 112G00771

WELL ID.: S43PZ003
DATE: 5/14/13

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)	Vertical Pump Placement Other Comments
1240	5.37	125	6.16	0.227	91.17	1.25	22.01	-11	Light Brown Sulfur odor No Sheen
1245	5.98	125	6.26	0.221	88.32	0.87	21.48	-23	Light Brown Sulfur odor No Sheen
1250	5.97	125	6.17	0.200	69.79	0.74	20.80	-19	
1255	5.97	125	6.05	0.194	51.74	0.69	20.39	-13	
1300	5.97	125	5.94	0.195	34.42	0.65	20.07	-10	
1305	5.97	125	5.81	0.196	22.67	0.65	19.62	-7	
1310	5.97	125	5.75	0.196	18.84	0.64	19.36	-3	
1315	5.97	125	5.72	0.198	14.97	0.63	19.23	-2	
1320	5.97	125	5.70	0.199	11.84	0.58	19.16	-1	clear slight sulfur odor
1325	5.97	125	5.71	0.200	8.41	0.53	18.94	-2	
1330	5.97	125	5.73	0.201	7.29	0.52	18.86	-3	
1335	5.97	125	5.75	0.202	6.67	0.51	18.70	-4	
1340	5.97	125	5.76	0.203	6.44	0.52	18.58	-6	
1345	5.97	125	5.78	0.205	5.40	0.51	18.60	-7	
1350	sample S43PZ003 was collected								

SIGNATURE(S): [signature] **PAGE** ___ **OF**

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Site 43 Toluene Disposal Area
Project No.: 112G00771

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

Sample ID No.: S43PZ004
Sample Location: PZ04
Sampled By: CM
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	TBD
Date: 5/14/13	Visual	Standard	mS/cm	°C	NTU	mg/l	mV	
Time: 1210								
Method: Peristaltic Pump	Clear	5.02	0.249	18.91	5.23	2.29	263	—

PURGE DATA:

Date: 5/14/13	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	ORP	TBD
Method: Peristaltic Pump								
Monitor Reading(ppm):								
Well Casing Diameter & Material								
Type: 1" PVC								
Total Well Depth (TD): —	(See Low Flow Purge Data Sheet)							
Static Water Level (WL): 13.31								
One Casing Volume(gal/L):								
Start Purge (hrs): 1100								
End Purge (hrs): 1205								
Total Purge Time (min): 65								
Total Vol. Purged (gal/L): 1.5								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOC	HCl	40 ml VOA Vials	3
Total Metals	HNO3	250 ml Poly	1
Dissolved Metals	HNO3	250 ml Poly	N/A

OBSERVATIONS / NOTES:

Initial readings water turbid light brown no odor or sheen observed slowed pump
Final water clear no odor or sheen observed

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

TBD: To Be Determined

Tetra Tech

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Site 43 Toluene Disposal Area
PROJECT NUMBER: 112G00771

WELL ID.: S43PZ004 ~~0401~~ CM 5/14/13
DATE: 5/14/13

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)	Vertical Pump Placement Other Comments
1100	13.31	100	5.82	0.540	205	8.44	15.29	192	
1105	13.98	100	5.82	0.536	310	3.46	15.64	188	
1110	13.99	100	5.55	0.457	197	2.99	16.01	201	
1115	14.00	100	5.34	0.404	103	2.70	16.28	213	
1120	14.09	100	5.29	0.327	61.49	2.75	16.67	221	slowed flow rate
1125	13.98	100	5.22	0.302	31.42	2.63	17.02	229	back down 100 ml/min
1130	13.98	100	5.19	0.286	21.82	2.58	17.29	235	
1135	13.98	100	5.12	0.273	15.34	2.53	17.77	243	
1140	13.98	100	5.09	0.264	11.83	2.49	18.02	248	
1145	13.98	100	5.08	0.262	9.19	2.45	18.12	250	
1150	13.98	100	5.06	0.258	8.62	2.38	18.34	255	
1155	13.98	100	5.04	0.253	8.10	2.32	18.58	260	
1200	13.98	100	5.03	0.251	6.31	2.32	18.76	262	
1205	13.98	100	5.02	0.249	5.23	2.29	18.91	263	
1210	sample S43PZ004 was collected								

SIGNATURE(S): _____ **PAGE** ___ **OF**

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF-Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43MW000105
Sample Location: S43MW001
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5-8-13	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1813	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Low Flow - Peristaltic	clear	5.57	0.145	14.42	18.2	0.88	0.0	155

PURGE DATA:

Date: 5-8-13	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): --								
Well Casing Diameter & Material								
Type: 2 " PVC								
Total Well Depth (TD): —								
Static Water Level (WL): 4.60								
One Casing Volume(gal/L):								
Start Purge (hrs): 1642								
End Purge (hrs): 1813								
Total Purge Time (min): 91								
Total Vol. Purged (gal/L): 6 gal								

See low Flow Sheet for details

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes
Total Metals	HNO3	1 250-mL poly bottle	yes
Filtered Metals	HNO3	1 250-mL poly bottle	no

OBSERVATIONS / NOTES:

Pulled Tubing 1' off bottom

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	~~S43Dup01 20130508~~ 1600 S43MW000105-D

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771

WELL ID.: S43MW001
DATE: 5-8-13

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
1642	4.60 Start purge									
1646	4.61	250	6.05	0.136	—	6.84	14.47	138	0.1	clear Put tubing 5' off
1651	4.61	250	6.33	0.109	38.3	4.42	14.52	75	0.1	clear light algae bottom
1656	4.61	250	6.41	0.106	34.9	3.90	14.47	79	0.1	clear " "
1701	4.61	250	6.49	0.104	31.3	3.56	14.44	81	0.0	clear " "
1706	4.61	250	6.48	0.104	30.2	2.91	14.41	94	0.0	
1711	4.61	250	6.45	0.104	27.5	2.73	14.40	107	0.0	clear 1 3/4 gal
1716	4.61	250	6.40	0.109	27.9	2.53	14.44	112	0.0	clear
1721	4.61	250	6.37	0.109	28.6	2.49	14.43	118	0.0	clear Drop tubing 2'
1726	4.61	250	6.06	0.129	41.9	1.94	14.45	79	0.0	clear more algae
1731	4.61	250	6.01	0.128	42.3	1.86	14.47	80	0.0	clear 3 gal
1736	4.61	250	6.00	0.127	36.2	1.72	14.45	88	0.0	clear w/some algae
1741	4.61	250	5.91	0.132	30.4	1.43	14.45	93	0.0	clear " "
1746	4.61	250	5.85	0.132	26.5	1.19	14.44	105	0.0	clear " "
90 1748/1751	~~Collect sample~~ 4.61	250	5.80	0.136	22.3	1.32	14.45	112	0.0	clear " " 4 gal
1756	4.61 90	250	5.68	0.138	21.2	0.95	14.44	140	0.0	" "
1801	4.61	250	5.61	0.142	20.8	0.58	14.44	155	0.0	" "
1806	90 ~~Collect sample~~ 4.61	250	5.58	0.142	19.3	0.97	14.43	158	0.0	" "
1811	4.61	250	5.57	0.145	18.2	0.88	14.42	155	0.0	" "
1813	Collect sample									

SIGNATURE(S):

PAGE___OF___

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF-Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43MW00205
Sample Location: S43MW0 02
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (^{0}C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Date: 5-19-13								
Time: 1032								
Method: Low Flow - Peristaltic	Clear	4.68	0.292	16.24	1.83	0.68	0.1	296

PURGE DATA:

	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Date: 5-19-13								
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): --								
Well Casing Diameter & Material								
Type: 2" PVC								
Total Well Depth (TD): —								
Static Water Level (WL): 11.22								
One Casing Volume(gal/L):								
Start Purge (hrs): 0945								
End Purge (hrs): 1032								
Total Purge Time (min): 47								
Total Vol. Purged (gal/L): 2 1/4 gal								

See low Flow log for details

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes
Total Metals	HNO3	1 250-mL poly bottle	yes
Filtered Metals	HNO3	1 250-mL poly bottle	no

OBSERVATIONS / NOTES:

Pulled tubing 2' off bottom

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771

WELL ID.: S43MW002
DATE: 5-19-13

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
0945	11.22									
0950	11.23	250	4.70	0.315	—	1.47	16.29	302	0.1	clear
0955	11.23	250	4.45	0.299	—	1.10	16.33	304	0.1	clear
1000	11.23	250	4.55	0.292	4.29	1.23	16.30	295	0.1	clear
1005	11.23	250	4.67	0.289	4.03	1.30	16.27	290	0.1	clear
1010	11.23	250	4.67	0.290	3.84	1.01	16.21	291	0.1	clear
1015	11.23	250	4.67	0.290	3.16	0.76	16.16	294	0.1	clear 1¼ gal
1020	11.23	250	4.68	0.294	2.35	0.75	16.20	294	0.1	clear
1025	11.23	250	4.69	0.291	2.13	0.73	16.22	294	0.1	clear
1030	11.23	250	4.68	0.292	1.88	0.68	16.24	296	0.1	clear 2 gal
1032	Collect Sample									

SIGNATURE(S): [signature]

PAGE 1 OF 1

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Site 43 Toluene Disposal Area
Project No.: 112G00771

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

Sample ID No.: S43MW0303
Sample Location: MW03
Sampled By: CM
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	TBD
Date: 5/9/13	Visual	Standard	mS/cm	^{0}C	NTU	mg/l	mV	
Time: 1815								
Method: Peristaltic Pump	clear	5.82	0.435	19.84	3.70	0.88	-5	—

PURGE DATA:

Date: 5/9/13	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	ORP	TBD
Method: Peristaltic Pump								
Monitor Reading(ppm):								
Well Casing Diameter & Material								
Type: 2" PVC								
Total Well Depth (TD): —	(See Low Flow Purge Data Sheet)							
Static Water Level (WL): 15.50								
One Casing Volume(gal/L):								
Start Purge (hrs): 1720								
End Purge (hrs): 1810								
Total Purge Time (min): 50								
Total Vol. Purged (gal/L): 3.0								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOC	HCl	40 ml VOA Vials	3
Total Metals	HNO3	250 ml Poly	1
Dissolved Metals	HNO3	250 ml Poly	N/A

OBSERVATIONS / NOTES:

Purging began water light gray no odor or sheen sample was clear with no odor or sheen observed

Circle if Applicable:

MS/MSD —

Duplicate ID No.: —

Signature(s):

TBD: To Be Determined

Tetra Tech

LOW FLOW PURGE DATA SHEET

03

PROJECT SITE NAME: Site 43 Toluene Disposal Area
PROJECT NUMBER: 112G00771

WELL ID.: S43MW0303
DATE: 5/9/13

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)	Vertical Pump Placement Other Comments
1720	15.50	200	5.75	0.380	26.35	1.58	23.39	23	
1725	15.51	200	5.85	0.410	30.12	0.61	22.17	-7	
1730	15.54	200	5.85	0.421	26.11	0.55	21.01	-11	
1735	15.56	200	5.82	0.428	11.88	0.48	20.34	-8	
1740	15.57	200	5.81	0.432	9.53	0.50	20.04	-8	
1745	15.57	200	5.85	0.435	8.50	0.44	20.04	-11	
1750	15.57	200	5.83	0.438	6.32	0.48	20.00	-8	
1755	15.57	200	5.83	0.437	5.56	0.50	19.99	-8	
1800	15.57	200	5.82	0.436	5.16	0.49	19.94	-7	
1805	15.57	200	5.82	0.436	4.97	0.48	19.96	-6	
1810	15.57	200	5.82	0.435	3.70	0.48	19.84	-5	

SIGNATURE(S): _____ **PAGE** ___ **OF**

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Site 43 Toluene Disposal Area
Project No.: 112G00771

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

Sample ID No.: S43MW0403
Sample Location: MW04
Sampled By: CM
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5/13/13	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	TBD
Time: 1810	Visual	Standard	mS/cm	°C	NTU	mg/l	mV	
Method: Peristaltic Pump	Clear	5.48	0.188	16.10	1.27	0.48	99	—

PURGE DATA:

Date: 5/13/13	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	ORP	TBD
Method: Peristaltic Pump								
Monitor Reading(ppm):								
Well Casing Diameter & Material								
Type: 2" PVC								
Total Well Depth (TD): —	(See Low Flow Purge Data Sheet)							
Static Water Level (WL): 6.38								
One Casing Volume(gal/L):								
Start Purge (hrs): 1710								
End Purge (hrs): 1805								
Total Purge Time (min): 55								
Total Vol. Purged (gal/L): 3.0								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOC	HCl	40 ml VOA Vials	3
Total Metals	HNO3	250 ml Poly	1
Dissolved Metals	HNO3	250 ml Poly	N/A

OBSERVATIONS / NOTES:

Water was clear with no odor or sheen observed

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

TBD: To Be Determined

Tetra Tech

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Site 43 Toluene Disposal Area
PROJECT NUMBER: 112G00771

WELL ID.: S43MW0403
DATE: 5/13/13

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)	Vertical Pump Placement Other Comments
1710	6.38	200	5.57	0.182	10.27	1.70	17.64	96	
1715	6.52	200	5.49	0.186	3.53	0.83	16.86	71	
1720	6.51	200	5.48	0.187	4.66	0.73	16.77	71	
1725	6.51	200	5.49	0.187	20.20	0.65	16.37	70	
1730	6.51	200	5.44	0.187	14.93	0.62	16.21	100	
1735	6.51	200	5.47	0.189	3.17	0.55	16.41	100	
1740	6.51	200	5.48	0.189	2.46	0.56	16.36	99	
1745	6.51	200	5.49	0.190	1.62	0.57	16.33	98	
1750	6.51	200	5.48	0.188	2.59	0.52	16.30	99	
1755	6.51	200	5.50	0.189	3.32	0.51	16.25	98	
1800	6.51	200	5.49	0.189	1.56	0.49	16.15	98	
1805	6.51	200	5.48	0.188	1.27	0.48	16.10	99	
18									
1810	Sample S43MW0403 was collected								

SIGNATURE(S): _____ **PAGE** ___ **OF**

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Site 43 Toluene Disposal Area
Project No.: 112G00771

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

Sample ID No.: S43MW0503
Sample Location: MW05
Sampled By: CM
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	TBD
Date: 5/9/13	Visual	Standard	mS/cm	^{0}C	NTU	mg/l	mV	
Time: 1940								
Method: Peristaltic Pump	Lt Brn	4.69	0.169	16.82	80.95	0.45	198	—

PURGE DATA:

Date: 5/9/13	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	ORP	TBD
Method: Peristaltic Pump								
Monitor Reading(ppm):								
Well Casing Diameter & Material								
Type: 2" PVC	(See Low Flow Purge Data Sheet)							
Total Well Depth (TD): —								
Static Water Level (WL): 4.87								
One Casing Volume(gal/L):								
Start Purge (hrs): 1845								
End Purge (hrs): 1935								
Total Purge Time (min): 50								
Total Vol. Purged (gal/L): 3.0								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOC	HCl	40 ml VOA Vials	3
Total Metals	HNO3	250 ml Poly	1
Dissolved Metals	HNO3	250 ml Poly	1

OBSERVATIONS / NOTES:

1825 arrive find well vault flooded set up peristaltic to pump out water 1.5 gallons
purging began water was light Brown with no odor or sheen observed sample was turbid light brown with no odor or sheen observed filtered sample sent

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

TBD: To Be Determined

Tetra Tech

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Site 43 Toluene Disposal Area
PROJECT NUMBER: 112G00771

WELL ID.: S43MW0503
DATE: 5/9/13

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)	Vertical Pump Placement Other Comments
1845	4.87	200	4.96	0.161	210	0.53	20.34	170	
1850	4.89	200	4.91	0.164	227	0.49	19.13	181	
1855	4.90	200	4.88	0.166	238	0.44	18.69	186	
1900	4.89	200	4.86	0.166	243	0.43	18.40	190	
1905	4.88	200	4.81	0.168	214	0.42	17.89	194	
1910	4.88	200	4.78	0.168	173	0.48	17.47	198	
1915	4.87	200	4.76	0.169	151	0.52	17.33	200	
1920	4.87	200	4.73	0.169	101	0.48	17.04	199	
1925	4.87	200	4.68	0.169	119	0.45	17.00	200	
1930	4.87	200	4.66	0.168	108.1	0.45	17.01	201	
1935	4.87	200	4.69	0.169	80.95	0.45	16.82	198	
1940	sample S43MW05								

SIGNATURE(S): _____ **PAGE** ___ **OF**

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF-Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43MW00603
Sample Location: S43MW006
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (^{0}C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Date: 5-9-13								
Time: 1807								
Method: Low Flow - Peristaltic	slightly tint	5.79	0.474	16.96	42.0	0.00	0.2	-33

PURGE DATA:

	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Date: 5-9-13								
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): --								
Well Casing Diameter & Material								
Type: 2" PVC								
Total Well Depth (TD): —								
Static Water Level (WL): 3.95								
One Casing Volume(gal/L):								
Start Purge (hrs): 1655								
End Purge (hrs): 1807								
Total Purge Time (min): 72								
Total Vol. Purged (gal/L): 5 gal								

See low flow log sheet

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes
Total Metals	HNO3	1 250-mL poly bottle	yes
Filtered Metals	HNO3	1 250-mL poly bottle	yes

OBSERVATIONS / NOTES:

Some Cr sand during purg
Tubing pulled 3' off bottom
Red algae

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771

WELL ID.: S43MW006
DATE: 5-9-13

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
1655	3.95									
1700	4.96	250	5.77	0.431	—	0.00	17.87	16	0.2	Red algae
1705	5.13	250	5.81	0.453	—	0.00	16.74	3	0.2	Red algae
1710	5.27	250	5.85	0.467	916	0.00	16.59	-12	0.2	Same Red algae
1715	5.27	250	5.77	0.467	278	0.00	17.10	-17	0.2	" " some sand
1720	5.45	250	5.80	0.471	162	0.00	17.07	-28	0.2	Red tint (tiny particles)
1725	5.50	250	5.78	0.473	129	0.00	17.05	-30	0.2	Red tint 2 gal
1730	5.51	250	5.80	0.470	125	0.00	17.00	-26	0.2	" "Dump Horiba
1735	5.51	250	5.82	0.469	103.9	0.00	16.99	-22	0.2	Slight red tint
1740	5.51	250	5.75	0.471	83.5	0.00	16.78	-25	0.2	" " 3 gal
1745	5.51	250	5.76	0.471	69.8	0.00	16.94	-25	0.2	" "
1750	5.51	250	5.76	0.472	59.8	0.00	17.06	-28	0.2	" "
1755	5.51	250	5.77	0.473	41.0	0.00	17.14	-31	0.2	Clear w/ tiny red particle 4 gal
1800	5.51	250	5.79	0.474	48.6	0.00	17.06	-32	0.2	" "
1805	5.51	250	5.79	0.474	42.0	0.00	16.96	-33	0.2	" "
1807	Collect sample									

SIGNATURE(S):

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF-Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43MW00702
Sample Location: S43MW007
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5-13-13	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1802	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Low Flow - Peristaltic	clear	4.71	0.209	13.51	0.36	0.00	0.1	190

PURGE DATA:

Date: 5-13-13	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): --								
Well Casing Diameter & Material								
Type: 2 " PVC								
Total Well Depth (TD): –								
Static Water Level (WL): 6.40								
One Casing Volume(gal/L):								
Start Purge (hrs): 1710								
End Purge (hrs): 1802								
Total Purge Time (min): 52								
Total Vol. Purged (gal/L): 3¼ gal								

See low flow log for details

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes
Total Metals	HNO3	1 250-mL poly bottle	yes
Filtered Metals	HNO3	1 250-mL poly bottle	no

OBSERVATIONS / NOTES:

Pull tubing 2' off bottom

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771
WELL ID.: S43MW0G7
DATE: 5-13-13

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
1710	6.40									
1715	6.40	250	5.33	0.206	—	2.09	15.58	138	0.1	clear
1720	6.40	250	4.65	0.213	3.11	0.00	14.09	175	0.1	clear
1725	6.40	250	4.61	0.211	1.24	0.00	13.78	184	0.1	clear
1730	6.40	250	4.61	0.211	1.06	0.00	13.57	184	0.1	clear 1¼ gal
1735	6.40	250	4.62	0.210	0.98	0.00	13.62	187	0.1	clear
1740	6.40	250	4.64	0.209	0.73	0.00	13.59	191	0.1	clear
1745	6.40	250	4.65	0.208	0.54	0.00	13.54	194	0.1	clear 2 gal
1750	6.40	250	4.68	0.208	0.51	0.00	13.56	193	0.1	clear
1755	6.40	250	4.70	0.210	0.40	0.00	13.54	191	0.1	clear
1800	6.40	250	4.71	0.209	0.36	0.00	13.51	190	0.1	clear 3 gal
1802	Collect sample									

SIGNATURE(S):

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF-Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43MW00802
Sample Location: S43MW008
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5-9-13	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1540	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Low Flow - Peristaltic	clear	4.45	0.063	16.02	0.46	0.00	0.0	207

PURGE DATA:

Date: 5-9-13	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): --								
Well Casing Diameter & Material								
Type: 2" PVC								
Total Well Depth (TD): —								
Static Water Level (WL): 7.92								
One Casing Volume(gal/L):								
Start Purge (hrs): 1452								
End Purge (hrs): 1540								
Total Purge Time (min): 48								
Total Vol. Purged (gal/L): 23/4gal								

See low flow purge sheet for details

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes
Total Metals	HNO3	1 250-mL poly bottle	yes
Filtered Metals	HNO3	1 250-mL poly bottle	

OBSERVATIONS / NOTES:

Pull tubing 1' off bottom

Circle if Applicable:

MS/MSD —

Duplicate ID No.: —

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771

WELL ID.: S43MW0008
DATE: 5-9-13

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
1452	7.92									
1457	7.97	250	0.069	5.08	—	0.82	16.50	169	0.0	clear
1502	7.98	250	4.96	0.065	10.31	0.00	16.08	178	0.0	clear
1507	7.98	250	4.78	0.063	5.28	0.00	16.02	195	0.0	clear
1512	7.98	250	4.62	0.062	2.16	0.00	16.01	200	0.0	" "
1517	7.98	250	4.55	0.062	0.89	0.00	16.10	205	0.0	" "
1522	7.98	250	4.49	0.062	0.71	0.00	16.00	203	0.0	" "
1527	7.98	250	4.47	0.063	0.56	0.00	15.98	204	0.0	" "
1532	7.98	250	4.46	0.062	0.51	0.00	16.04	207	0.0	" " 2½ gal
1537	7.98	250	4.45	0.063	0.46	0.00	16.02	207	0.0	" "
1540	Collect sample									

SIGNATURE(S):

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Site 43 Toluene Disposal Area
Project No.: 112G00771

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

Sample ID No.: S43MW09S02
Sample Location: MW09S
Sampled By: CM
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5/13/13	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	TBD
Time: 1205	Visual	Standard	mS/cm	^{0}C	NTU	mg/l	mV	
Method: Peristaltic Pump	clear	4.97	0.325	13.45	1.59	1.23	101	—

PURGE DATA:

Date: 5/13/13	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	ORP	TBD
Method: Peristaltic Pump								
Monitor Reading(ppm):								
Well Casing Diameter & Material								
Type: 2" PVC								
Total Well Depth (TD): —	(See Low Flow Purge Data sheet)							
Static Water Level (WL): 6.88								
One Casing Volume(gal/L):								
Start Purge (hrs): 1055								
End Purge (hrs): 1200								
Total Purge Time (min): 65								
Total Vol. Purged (gal/L): 3.0								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOC	HCl	40 ml VOA Vials	6
Total Metals	HNO3	250 ml Poly	2
Dissolved Metals	HNO3	250 ml Poly	N/A

OBSERVATIONS / NOTES:

Water was clear with no odor or sheen observed

Circle if Applicable:

MS/MSD	Duplicate ID No.: S43MW09S02-D
—	Assigned Time = 1210

Signature(s):

TBD: To Be Determined

Tetra Tech

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Site 43 Toluene Disposal Area
PROJECT NUMBER: 112G00771

WELL ID.: S43MW09S02
DATE: 5/13/13

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)	Vertical Pump Placement Other Comments
1055	6.88	200	5.65	0.450	8.91	3.96	15.29	32	
1100	7.48	200	5.76	0.441	10.42	2.45	14.53	6	
1105	7.54	200	5.62	0.409	13.67	1.57	13.81	27	
1110	7.61	200	5.55	0.382	12.34	1.01	13.46	35	
1115	7.56	150	5.47	0.376	11.76	0.96	13.44	47	
1120	7.53	150	5.29	0.356	7.85	0.94	13.47	70	
1125	7.53	150	5.19	0.347	3.42	0.90	13.42	88	
1130	7.53	150	5.04	0.341	2.94	0.87	13.47	95	
1135	7.53	150	5.06	0.336	2.85	0.84	13.52	95	
1140	7.53	150	5.01	0.331	1.90	0.77	13.60	97	
1145	7.53	150	4.98	0.327	1.77	1.26	13.45	99	
1150	7.53	150	4.98	0.327	1.62	1.25	13.41	98	
1155	7.53	150	4.97	0.326	1.56	1.21	13.35	100	
1200	7.53	150	4.97	0.325	1.59	1.23	13.45	101	

SIGNATURE(S): _____ **PAGE** ___ **OF**

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Site 43 Toluene Disposal Area
Project No.: 112G00771

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

Sample ID No.: S43MW09D02
Sample Location: MW09D
Sampled By: CM
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5/13/13	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	TBD
Time: 1335	Visual	Standard	mS/cm	^{0}C	NTU	mg/l	mV	
Method: Peristaltic Pump	Clear	6.51	0.314	16.73	5.16	0.55	-106	–

PURGE DATA:

Date: 5/13/13	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	ORP	TBD
Method: Peristaltic Pump								
Monitor Reading(ppm):								
Well Casing Diameter & Material								
Type: 2" PVC								
Total Well Depth (TD): –	(See Low Flow Purge Data Sheet)							
Static Water Level (WL): 5.15								
One Casing Volume(gal/L):								
Start Purge (hrs): 1225								
End Purge (hrs): 1330								
Total Purge Time (min): 55	55							
Total Vol. Purged (gal/L): 2.5								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOC	HCl	40 ml VOA Vials	3
Total Metals	HNO3	250 ml Poly	1
Dissolved Metals	HNO3	250 ml Poly 1	~~N/A~~ CM 5/13/13

OBSERVATIONS / NOTES:

Water started out with yellow suspended particals no odor or sheen observed
Final water clear with yellow suspended solids no odor or sheen Filtered sample sent because suspended solids observed

Circle if Applicable:

MS/MSD	Duplicate ID No.:
–	–

Signature(s):

TBD: To Be Determined

Tetra Tech

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Site 43 Toluene Disposal Area
PROJECT NUMBER: 112G00771

WELL ID.: S43MW09D02
DATE: 5/13/13

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)	Vertical Pump Placement Other Comments
1225	5.15	150	6.40	0.336	12.63	1.70	14.70	20	
1230	6.56	150	6.62	0.340	36.30	0.97	14.06	-106	
1235	7.16	150	6.67	0.342	31.46	0.63	15.17	-114	
1240	7.59	150	6.67	0.339	23.39	0.54	15.28	-115	
1245	8.00	150	6.67	0.337	21.72	0.50	15.39	-117	
1250	8.29	150	6.65	0.330	11.41	0.47	15.76	-117	
1255	8.22	125	6.64	0.328	7.98	0.75	15.86	~~-117~~ -116	
1300	8.17	125	6.65	0.326	7.96	0.65	15.81	-114	
1305	8.07	125	6.60	0.326	12.84	0.63	15.88	-111	
1310	8.12	125	6.57	0.321	5.00	0.57	16.30	-111	
1315	8.12	125	6.55	0.318	3.92	0.55	16.40	-109	
1320	8.12	125	6.54	0.315	6.54	0.55	16.42	-109	
1325	8.12	125	6.53	0.316	2.78	0.54	16.57	-108	
1330	8.12	125	6.51	0.314	5.16	0.55	16.73	-106	
1335	Sample	S43MW09D02	was	collected					

SIGNATURE(S): _____ **PAGE** ___ **OF**

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GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF-Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43MW01002
Sample Location: S43MW010
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: ~~5-13-12~~ 5-9-13	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1912	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Low Flow - Peristaltic	clear	6.04	0.321	17.03	39.6	0.00	0.1	-69

PURGE DATA:

Date: 5-9-13	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): --								
Well Casing Diameter & Material								
Type: 2" PVC								
Total Well Depth (TD): —								
Static Water Level (WL): 9.73								
One Casing Volume(gal/L):								
Start Purge (hrs): 1820								
End Purge (hrs): 1912								
Total Purge Time (min): 52								
Total Vol. Purged (gal/L): 3½gal								

See low flow log sheet for details

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes
Total Metals	HNO3	1 250-mL poly bottle	yes
Filtered Metals	HNO3	1 250-mL poly bottle	yes

OBSERVATIONS / NOTES:

Pull tubing 4' off bottom
Some little red algae particles

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771

WELL ID.: S43MW010
DATE: 5-9-13

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
1820	9.73	Start	purge							
1825	10.74	250	6.12	0.292	—	1.08	17.46	-43	0.1	clear w/tiny red particles
1830	11.31	250	5.95	0.296	92.2	0.00	16.91	-38	0.1	clear " "
1835	11.52	250	5.84	0.299	80.8	0.00	16.97	-37	0.1	clear " "
1840	11.78	200	5.89	0.301	62.9	0.00	17.18	-43	0.1	clear 1¼ gal
1845	12.03	200	5.88	0.306	60.4	0.00	17.16	-47	0.1	clear w/tiny red particles
1850	12.10	200	5.94	0.304	53.4	0.00	17.18	-53	0.1	clear " "
1855	12.20	200	5.96	0.314	49.4	0.00	17.10	-59	0.1	clear 2¼ gal
1900	1225	200	5.98	0.316	39.6	0.00	17.01	-62	0.1	clear
1905	12.27	200	6.03	0.321	34.7	0.00	17.06	-68	0.1	clear
1910	12.28	200	6.04	0.321	39.6	0.00	17.03	-69	0.1	clear 3½ gal
1912	Collect sample									

SIGNATURE(S): [signature]

PAGE 1 **OF** 1

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GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF-Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43MW0111 02
Sample Location: S43MW0111
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5-9-13	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (^{0}C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Time: 1137								
Method: Low Flow - Peristaltic	clear	5.19	0.175	14.04	1.59	0.00	0.0	51

PURGE DATA:

Date: 5-9-13	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): --								
Well Casing Diameter & Material								
Type: 2 " PVC								
Total Well Depth (TD):								
Static Water Level (WL): 10.01								
One Casing Volume(gal/L):								
Start Purge (hrs): 1040								
End Purge (hrs): 1137								
Total Purge Time (min): 57								
Total Vol. Purged (gal/L): 4 gal								

See Low Flow Log for details

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	Yes
Total Metals	HNO3	1 250-mL poly bottle	yes
Filtered Metals	HNO3	1 250-mL poly bottle	no

OBSERVATIONS / NOTES:

Tubing pulled 1' off bottom

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771

WELL ID.: S43MW011
DATE: 5-9-13

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
1040	10.01	Start	purge							
1045	10.35	250	4.34	0.202	—	0.13	14.05	112	0.1	clear
1050	10.43	250	4.76	0.174	10.31	0.00	13.89	86	0.1	clear
1056	10.43	250	4.89	0.173	9.36	0.00	13.85	75	0.1	clear
1100	10.43	250	4.94	0.174	4.29	0.00	13.85	71	0.1	clear 1 1/4 gal
1105	10.43	250	5.01	0.175	2.70	0.00	13.85	65	0.1	clear
1110	10.43	250	5.05	0.175	1.67	0.00	13.88	62	0.1	clear
1115	10.43	250	5.09	0.175	1.53	0.00	13.94	58	0.1	clear 2 1/2 gal
1120	10.43	250	5.12	0.176	1.76	0.00	14.00	56	0.1	clear
1125	10.43	250	5.14	0.175	1.70	0.00	14.01	55	0.1	clear
1130	10.43	250	5.18	0.176	1.76	0.00	13.99	51	0.1	clear 3 1/2 gal
1135	10.43	250	5.19	0.175	1.59	0.00	14.04	51	0.1	clear
1137	Collect sample									

SIGNATURE(S):

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Site 43 Toluene Disposal Area
Project No.: 112G00771

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

Sample ID No.: S43MW12D2
Sample Location: S43MW12
Sampled By: CM
C.O.C. No.:
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	TBD
Date: 5/14/13								
Time: 1755								
Method: Peristaltic Pump	Clear	6.14	0.169	20.27	4.09	0.45	-51	—

PURGE DATA:

	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	ORP	TBD
Date: 5/14/13								
Method: Peristaltic Pump								
Monitor Reading(ppm):								
Well Casing Diameter & Material								
Type: 1" PVC								
Total Well Depth (TD): —	(See Low Flow Purge Data sheet)							
Static Water Level (WL): 13.34								
One Casing Volume(gal/L):								
Start Purge (hrs): 1645								
End Purge (hrs): 1750								
Total Purge Time (min): 55								
Total Vol. Purged (gal/L): 1.5								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOC	HCl	40 ml VOA Vials	3
Total Metals	HNO3	250 ml Poly	1
Dissolved Metals	HNO3	250 ml Poly	N/A

OBSERVATIONS / NOTES:

Upon purging water light Brown no odor or sheen
Purging completed water clear no odor or sheen observed

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

TBD: To Be Determined

Tetra Tech

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Site 43 Toluene Disposal Area
PROJECT NUMBER: 112G00771

WELL ID.: S43MW1202
DATE: 5/14/13

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)	Vertical Pump Placement Other Comments
1645	13.34	120	6.07	0.180	48.12	2.55	18.44	-21	Light Brown No odor
1650	13.73	120	6.11	0.182	120	1.11	18.21	-43	
1655	13.68	120	6.11	0.179	97.46	0.89	18.73	-45	
1700	13.68	120	6.12	0.177	83.79	0.75	19.19	-47	
1705	13.69	120	6.12	0.176	57.07	0.70	19.38	-47	
1710	13.69	120	6.13	0.174	39.02	0.65	19.75	-48	
1715	13.69	120	6.12	0.172	20.57	0.62	19.94	-48	
1720	13.69	120	6.12	0.172	14.59	0.59	19.95	-49	
1725	13.69	120	6.12	0.172	11.87	0.56	19.95	-49	
1730	13.69	120	6.12	0.171	9.74	0.53	19.97	-50	
1735	13.69	120	6.13	0.171	9.44	0.51	20.02	-51	
1740	13.69	120	6.13	0.170	6.23	0.49	20.17	-51	
1745	13.69	120	6.14	0.170	5.26	0.47	20.26	-51	
1750	13.69	120	6.14	0.169	4.09	0.45	20.27	-51	
1755	sample S43MW1202			was	collected				

SIGNATURE(S): _____ **PAGE** ___ **OF**

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GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF-Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43MW013-02
Sample Location: S43MW013
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (^{0}C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Date: 5-19-13								
Time: 0937								
Method: Low Flow - Peristaltic	clear	4.55	0.242	15.65	0.35	0.61	0.1	299

PURGE DATA:

Date: 5-19-13	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): --								
Well Casing Diameter & Material								
Type: 1 " PVC								
Total Well Depth (TD): —								
Static Water Level (WL): 15.77								
One Casing Volume(gal/L):								
Start Purge (hrs): 0845								
End Purge (hrs): 0937								
Total Purge Time (min): 52								
Total Vol. Purged (gal/L): 3 gal								

See low flow log for details

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes
Total Metals	HNO3	1 250-mL poly bottle	yes
Filtered Metals	HNO3	1 250-mL poly bottle	no

OBSERVATIONS / NOTES:

Pulled tubing 1' off bottom

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771

WELL ID.: S43MW013
DATE: 5-19-13

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
0845	15.77									
0850	15.78	250	4.52	0.306	—	1.77	16.13	280	0.1	clear
0855	15.78	250	4.46	0.277	7.37	1.28	15.86	289	0.1	clear
0900	15.78	250	4.42	0.258	4.60	1.01	15.71	296	0.1	clear
0905	15.78	250	4.38	0.247	2.13	0.80	15.63	304	0.1	clear
0910	15.78	250	4.38	0.245	1.91	0.76	15.59	307	0.1	clear 1¼ gal
0915	15.78	250	4.43	0.244	1.56	0.70	15.61	302	0.1	clear
0920	15.78	250	4.46	0.243	1.38	0.63	15.62	297	0.1	clear
0925	15.78	250	4.53	0.242	1.23	0.70	15.63	295	0.1	clear
0930	15.78	250	4.54	0.242	1.10	0.65	15.63	297	0.1	clear 2¼ gal
0935	15.78	250	4.55	0.242	0.85	0.61	15.65	299	0.1	clear
0937	Collect sample									

SIGNATURE(S):

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF-Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43MW019
Sample Location: S43MW019
Sampled By: RMS
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5/19/13	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 0945	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Low Flow - Peristaltic	clear	4.55	0.156	18.16	2.90	0	0.1	234

PURGE DATA:

Date: 5/19/13	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): -- -0-								
Well Casing Diameter & Material			See Low Flow Purge					
Type: 1 " PVC						Data Sheet		
Total Well Depth (TD):								
Static Water Level (WL): 13.18								
One Casing Volume(gal/L):								
Start Purge (hrs): 0850								
End Purge (hrs): 0945								
Total Purge Time (min): 55								
Total Vol. Purged (gal/L): ~8L								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes
Total Metals	HNO3	1 250-mL poly bottle	yes
Filtered Metals	HNO3	1 250-mL poly bottle	no

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771

WELL ID.: S43MW0 14
DATE: 5-19-13

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
0850	13.18	280								
0900	13.29	280	4.34	0.169	58.7	0	20.12	247	0.1	cloudy
0910	13.28	280	4.38	0.165	33.1	0	19.66	242	0.1	cloudy
0920	13.29	250	4.48	0.161	19.4	0	18.79	236	0.1	clearing up
0925	13.29	250	4.48	0.160	4.04	0	18.52	236	0.1	clear
0930	13.28	250	4.51	0.159	3.40	0	18.47	235	0.1	clear
0935	13.29	250	4.53	0.159	3.21	0	18.31	235	0.1	"
0940	13.29	260	4.55	0.159	2.91	0	18.19	235	0.1	"
0945	13.29	260	4.55	0.156	2.90	0	18.16	234	0.1	"
	Sampled @ 0945									

SIGNATURE(S): [signature]

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GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF-Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43MW0 15-02
Sample Location: S43MW0
Sampled By: RMS
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5/19/13	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1055	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Low Flow - Peristaltic	clear	6.13	0.505	15.43	0	0	0.2	50

PURGE DATA:

Date: 5/19/13	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): -- -0-								
Well Casing Diameter & Material		See Low Flow Purge Data Sheet						
Type: 1 " PVC								
Total Well Depth (TD):								
Static Water Level (WL): 11.38								
One Casing Volume(gal/L):								
Start Purge (hrs): 1005								
End Purge (hrs): 1055								
Total Purge Time (min): 50								
Total Vol. Purged (gal/L): 10 L								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes
Total Metals	HNO3	1 250-mL poly bottle	yes
Filtered Metals	HNO3	1 250-mL poly bottle	No

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771

WELL ID.: S43MW0 15
DATE: 5/19/13

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
1005	11.38	300								
1010	11.48	280	6.19	0.492	31.6	0	15.62	50	0.2	slightly cloudy
1020	11.47	240	6.19	0.511	5.23	0	15.64	49	0.2	clear
1025	11.46	240	6.14	0.511	1.53	0	15.59	51	0.2	clear
1030	11.46	240	6.14	0.512	0.42	0	15.53	50	0.2	"
1035	11.47	240	6.13	0.510	-0.65	0	15.51	50	0.2	"
1040	11.47	240	6.12	0.508	-0.34	0	15.51	51	0.2	"
1045	11.47	240	6.12	0.508	0	0	15.47	50	0.2	"
1050	11.47	240	6.13	0.505	0	0	15.43	50	0.2	"
	Sampled @	1055								

SIGNATURE(S):

PAGE___OF___

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GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF-Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43MW01602
Sample Location: S43MW016
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5-19-13	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1135	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Low Flow - Peristaltic	clear	4.42	0.361	15.93	1.36	0.59	0.2	348

PURGE DATA:

Date: 5-19-13	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): --								
Well Casing Diameter & Material								
Type: 1" PVC								
Total Well Depth (TD): —								
Static Water Level (WL): 14.50								
One Casing Volume(gal/L):								
Start Purge (hrs): 1043								
End Purge (hrs): 1135								
Total Purge Time (min): 52								
Total Vol. Purged (gal/L): 2 3/4 gal								

See low flow log for details

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes
Total Metals	HNO3	1 250-mL poly bottle	yes
Filtered Metals	HNO3	1 250-mL poly bottle	no

OBSERVATIONS / NOTES:

Pull tubing 1" off bottom

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771

WELL ID.: S43MW016
DATE: 5-19-13

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
1043	14.50									
1048	14.58	250	4.22	0.364	—	3.50	16.92	338	0.2	clear
1053	14.60	250	4.23	0.366	7.18	1.75	16.09	341	0.2	clear
1058	14.60	250	4.23	0.365	4.63	1.14	16.09	344	0.2	clear
1103	14.60	250	4.25	0.363	3.34	0.79	16.02	347	0.2	clear
1108	14.60	250	4.27	0.363	2.07	0.75	16.00	347	0.2	clear
1113	14.60	250	4.30	0.362	1.88	0.71	16.04	347	0.2	clear 1½ gal
1118	14.60	250	4.33	0.362	1.39	0.70	16.04	347	0.2	clear
1123	14.60	250	4.37	0.362	1.40	0.66	15.96	347	0.2	clear
1128	14.60	250	4.41	0.362	1.34	0.65	15.95	347	0.2	clear
1133	14.60	250	4.42	0.361	1.36	0.59	15.93	348	0.2	clear
1135	Collect sample									

SIGNATURE(S): [signature]

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GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF-Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43MW0175 02
Sample Location: S43MW0175
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5-9-13	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1237	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Low Flow - Peristaltic	Clear	5.34	0.302	14.99	5.80	0.00	0.1	28

PURGE DATA:

Date: 5-9-13	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): --								
Well Casing Diameter & Material								
Type: 2 " PVC								
Total Well Depth (TD): –								
Static Water Level (WL): 13.83								
One Casing Volume(gal/L):								
Start Purge (hrs): 1150								
End Purge (hrs): 1237								
Total Purge Time (min): 47								
Total Vol. Purged (gal/L): 2 3/4 gal								

See low flow log for details

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes
Total Metals	HNO3	1 250-mL poly bottle	yes
Filtered Metals	HNO3	1 250-mL poly bottle	

OBSERVATIONS / NOTES:

Pulled tubing 1' off bottom

Circle if Applicable:

MS/MSD — Duplicate ID No.:

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771

WELL ID.: S43MW0175
DATE: 5-9-13

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
1150	13.83	Start	purge							
1155	14.10	250	5.48	0.299	—	0.00	14.30	30	0.1	clear some fine algae particles
1200	14.13	250	5.48	0.301	14.6	0.00	14.32	26	0.1	clear
1205	14.13	250	5.51	0.302	9.32	0.00	14.33	25	0.1	clear ↓
1210	14.13	250	5.45	0.302	17.1	0.00	14.34	27	0.1	clear few algae
1215	14.13	250	5.39	0.301	12.9	0.00	14.46	28	0.1	clear 1 1/2 gal
1220	14.13	250	5.37	0.302	7.23	0.00	14.53	29	0.1	clear
1225	14.13	250	5.34	0.301	10.82	0.00	14.58	29	0.1	clear very few algae
1230	14.13	250	5.34	0.303	8.08	0.00	14.84	29	0.1	clear 2 1/4 gal
1235	14.13	250	5.34	0.302	5.80	0.00	14.99	28	0.1	clear
1237	Collect sample									

SIGNATURE(S):

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF-Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43MW017D02
Sample Location: S43MW017D~~02~~
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5-9-13	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1337	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Low Flow - Peristaltic	clear	5.76	0.295	16.28	6.76	0.00	0.1	-2

PURGE DATA:

Date: 5-9-13	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): --								
Well Casing Diameter & Material								
Type: 2 " PVC								
Total Well Depth (TD): –								
Static Water Level (WL): 17.79								
One Casing Volume(gal/L):								
Start Purge (hrs): 1240								
End Purge (hrs): 1337								
Total Purge Time (min): 57								
Total Vol. Purged (gal/L): 3 1/2 gal								

See low flow log for details

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes
Total Metals	HNO3	1 250-mL poly bottle	yes
Filtered Metals	HNO3	1 250-mL poly bottle	no

OBSERVATIONS / NOTES:

Pulled tubing 1' off bottom

Circle if Applicable:

MS/MSD	Duplicate ID No.:
–	~~S43Dup02 20130509~~ S43MW017D02-D 5-9-13 1100

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771

WELL ID.: S43MW0|7D
DATE: 5-9-13

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
1240	17.79									
1245	17.93	350	5.56	0.301	—	12.26	17.31	21	0.1	
1250	18.00	250	5.60	0.285	20.4	8.33	17.66	16	0.1	clear
1255	18.01	250	5.60	0.283	23.2	7.14	18.20	16	0.1	clear get air out of horiba
1300	18.01	250	5.61	0.300	21.0	0.00	16.26	14	0.1	clear
1305	18.01	250	5.62	0.301	15.8	0.00	16.24	12	0.1	clear 1¼ gal
1310	18.01	250	5.64	0.300	10.93	0.00	16.20	10	0.1	clear
1315	18.01	250	5.67	0.298	9.62	0.00	16.33	7	0.1	clear
1320	18.01	250	5.69	0.297	7.53	0.00	16.37	5	0.1	clear 2¼ gal
1325	18.01	250	5.73	0.294	6.31	0.00	16.32	2	0.1	clear
1330	18.01	250	5.75	0.295	5.68	0.00	16.33	0	0.1	clear
1335	18.01	250	5.76	0.295	6.76	0.00	16.28	-2	0.1	clear 3¼ gal
1337	Collect sample									

SIGNATURE(S):

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Site 43 Toluene Disposal Area
Project No.: 112G00771

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

Sample ID No.: S43MW18O2
Sample Location: MW18
Sampled By: CLM
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	TBD
Date: 5/8/13	Visual	Standard	mS/cm	^{0}C	NTU	mg/l	mV	
Time: 1305								
Method: Peristaltic Pump	Clear	4.97	0.270	15.77	2.03	7.77	307	—

PURGE DATA:

	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	ORP	TBD
Date: 5/8/13								
Method: Peristaltic Pump								
Monitor Reading(ppm):								
Well Casing Diameter & Material								
Type: 2" PVC								
Total Well Depth (TD): —	(See Low Flow Purge Data Sheets)							
Static Water Level (WL): 11.41								
One Casing Volume(gal/L):								
Start Purge (hrs): 1155								
End Purge (hrs): 1305								
Total Purge Time (min): 70								
Total Vol. Purged (gal/L): 3.5								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOC	HCl	40 ml VOA Vials	3
Total Metals	HNO3	250 ml Poly	1
Dissolved Metals	HNO3	250 ml Poly	N/A

OBSERVATIONS / NOTES:

No odors or sheens observed during Sampling Activities

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

TBD: To Be Determined

Tetra Tech

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Site 43 Toluene Disposal Area
PROJECT NUMBER: 112G00771

WELL ID.: S42MW1802
DATE: 5/8/13

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)	Vertical Pump Placement Other Comments
1155	11.41	225	5.47	0.313	39.56	9.32	16.06	245	
1200	11.47	225	5.38	0.300	26.50	8.64	15.54	256	
1205	11.51	200	5.33	0.298	17.92	8.14	15.32	287	
1210	11.51	200	5.28	0.295	15.52	7.93	15.31	276	
1215	11.51	200	5.25	0.293	12.30	7.61	15.30	281	
1220	11.51	200	5.24	0.290	10.24	7.43	15.27	283	
1225	11.51	200	5.17	0.286	6.63	7.81	15.28	287	
1230	11.51	200	5.13	0.283	5.66	7.82	15.29	282	
1235	11.51	200	5.10	0.280	5.74	7.43	15.35	290	
1240	11.51	200	5.05	0.277	4.45	7.14	15.46	293	
1245	11.51	200	5.04	0.276	4.38	7.57	15.50	297	
1250	11.51	200	5.01	0.274	3.48	7.68	15.59	299	
1255	11.51	200	5.00	0.272	2.47	7.43	15.67	301	
1300	11.51	200	4.98	0.270	2.59	7.54	15.70	303	
1305	11.51	200	4.97	0.270	2.03	7.77	15.77	307	

SIGNATURE(S): [signature]

PAGE 1 **OF** 1

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Site 43 Toluene Disposal Area
Project No.: 112G00771

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

Sample ID No.: S43MW19S02
Sample Location: MW19S
Sampled By: CM
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5/8/13	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	TBD
Time: 1445	Visual	Standard	mS/cm	^{0}C	NTU	mg/l	mV	
Method: Peristaltic Pump	Clear	4.53	0.266	16.16	0.50	0.54	276	

PURGE DATA:

Date: 5/8/13	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	ORP	TBD
Method: Peristaltic Pump								
Monitor Reading(ppm): —								
Well Casing Diameter & Material								
Type: 2" PVC								
Total Well Depth (TD):	(See Low Flow Purge Data Sheet)							
Static Water Level (WL): 14.64								
One Casing Volume(gal/L):								
Start Purge (hrs): 1345								
End Purge (hrs): 1445								
Total Purge Time (min): 60								
Total Vol. Purged (gal/L): 2.5								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOC	HCl	40 ml VOA Vials	3
Total Metals	HNO3	250 ml Poly	1
Dissolved Metals	HNO3	250 ml Poly	N/A

OBSERVATIONS / NOTES:

No odors or sheens were observed during sampling activities

Circle if Applicable:

MS/MSD — Duplicate ID No.:

Signature(s):

TBD: To Be Determined

Tetra Tech

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Site 43 Toluene Disposal Area
PROJECT NUMBER: 112G00771

WELL ID.: 943MW19S02
DATE: 5/8/13

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)	Vertical Pump Placement Other Comments
1345	14.64	150	4.57	0.272	15.67	2.88	16.58	266	
1350	14.72	150	4.55	0.271	10.24	1.57	16.59	268	
1355	14.73	150	4.54	0.270	6.31	1.21	16.51	270	
1400	14.74	150	4.54	0.270	3.72	0.99	16.45	271	
1405	14.74	150	4.53	0.268	2.00	0.82	16.23	272	
1410	14.74	150	4.54	0.265	0.85	0.68	16.36	272	
1415	14.74	150	4.53	0.267	0.89	0.63	16.24	273	
1420	14.74	150	4.53	0.267	1.03	0.62	16.08	274	
1425	14.74	150	4.52	0.265	0.71	0.70	16.28	274	
1430	14.74	150	4.50	0.265	0.59	0.76	16.48	276	
1435	14.74	150	4.51	0.266	0.64	0.60	16.35	276	
1440	14.74	150	4.52	0.266	0.56	0.57	16.25	276	
1445	14.74	150	4.53	0.266	0.50	0.54	16.16	276	

SIGNATURE(S): [illegible]

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Site 43 Toluene Disposal Area
Project No.: 112G00771

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

Sample ID No.: S43MW19D02
Sample Location: MW19D
Sampled By: CM
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5/8/13	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	TBD
Time: 1640	Visual	Standard	mS/cm	^{0}C	NTU	mg/l	mV	
Method: Peristaltic Pump	clear	5.57	0.245	16.39	4.47	0.69	13	

PURGE DATA:

Date: 5/8/13	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	ORP	TBD
Method: Peristaltic Pump								
Monitor Reading(ppm): —								
Well Casing Diameter & Material								
Type: 2" PVC	See Low Flow Purge Data Sheet							
Total Well Depth (TD): —								
Static Water Level (WL): 22.26								
One Casing Volume(gal/L):								
Start Purge (hrs): 1510								
End Purge (hrs): 1635								
Total Purge Time (min): 85								
Total Vol. Purged (gal/L): 4.0								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOC	HCl	40 ml VOA Vials	3
Total Metals	HNO3	250 ml Poly	1
Dissolved Metals	HNO3	250 ml Poly	N/A

OBSERVATIONS / NOTES:

Iron bacteria noted on the water level probe along with initial water in the purge tube water
weather turned bad heavy rain wind and hail wait it out
After storm through water clear no odor or sheen observed

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

TBD: To Be Determined

Tetra Tech

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Site 43 Toluene Disposal Area
PROJECT NUMBER: 112G00771

WELL ID.: S43MW19D02
DATE: 5/8/13

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)	Vertical Pump Placement Other Comments
1510	22.26	150	5.99	0.273		8.42	18.29	5	
1515	22.50	150	6.00	0.271	87.21	8.27	18.14	-1	
1520	22.50	150	5.90	0.265		8.18	18.08	-1	
	Weather Delay								
1550	22.50	150	5.53	0.254	6.14	1.55	16.34	21	
1555	22.50	150	5.50	0.248	5.42	1.32	16.29	20	
1600	22.50	150	5.53	0.246	4.98	1.76	16.29	19	
1605	22.50	150	5.52	0.247	4.86	2.03	16.29	20	
1610	22.50	150	5.55	0.245	4.72	2.30	16.29	17	
1615	22.50	150	5.55	0.245	4.68	1.23	16.23	16	
1620	22.50	150	5.33	0.245	4.71	0.65	16.25	17	
1625	22.51	150	5.55	0.245	4.21	0.62	16.29	15	
1630	22.50	150	5.55	0.245	3.96	0.69	16.30	14	
1635	22.50	150	5.57	0.245	4.47	0.69	16.39	13	

SIGNATURE(S): [signature]

PAGE 1 **OF** 1

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Site 43 Toluene Disposal Area
Project No.: 112G00771

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

Sample ID No.: S43MW20D2
Sample Location: MW20
Sampled By: CM
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	TBD
Date: 5/9/13	Visual	Standard	mS/cm	^{0}C	NTU	mg/l	mV	
Time: 1525								
Method: Peristaltic Pump	LtBrn	5.05	0.178	18.40	53.23	1.97	254	

PURGE DATA:

Date: 5/9/13	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	ORP	TBD
Method: Peristaltic Pump								
Monitor Reading(ppm): —								
Well Casing Diameter & Material								
Type: 2" PVC								
Total Well Depth (TD): —	(See Low Flow Purge Data Sheet)							
Static Water Level (WL): 15.59								
One Casing Volume(gal/L):								
Start Purge (hrs): 1420								
End Purge (hrs): 1520								
Total Purge Time (min): 60								
Total Vol. Purged (gal/L): 3.0								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOC	HCl	40 ml VOA Vials	3
Total Metals	HNO3	250 ml Poly	1
Dissolved Metals	HNO3	250 ml Poly	1

OBSERVATIONS / NOTES:

water was slightly turbid light brown throughout no odor or sheen observed Filtered sample collected at this location

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

TBD: To Be Determined

Tetra Tech

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Site 43 Toluene Disposal Area
PROJECT NUMBER: 112G00771

WELL ID.: S43 MW 2002
DATE: 5/9/13

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)	Vertical Pump Placement Other Comments
1420	15.59	150	5.01	0.189	25.14	3.62	17.25	279	
1425	15.59	150	5.00	0.188	30.23	2.87	17.53	277	
1430	15.59	150	5.00	0.187	33.41	2.36	17.77	276	
1435	15.59	150	5.03	0.180	39.75	2.05	18.72	265	
1440	15.59	150	5.03	0.175	33.00	1.83	19.19	265	
1445	15.59	150	5.03	0.177	34.72	1.85	18.77	262	
1450	15.59	150	5.03	0.178	35.54	1.86	18.52	260	
1455	15.59	150	5.03	0.178	39.63	1.90	18.47	258	
1500	15.59	150	5.03	0.179	42.47	1.92	18.39	255	
1505	15.59	150	5.04	0.178	47.80	1.95	18.44	255	
1510	15.59	150	5.03	0.180	51.11	1.94	18.29	256	
1515	15.59	150	5.04	0.178	52.57	1.95	18.37	255	
1520	15.59	150	5.05	0.178	53.23	1.97	18.40	254	
1525	sampling	of S43	MW2002		was	begun			

SIGNATURE(S): _____ **PAGE** ___ **OF**

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Site 43 Toluene Disposal Area
Project No.: 112G00771

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

Sample ID No.: S43MW2102
Sample Location: MW21
Sampled By: CM
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	TBD
Date: 5/8/13	Visual	Standard	mS/cm	^{0}C	NTU	mg/l	mV	
Time: 1800								
Method: Peristaltic Pump	Clear	5.16	0.153	15.29	3.44	1.05	205	

PURGE DATA:

	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	ORP	TBD
Date: 5/8/13								
Method: Peristaltic Pump								
Monitor Reading(ppm): —								
Well Casing Diameter & Material								
Type: 2" PVC	(See Low Flow Purge Data Sheet)							
Total Well Depth (TD): —								
Static Water Level (WL): 15.44								
One Casing Volume(gal/L):								
Start Purge (hrs): 1700								
End Purge (hrs): 1755								
Total Purge Time (min): 55								
Total Vol. Purged (gal/L): 2.5								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOC	HCl	40 ml VOA Vials	3
Total Metals	HNO3	250 ml Poly	1
Dissolved Metals	HNO3	250 ml Poly	N/A

OBSERVATIONS / NOTES:

Sample was clear with a slight sulfur odor and no sheen observed

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

TBD: To Be Determined

Tetra Tech

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Site 43 Toluene Disposal Area
PROJECT NUMBER: 112G00771

WELL ID.: S43MW2102
DATE: 5/8/13

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)	Vertical Pump Placement Other Comments
1705	15.44	150	5.23	0.160	16.89	2.87	15.38	184	
1710	15.44	150	5.17	0.158	11.64	1.67	15.29	194	
1715	15.44	150	5.15	0.157	9.35	1.35	15.22	204	
1720	15.44	150	5.13	0.156	9.12	1.21	15.22	208	
1725	15.44	150	5.11	0.155	8.84	1.10	15.26	211	
1730	15.44	150	5.13	0.154	5.71	1.12	15.25	210	
1735	15.44	150	5.16	0.154	4.99	1.07	15.30	203	
1740	15.44	150	5.18	0.154	4.77	1.07	15.30	205	
1745	15.44	150	5.18	0.154	4.99	1.00	15.30	204	
1750	15.44	150	5.18	0.154	4.62	1.00	15.29	203	
1755	15.44	150	5.16	0.153	3.44	1.05	15.29	205	

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Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Site 43 Toluene Disposal Area
Project No.: 112G00771

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

Sample ID No.: S43MW22D2
Sample Location: MW22
Sampled By: CM
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	TBD
Date: 5/9/13	Visual	Standard	mS/cm	°C	NTU	mg/l	mV	
Time: 1355								
Method: Peristaltic Pump	Clear	4.71	0.255	13.64	2.82	1.99	345	

PURGE DATA:

Date: 5/9/13	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	ORP	TBD
Method: Peristaltic Pump								
Monitor Reading(ppm): –								
Well Casing Diameter & Material								
Type: 2" PVC								
Total Well Depth (TD): –	(See Low Flow Purge Data Sheet)							
Static Water Level (WL): 14.49								
One Casing Volume(gal/L):								
Start Purge (hrs): 1250								
End Purge (hrs): 1350								
Total Purge Time (min): 60								
Total Vol. Purged (gal/L): 410								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOC	HCl	40 ml VOA Vials	3
Total Metals	HNO3	250 ml Poly	1
Dissolved Metals	HNO3	250 ml Poly	N/A

OBSERVATIONS / NOTES:

Sample clear with no odors or sheens observed during purging or sampling

Circle if Applicable:

MS/MSD	Duplicate ID No.:
–	–

Signature(s):

TBD: To Be Determined

Tetra Tech

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Site 43 Toluene Disposal Area
PROJECT NUMBER: 112G00771

WELL ID.: S43MW2202
DATE: 5/9/13

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)	Vertical Pump Placement Other Comments
1250	14.49	300	4.93	0.230	35.63	4.71	13.72	285	
1255	14.51	300	4.87	0.234	29.30	3.45	13.66	305	
1300	14.49	200	4.85	0.238	20.56	3.02	13.55	325	
1305	14.49	200	4.81	0.241	17.69	2.91	13.53	332	
1310	14.49	200	4.73	0.247	14.26	2.48	13.59	343	
1315	14.49	200	4.71	0.249	11.37	2.34	13.52	346	
1320	14.49	200	4.70	0.250	9.15	2.22	13.62	347	
1325	14.49	200	4.71	0.253	6.83	2.34	13.60	347	
1330	14.49	200	4.70	0.252	5.34	2.20	13.56	348	
1335	14.49	200	4.69	0.252	4.19	2.15	13.61	352	
1340	14.49	200	4.70	0.253	3.05	2.05	13.67	350	
1345	14.49	200	4.72	0.255	2.82	2.00	13.71	348	
1350	14.49	200	4.71	0.255	2.82	1.99	13.64	345	
1355	sample	S43MW2202	was	collected					

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Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Site 43 Toluene Disposal Area
Project No.: 112G00771

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

Sample ID No.: S43MW2302
Sample Location: MW23
Sampled By: CM
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	TBD
Date: 5/9/13	Visual	Standard	mS/cm	^{0}C	NTU	mg/l	mV	
Time: 1205								
Method: Peristaltic Pump	Clear	4.98	0.208	16.15	0.59	0.63	205	—

PURGE DATA:

Date: 5/9/13	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	ORP	TBD
Method: Peristaltic Pump								
Monitor Reading(ppm): —								
Well Casing Diameter & Material								
Type: 2" PVC								
Total Well Depth (TD): —	(See Low Flow Purge Data Sheet)							
Static Water Level (WL): 16.47								
One Casing Volume(gal/L):								
Start Purge (hrs): 1100								
End Purge (hrs): 1200								
Total Purge Time (min): 60								
Total Vol. Purged (gal/L): 3.0								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOC	HCl	40 ml VOA Vials	9
Total Metals	HNO3	250 ml Poly	3
Dissolved Metals	HNO3	250 ml Poly	N/A

OBSERVATIONS / NOTES:

Water was clear with no odor or sheen observed
MS/MSD sample collected at this location

Circle if Applicable:

(MS/MSD) Duplicate ID No.: —

Signature(s):

TBD: To Be Determined

Tetra Tech

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Site 43 Toluene Disposal Area
PROJECT NUMBER: 112G00771

WELL ID.: 542MW2302
DATE: 5/9/13

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)	Vertical Pump Placement Other Comments
1100	16.47	150	4.89	0.206	4.53	2.03	18.06	258	
1105	16.55	150	4.99	0.199	2.27	1.06	17.83	220	
1110	16.55	150	4.98	0.202	1.39	0.86	17.18	200	
1115	16.55	150	4.98	0.204	1.03	0.79	16.77	191	
1120	16.55	150	4.98	0.205	0.92	0.73	16.52	185	
1125	16.55	150	4.96	0.206	0.85	0.70	16.45	198	
1130	16.55	150	4.95	0.207	0.84	0.74	16.28	200	
1135	16.55	150	4.98	0.208	0.73	0.73	16.12	197	
1140	16.55	150	4.97	0.208	0.62	0.68	16.20	201	
1145	16.55	150	4.96	0.208	0.51	0.65	16.25	204	
11.50	16.55	150	4.99	0.208	0.56	0.64	16.13	200	
11.55	16.55	150	5.00	0.209	0.59	0.64	16.06	203	
12.00	16.55	150	4.98	0.208	—	0.63	16.15	205	
1205	sampling of 543MW2302 MS/MSD collected								

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GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF-Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43MW02402
Sample Location: S43MW024
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5-8-13	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1510	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Low Flow - Peristaltic	Clear	5.00	0.107	16.35	2.03	0.33	0.1	289

PURGE DATA:

Date: 5-8-13	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): --								
Well Casing Diameter & Material								
Type: 2 " PVC								
Total Well Depth (TD): –								
Static Water Level (WL): 9.77								
One Casing Volume(gal/L):								
Start Purge (hrs): 1415								
End Purge (hrs): 1510								
Total Purge Time (min): 55 min ~~gal~~								
Total Vol. Purged (gal/L): 3.5 gal								

See Low Flow Sheet for details

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes
Total Metals	HNO3	1 250-mL poly bottle	yes
Filtered Metals	HNO3	1 250-mL poly bottle	no

OBSERVATIONS / NOTES:

Pulled tubing 1' off bottom

Circle if Applicable:

MS/MSD	Duplicate ID No.:
–	–

Signature(s): [signature]

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771
WELL ID.: S43MW024
DATE: 5-8-13

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
1415	9.77									
1420	9.96	250	5.80	0.143	—	1.50	17.13	134	0.1	clear
1425	10.05	250	5.51	0.128	61.0	0.77	16.25	223	0.1	clear
1430	10.11	250	5.42	0.122	29.4	0.79	16.24	234	0.1	clear
1435	10.12	250	5.24	0.117	16.0	0.88	16.19	257	0.1	clear
1440	10.13	250	5.24	0.118	11.5	0.93	16.16	261	0.1	clear 1/2 gal
1445	10.13	250	5.18	0.117	6.80	0.89	16.08	269	0.1	clear
1450	10.13	250	5.07	0.111	3.18	0.54	16.18	280	0.1	clear
1455	10.13	250	5.03	0.108	2.53	0.41	16.27	288	0.1	clear
1500	10.13	250	4.98	0.108	2.19	0.37	16.33	289	0.1	clear
1505	10.13	250	5.00	0.107	2.03	0.33	16.35	289	0.2	clear
1510	Collect sample									

SIGNATURE(S):

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF-Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43MW02502
Sample Location: S43MW025
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5-8-13	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1612	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Low Flow - Peristaltic	clear	4.44	0.581	12.49	2.70	0.00	0.1	348

PURGE DATA:

Date: 5-8-13	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): --								
Well Casing Diameter & Material								
Type: 2" PVC								
Total Well Depth (TD):								
Static Water Level (WL): 9.38								
One Casing Volume(gal/L):								
Start Purge (hrs): 1520								
End Purge (hrs): 1612								
Total Purge Time (min): 42								
Total Vol. Purged (gal/L): 3gal								

See low flow purge sheet for details

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes
Total Metals	HNO3	1 250-mL poly bottle	yes
Filtered Metals	HNO3	1 250-mL poly bottle	no

OBSERVATIONS / NOTES:

Pulled Tubing 1' off bottom

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771

WELL ID.: S43MW025
DATE: 5-8-13

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
1520	9.38									
1525	10.41	250	4.43	0.481	—	0.00	13.51	344	0.1	clear
1530	10.63	250	4.37	0.488	—	0.00	13.08	361	0.1	clear
1535	10.89	250	4.37	0.518	8.16	0.00	12.75	361	0.1	clear
1540	11.04	250	4.40	0.554	7.93	0.00	12.46	354	0.1	clear
1545	11.25	250	4.48	0.587	7.68	0.00	12.54	344	0.1	clear
1550	11.40	200	4.43	0.598	6.83	0.00	12.57	349	0.1	clear
1555	11.50	200	4.43	0.597	5.17	0.00	12.57	350	0.1	clear 2 1/2 gal
1600	11.54	200	4.43	0.593	3.84	0.00	12.52	351	0.1	clear
1605	11.55	200	4.44	0.584	2.95	0.00	12.51	346	0.1	clear
1610	11.55	200	4.44	0.581	2.70	0.00	12.49	348	0.1	clear 3 gal
1612	Collect Sample									

SIGNATURE(S):

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Site 43 Toluene Disposal Area
Project No.: 112G00771

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

Sample ID No.: 543MW2602
Sample Location: MW26
Sampled By: CM
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	TBD
Date: 5/9/13	Visual	Standard	mS/cm	^{0}C	NTU	mg/l	mV	
Time: 1700								
Method: Peristaltic Pump	Clear	4.49	0.079	18.32	0.48	0.43	376	

PURGE DATA:

	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	ORP	TBD
Date: 5/9/13								
Method: Peristaltic Pump								
Monitor Reading(ppm): —								
Well Casing Diameter & Material								
Type: 2" PVC	(See	Low	Flow	Purge	Data	Sheet)		
Total Well Depth (TD): —								
Static Water Level (WL): 15.54								
One Casing Volume(gal/L):								
Start Purge (hrs): 1600								
End Purge (hrs): 1655								
Total Purge Time (min): 55								
Total Vol. Purged (gal/L): 2.5								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOC	HCl	40 ml VOA Vials	3
Total Metals	HNO3	250 ml Poly	1
Dissolved Metals	HNO3	250 ml Poly	N/A

OBSERVATIONS / NOTES:

The sample was clear with no odor or sheen observed

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

TBD: To Be Determined

Tetra Tech

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Site 43 Toluene Disposal Area
PROJECT NUMBER: 112G00771

WELL ID.: S43MW26
DATE: 5/9/13

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)	Vertical Pump Placement Other Comments
1600	15.54	200	4.76	0.081	3.58	2.51	19.90	304	
1605	15.57	200	4.75	0.073	1.34	0.83	19.04	342	
1610	15.57	200	4.74	0.077	2.13	0.73	18.75	350	
1615	15.57	200	4.73	0.078	1.60	0.60	18.49	354	
1620	15.57	200	4.71	0.078	1.03	0.57	18.21	360	
1625	15.57	200	4.68	0.079	0.79	0.53	18.13	366	
1630	15.57	200	4.67	0.079	0.63	0.49	18.02	368	
1635	15.57	200	4.61	0.077	0.59	0.45	18.17	371	
1640	15.57	200	4.51	0.079	0.51	0.45	18.04	368	
1645	15.57	200	4.49	0.079	0.45	0.46	17.95	374	
1650	15.57	200	4.47	0.079	0.42	0.44	18.14	375	
1655	15.57	200	4.49	0.079	0.48	0.43	18.32	376	

SIGNATURE(S): _____ **PAGE** ___ **OF**

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF-Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43MW02701
Sample Location: S43MW027
Sampled By: J. Birkelt
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5-13-13	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1447	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Low Flow - Peristaltic	clear	5.93	0.183	13.54	15.0	0.00	0.1	5

PURGE DATA:

Date: 5-13-13	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): --								
Well Casing Diameter & Material								
Type: 2 " PVC								
Total Well Depth (TD): 25.03								
Static Water Level (WL): 7.52								
One Casing Volume(gal/L):								
Start Purge (hrs): 1327								
End Purge (hrs): 1447								
Total Purge Time (min): 80								
Total Vol. Purged (gal/L): 4 gal								

See low flow log for details

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	9 ~~8~~ 40-mL glass vials	yes
Total Metals	HNO3	3 ~~1~~ 250-mL poly bottle	yes
Filtered Metals	HNO3	1 250-mL poly bottle	

OBSERVATIONS / NOTES:

Pulled tubing 2' off bottom

Circle if Applicable:

MS/MSD	Duplicate ID No.:
yes	—

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771

WELL ID.: S43MW027
DATE: 5-13-13

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
1327	7.52									
1330	7.55	250	6.30	0.252	–	0.34	14.39	-11	0.1	tan color
1335	7.55	250	6.23	0.248	246	0.00	14.16	-16	0.1	" "
1340	7.55	250	6.16	0.244	262	0.00	14.01	-19	0.1	" "
1345	7.55	250	6.13	0.241	266	0.00	13.83	-18	0.1	" "
1350	7.55	250	6.12	0.228	196	0.00	13.56	-19	0.1	" "
1355	7.55	250	6.13	0.228	140	0.00	13.54	-16	0.1	" " 1 1/2 gal
1400	7.55	250	6.06	0.221	122	0.00	13.75	-12	0.1	" "
1405	7.55	250	6.02	0.215	83.9	0.00	13.49	-9	0.1	tan tint
1410	7.55	250	6.00	0.211	62.5	0.00	13.37	-7	0.1	clear w/tan tint 2 1/2 gal
1415	7.55	250	5.98	0.207	51.9	0.00	13.61	-6	0.1	" "
1420	7.55	250	5.99	0.201	44.4	0.00	13.59	-5	0.1	" "
1425	7.55	250	6.01	0.199	42.8	0.00	13.34	-1	0.1	" "
1430	7.55	250	5.97	0.193	30.8	0.00	13.24	2	0.1	clear 3 1/4 gal
1435	7.55	250	5.96	0.190	23.0	0.00	13.19	3	0.1	clear
1440	7.55	250	5.94	0.187	19.8	0.00	13.38	4	0.1	clear
1445	7.55	250	5.93	0.183	15.0	0.00	13.54	5	0.1	clear 4 gal
1447	Collect sample									

SIGNATURE(S): [signature]

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Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF-Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43MW02801
Sample Location: S43MW028
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5-13-13	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1319	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Low Flow - Peristaltic	clear	5.58	0.286	13.68	2.71	0.00	0.1	131

PURGE DATA:

Date: 5-13-13	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): --								
Well Casing Diameter & Material								
Type: 2" PVC								
Total Well Depth (TD): 20.00								
Static Water Level (WL): 10.84								
One Casing Volume(gal/L):								
Start Purge (hrs): 1157								
End Purge (hrs): 1319								
Total Purge Time (min): 82								
Total Vol. Purged (gal/L): 4 1/4 gal								

See low flow log for details

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes
Total Metals	HNO3	1 250-mL poly bottle	yes
Filtered Metals	HNO3	1 250-mL poly bottle	no

OBSERVATIONS / NOTES:

Pulled tubing 2' off bottom

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771
WELL ID.: S43MW028
DATE: 5-13-13

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
1157	10.84									
1202	11.03	200	6.44	0.598	—	0.05	13.45	72	0.3	clear
1207	11.18	200	6.48	0.613	25.1	0.00	13.16	87	0.3	clear
1212	11.30	200	6.37	0.606	14.9	0.00	13.15	103	0.3	clear
1217	11.37	200	5.94	0.434	12.4	0.00	13.45	93	0.3	clear
1222	11.42	200	5.87	0.410	10.21	0.00	13.55	92	0.3	clear
1227	11.45	200	5.83	0.391	7.13	0.00	13.50	95	0.3	clear
1232	11.47	200	5.79	0.380	4.45	0.00	13.48	97	0.3	clear 1½ gal
1237	11.49	200	5.76	0.366	3.74	0.00	13.55	100	0.3	clear
1242	11.50	200	5.70	0.344	3.16	0.00	13.52	106	0.3	clear
1247	11.50	200	5.68	0.333	2.29	0.00	13.47	110	0.3	clear
1252	11.50	200	5.66	0.323	2.64	0.00	13.31	114	0.3	clear 3 gal
1257	11.50	200	5.63	0.312	2.41	0.00	13.25	119	0.2	clear
1302	11.50	200	5.60	0.300	2.36	0.00	13.31	123	0.2	clear
1307	11.50	200	5.57	0.290	2.81	0.00	13.61	129	0.1	clear
1312	11.50	200	5.57	0.288	2.68	0.00	13.69	130	0.1	clear
1317	11.50	200	5.58	0.286	2.71	0.00	13.68	131	0.1	clear 4¼ gal
1319	Collect sample									

SIGNATURE(S):

Tetra Tech

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSF-Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43MW02901
Sample Location: S43MW02901
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5-13-13	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (^{0}C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Time: 1147								
Method: Low Flow - Peristaltic	clear	4.64	0.069	14.25	1.60	0.00	0.0	194

PURGE DATA:

Date: 5-13-13	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): --								
Well Casing Diameter & Material Type: 2" PVC								
Total Well Depth (TD): 21.31								
Static Water Level (WL): 10.05								
One Casing Volume(gal/L):								
Start Purge (hrs): 1040								
End Purge (hrs): 1147								
Total Purge Time (min): 67								
Total Vol. Purged (gal/L): 4 gal								

See low flow log sheet for details

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes
Total Metals	HNO3	1 250-mL poly bottle	yes
Filtered Metals	HNO3	1 250-mL poly bottle	no

OBSERVATIONS / NOTES:

Pulled tubing 1' off bottom

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSF-Indian Head Site 43
PROJECT NUMBER: 112G00771
WELL ID.: S43MW029
DATE: 5-13-13

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
1040	10.05									
1045	10.07	250	3.88	0.114	—	0.00	15.57	223	0.0	clear
1050	10.07	250	3.98	0.074	48.3	0.00	14.63	217	0.0	clear
1055	10.07	250	4.12	0.069	21.6	0.00	14.38	211	0.0	clear
1100	10.07	250	4.22	0.071	14.3	0.00	14.41	207	0.0	clear
1105	10.07	250	4.28	0.071	19.3	0.00	14.23	206	0.0	clear
1110	10.07	250	4.35	0.073	22.2	0.00	14.01	203	0.0	clear 1 3/4 gal
1115	10.07	250	4.40	0.073	15.6	0.00	14.05	201	0.0	clear
1120	10.07	250	4.45	0.073	10.7	0.00	14.03	200	0.0	clear
1125	10.07	250	4.50	0.072	7.46	0.00	14.15	199	0.0	clear
1130	10.07	250	4.55	0.071	6.31	0.00	14.36	197	0.0	clear 3 gal
1135	10.07	250	4.59	0.070	3.75	0.00	14.51	196	0.0	Clear
1140	10.07	250	4.62	0.070	2.31	0.00	14.52	195	0.0	clear
1145	10.07	250	4.64	0.069	1.60	0.00	14.25	194	0.0	clear 4 gal
1147	Collect sample									

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Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Site 43 Toluene Disposal Area
Project No.: 112G00771

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

Sample ID No.: S43MW3001
Sample Location: MW30
Sampled By: CM
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	TBD
Date: 5/13/13	Visual	Standard	mS/cm	^{0}C	NTU	mg/l	mV	
Time: 1600								
Method: Peristaltic Pump	Clear	6.12	0.224	18.29	3.39	0.62	-39	–

PURGE DATA:

	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	ORP	TBD
Date: 5/13/13								
Method: Peristaltic Pump								
Monitor Reading(ppm): –								
Well Casing Diameter & Material								
Type: 2" PVC								
Total Well Depth (TD): 41.49	(See Low Flow Purge Data Sheet)							
Static Water Level (WL): 26.79								
One Casing Volume(gal/L):								
Start Purge (hrs): 1500								
End Purge (hrs): 1555								
Total Purge Time (min): 55								
Total Vol. Purged (gal/L): 3.0								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOC	HCl	40 ml VOA Vials	6
Total Metals	HNO3	250 ml Poly	1
Dissolved Metals	HNO3	250 ml Poly	N/A

OBSERVATIONS / NOTES:

Water started slightly turbid Light Brown with no odor or sheen observed
Final water clear no odor or sheen observed

Circle if Applicable:

MS/MSD –

Duplicate ID No.: S43MW3001-D
Assigned time = 1605

Signature(s):

TBD: To Be Determined

Tetra Tech

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Site 43 Toluene Disposal Area
PROJECT NUMBER: 112G00771

WELL ID.: S43 MW 3001
DATE: 5/13/13

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)	Vertical Pump Placement Other Comments
1500	26.79	150	6.20	0.234	57.49	1.81	18.33	-29	
1505	26.81	150	6.18	0.229	43.97	1.19	18.30	-31	
1510	26.81	150	6.14	0.229	29.41	0.89	18.22	-33	
1515	26.80	150	6.14	0.226	13.26	0.76	18.32	-35	
1520	26.80	150	6.13	0.225	5.98	0.65	18.16	-35	
1525	26.81	150	6.13	0.227	4.67	0.62	18.21	-36	
1530	26.81	150	6.12	0.229	4.23	0.60	18.36	-38	
1535	26.81	150	6.12	0.227	3.93	0.58	18.23	-38	
1540	26.81	150	6.12	0.224	3.25	0.65	18.17	-38	
1545	26.81	150	6.12	0.223	2.89	0.61	18.13	-39	
1550	26.81	150	6.12	0.224	3.21	0.59	18.23	-39	
1555	26.81	150	6.12	0.224	3.39	0.62	18.29	-39	

SIGNATURE(S): _____ **PAGE** ___ **OF**

Appendix G

Groundwater Level Measurement Sheets

Tetra Tech NUS, Inc.

GROUNDWATER LEVEL MEASUREMENT SHEET

Project Name: Indian Head Site 43
Project No.: 112G00771
Location:
Personnel: ~~Keith Simpson, Jacob Birkett~~ Robert Sok
Weather Conditions: 70°F sunny humid
Measuring Device:
Tidally Influenced: Yes ___ No X
Remarks:

Well or Piezometer Number	Date	Time	Elevation of Reference Point (feet)* screen	Total Well Depth (feet)*	Water Level Indicator Reading (feet)*	Thickness of Free Product (feet)* 8/2/11	Groundwater Elevation (feet)*	Comments
MW01	6-18-11	0904			6.59	8.27		
MW02		0856			10.94	11.40		
MW03		0845	24-34		15.94	16.66		
MW04		0859	23-33		9.44	11.01		
MW05		0901	21-31		7.76	9.20		
MW06		0906	17-27		7.15	8.31		

* All measurements to the nearest 0.01 foot

Tetra Tech, Inc.

GROUNDWATER LEVEL MEASUREMENT SHEET

Project Name: Indian Head Site 43
Project No.: 112G00771
Location: Indian Head, Md
Personnel: Jacob Birkett, E. Wy, R. Sok
Weather Conditions: 80°F Partly Cloudy
Measuring Device: Heron Dipper T
Tidally Influenced: Yes ___ No _X_
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
MW01	7-22-12	1343			8.46			
MW02					11.68			
MW03					16.76			
MW04					11.20			
MW05					9.05			
MW06		1700			8.52			
MW07		1519			11.37			
MW08		1703			12.56			
MW09S		0920			10.28			
MW10		1203			11.68			
MW11					13.92			
MW12					14.90			
MW13					16.18			
MW14					13.56			
MW15					11.89			
MW16					14.92			
MW09D		1027			9.86			
MW17S					15.18			
MW17D					19.42			
MW18		1707			13.21			
MW19S					15.26			
MW19D					22.54			
MW20					15.93			
MW21					15.76			
MW22					14.70			

* All measurements to the nearest 0.01 foot

Tetra Tech NUS, Inc.

GROUNDWATER LEVEL MEASUREMENT SHEET

Project Name: NSF-Indian Head Site 43
Project No.: 112G00771
Location: Indian Head, Md
Personnel: J. Birkett, E. Wu, R. Sok
Weather Conditions: 80°F Partly Cloudy
Measuring Device: Heron DipperT
Tidally Influenced: Yes ____ No X
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
MW23					16.63			
MW24					9.94			
MW25					11.68			
MW26					16.06			

* All measurements to the nearest 0.01 foot

Tetra Tech

GROUNDWATER LEVEL MEASUREMENT SHEET

Project Name: NSF-Indian Head Site 43
Project No.: 112G00771
Location: Indian Head MD
Personnel: J. Birkett, C. Meyer
Weather Conditions:
Measuring Device:
Tidally Influenced: Yes ___ No X
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
S43MW01	5-14-13	1720			3.65			
S43MW02		← 1653			11.24			
S43MW03		1702	1		15.01			
S43MW04		1704			16.57			
S43MW05		1711			4.57			
S43MW06		1731			3.98			
S43MW07		1714			6.58			
S43MW08		1443			7.68			
S43MW09S		1447			7.14			
S43MW09D		1448			5.29			
S43MW10		1726			9.00			
S43MW11		1434			9.77			
S43MW12		1645			13.34			
S43MW13		1643			15.75			
S43MW14		1646			13.19			
S43MW15		1656			11.39			
S43MW16		1651			14.52			
S43MW17S		1436			13.73			
S43MW17D		1437			17.62			
S43MW18		1431			10.30			
S43MW19S		1428			14.60			
S43MW19D		1429			22.05			
S43MW20		1425			15.48			
S43MW21		1700			15.25			
S43MW22	↓	1422			14.34			

* All measurements to the nearest 0.01 foot

Tetra Tech

GROUNDWATER LEVEL MEASUREMENT SHEET

Project Name: NSF-Indian Head Site 43
Project No.: 112G00771
Location: Indian Head MD
Personnel: J. Birkett
Weather Conditions:
Measuring Device:
Tidally Influenced: Yes ___ No X
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
S43MW23	5-14-13	1415			16.40			
S43MW24		1413			9.81			
S43MW25		1410			9.13			
S43MW26		1418			15.56			
S43MW27		1453		25.03	7.76			
S43MW28		1450		20.00	11.02			
S43MW29		1456		21.31	10.07			
S43MW30		1417		41.49	26.81			
S43PZ01		1100		17.83	7.69			
S43PZ02		1220		16.72	7.13			
S43PZ03		1240		17.30	~~17.30~~ 5.37 QB 5-14-13			
S43PZ04		1100			13.31			

* All measurements to the nearest 0.01 foot

Tetra Tech, Inc.

GROUNDWATER LEVEL MEASUREMENT SHEET

Project Name: Indian Head Site 43
Project No.: 112G00771
Location: Indian Head, MD
Personnel: Jacob Birkett
Weather Conditions: 70°F Cloudy
Measuring Device: Testwell Instruments Water Level
Tidally Influenced: Yes ___ No _X_
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
MW01	10-31-13	1716			8.59			
MW02		1646			11.81			
MW03		1704			16.81			
MW04		1708			11.30			
MW05		1730			9.23			
MW06		1640			8.57			
MW07		1713			11.49			
MW08		1549			12.62			
MW09D		1555			9.98			
MW09S		1557			9.77			
MW10		1636			12.23			
MW11		1544			14.03			
MW12		1725			14.74			
MW13		1655			16.25			
MW14		1650			13.73			
MW15		1658			11.93			
MW16		1653			14.97			
MW17S		1541			15.39			
MW17D		1542			19.20			
MW18		1536			12.64			
MW19S		1533			15.37			
MW19D		1532			22.69			
MW20		1527			16.05			
MW21		1701			15.89			
MW22		1524			14.84			
MW23	✓	1516			16.59			

* All measurements to the nearest 0.01 foot

Tetra Tech, Inc.

GROUNDWATER LEVEL MEASUREMENT SHEET

Project Name: Indian Head Site 43
Project No.: 112G00771
Location: Indian Head, MD
Personnel: Jacob Birkett
Weather Conditions: 70°F Cloudy
Measuring Device: Test well Instruments Water Level
Tidally Influenced: Yes ___ No _X_
Remarks:

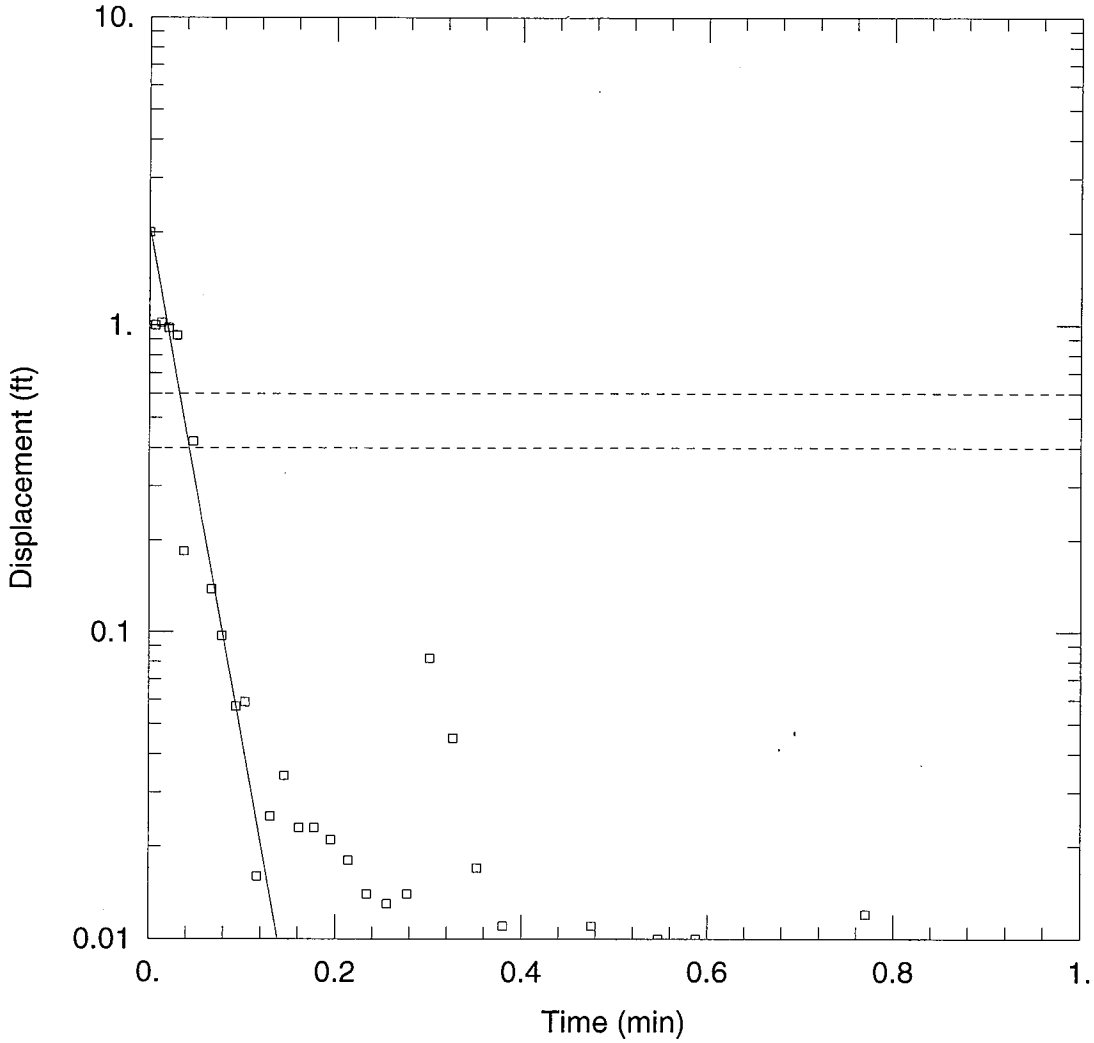
Well or Piezometer Number	Date	Time	Elevation of Reference Point (feet)*	Total Well Depth (feet)*	Water Level Indicator Reading (feet)*	Thickness of Free Product (feet)*	Groundwater Elevation (feet)*	Comments
MW24	10-31-13	1513			10.57			
MW25		1510			10.57			
MW26		1519			16.16			
MW27		1604			12.36			
MW28		1600			12.00			
MW29		1552			11.53			
MW30		1520			27.02			
PZ01		1504			8.18			
PZ02		1502			7.28			
PZ03		1459			5.62			
PZ04		1457			14.33			
MW23								

* All measurements to the nearest 0.01 foot

Appendix H

2011

Slug Test Output Forms



WELL TEST ANALYSIS

Data Set: G:\Indian Head - Rob Sok\AQTESolv Files\S43-MW01_Fall_1.aqt
Date: 08/02/11 Time: 10:51:01

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: U.S. Navy
Project: 112G00771
Location: Indian Head - Site 43
Test Well: S43-MW01 - Falling 1
Test Date: 6/18/2011

AQUIFER DATA

Saturated Thickness: 28. ft
Anisotropy Ratio (Kz/Kr): 1.

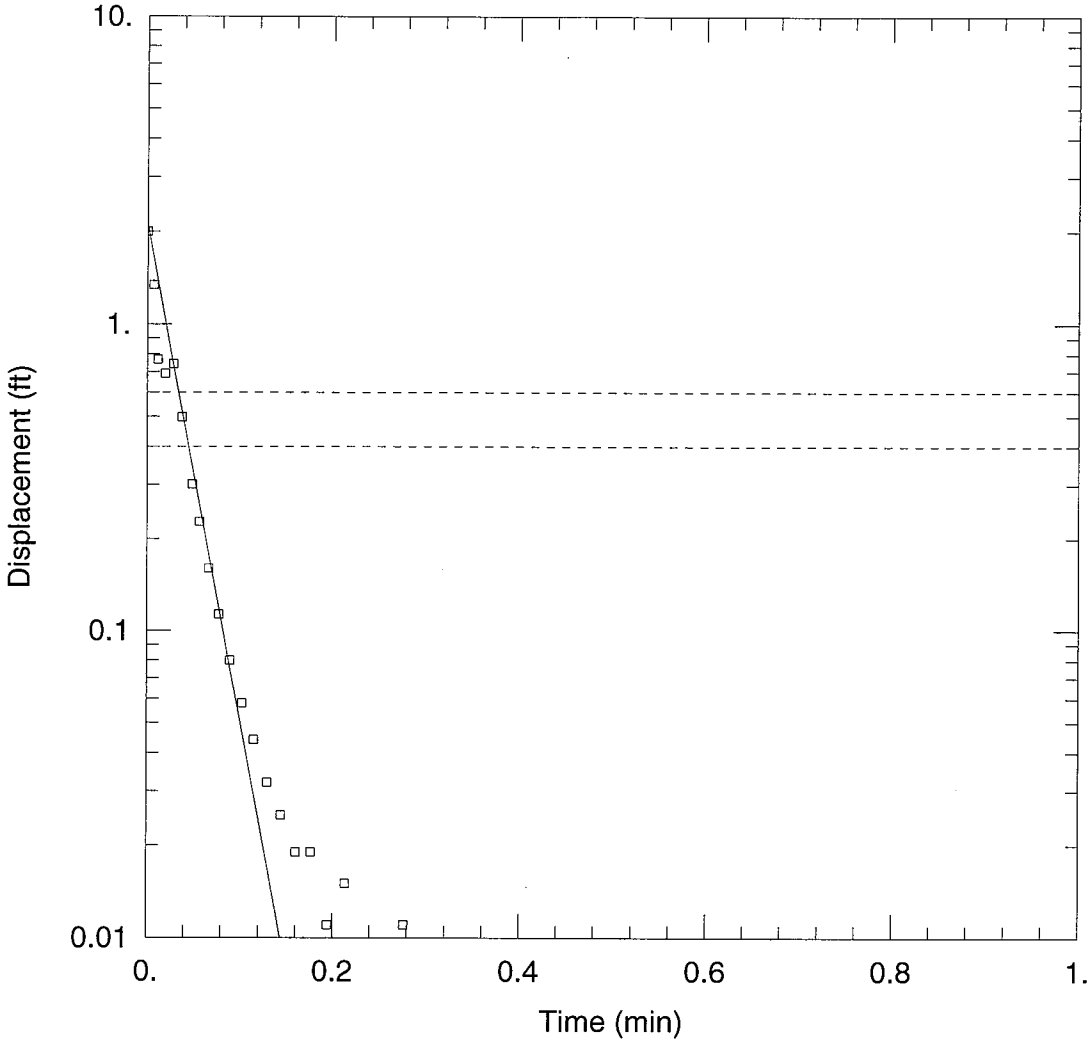
WELL DATA (S43-MW01)

Initial Displacement: 2. ft
Total Well Penetration Depth: 13. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 13. ft
Screen Length: 10. ft
Wellbore Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 49.03 ft/day
y0 = 2.084 ft



WELL TEST ANALYSIS

Data Set: G:\Indian Head - Rob Sok\AQTESolv Files\S43-MW01_Rise_1.aqt
Date: 08/02/11 Time: 10:51:12

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: U.S. Navy
Project: 112G00771
Location: Indian Head - Site 43
Test Well: S43-MW01 - Rising 1
Test Date: 6/18/2011

AQUIFER DATA

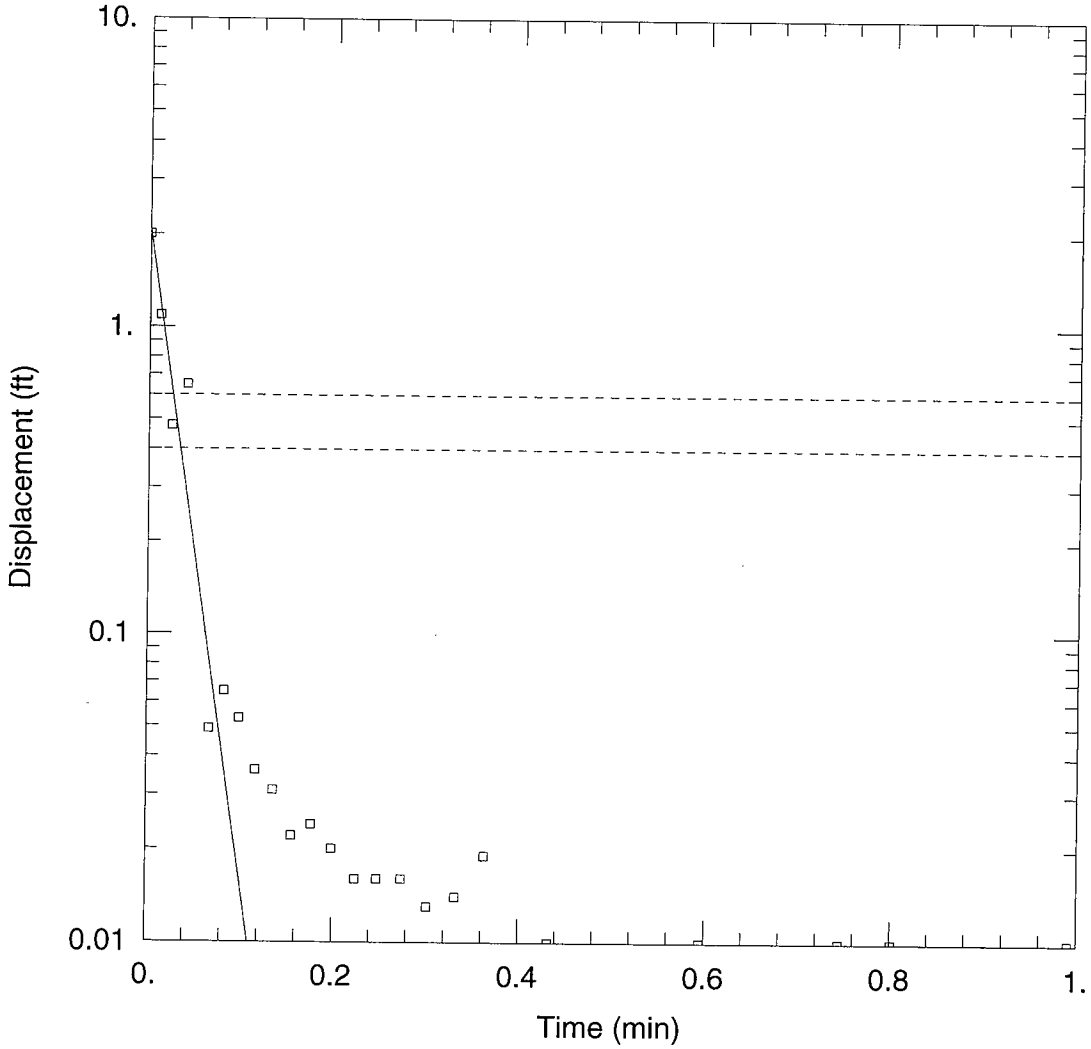
Saturated Thickness: 28. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (S43-MW01)

Initial Displacement: 2. ft
Total Well Penetration Depth: 13. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 13. ft
Screen Length: 10. ft
Wellbore Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 47.25 ft/day
y0 = 2.102 ft



WELL TEST ANALYSIS

Data Set: G:\Indian Head - Rob Sok\AQTESolv Files\S43-MW01_Fall_2.aqt
Date: 08/02/11 Time: 10:47:26

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: U.S. Navy
Project: 112G00771
Location: Indian Head - Site 43
Test Well: S43-MW01 - Falling 2
Test Date: 6/18/2011

AQUIFER DATA

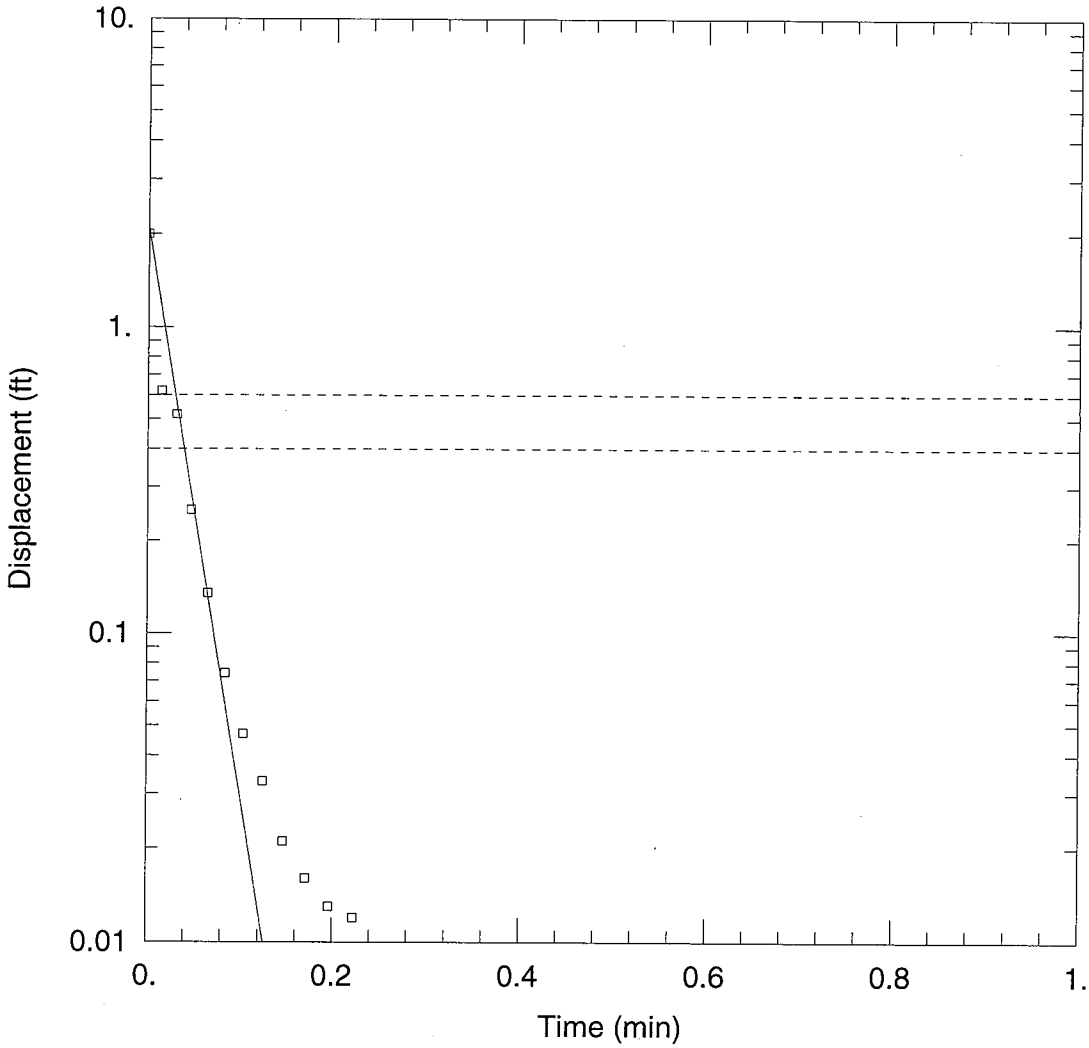
Saturated Thickness: 28. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (S43-MW01)

Initial Displacement: 2. ft
Total Well Penetration Depth: 13. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 13. ft
Screen Length: 10. ft
Wellbore Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 61.62 ft/day
y0 = 2.07 ft



WELL TEST ANALYSIS

Data Set: G:\Indian Head - Rob Sok\AQTESolv Files\S43-MW01_Rise_2.aqt
Date: 08/02/11 Time: 10:52:03

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: U.S. Navy
Project: 112G00771
Location: Indian Head - Site 43
Test Well: S43-MW01 - Rising 2
Test Date: 6/18/2011

AQUIFER DATA

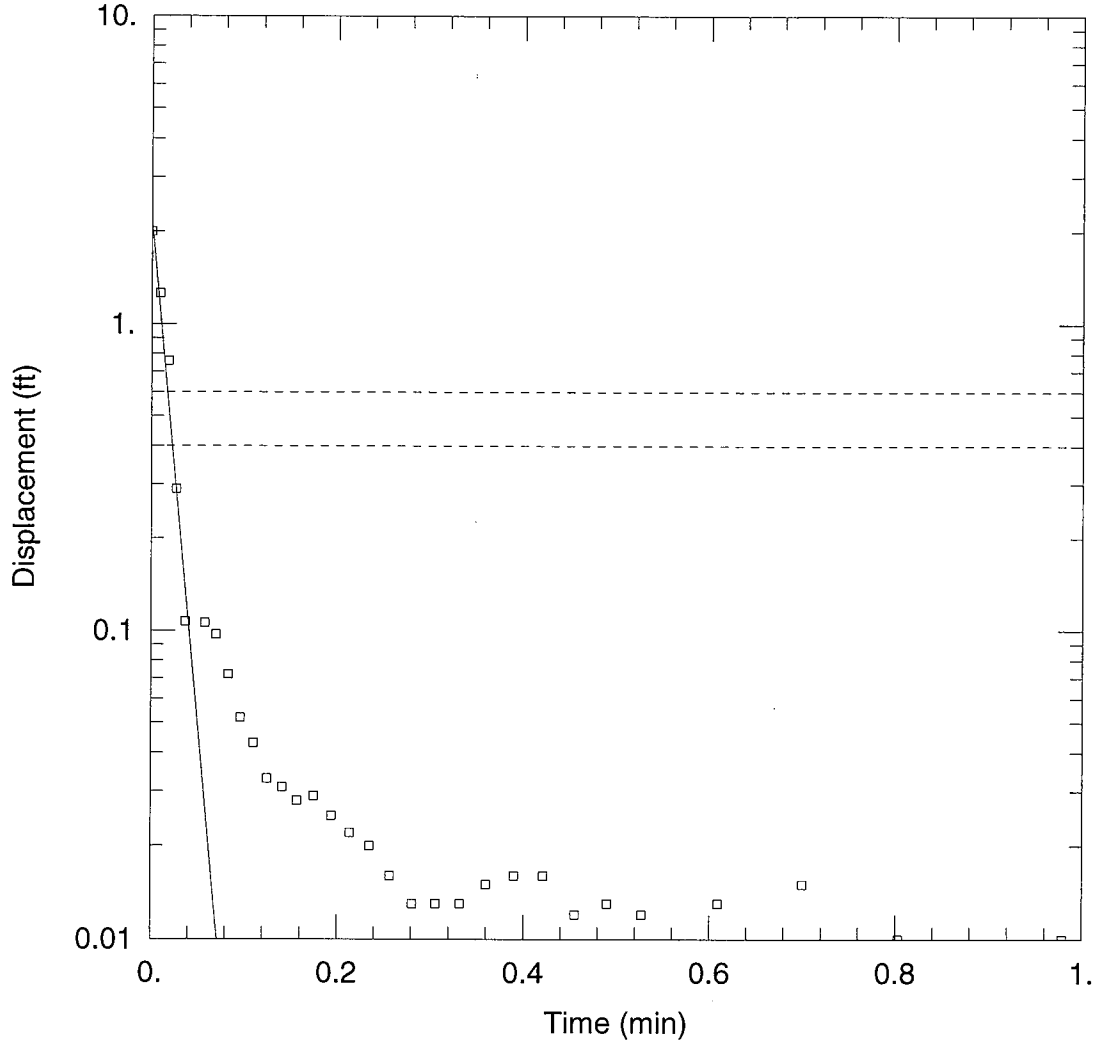
Saturated Thickness: 28. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (S43-MW01)

Initial Displacement: 2. ft
Total Well Penetration Depth: 13. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 13. ft
Screen Length: 10. ft
Wellbore Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 53.99 ft/day
y0 = 2.097 ft



WELL TEST ANALYSIS

Data Set: G:\Indian Head - Rob Sok\AQTESolv Files\S43-MW01_Fall_3.aqt
Date: 08/02/11 Time: 10:52:11

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: U.S. Navy
Project: 112G00771
Location: Indian Head - Site 43
Test Well: S43-MW01 - Falling 3
Test Date: 6/18/2011

AQUIFER DATA

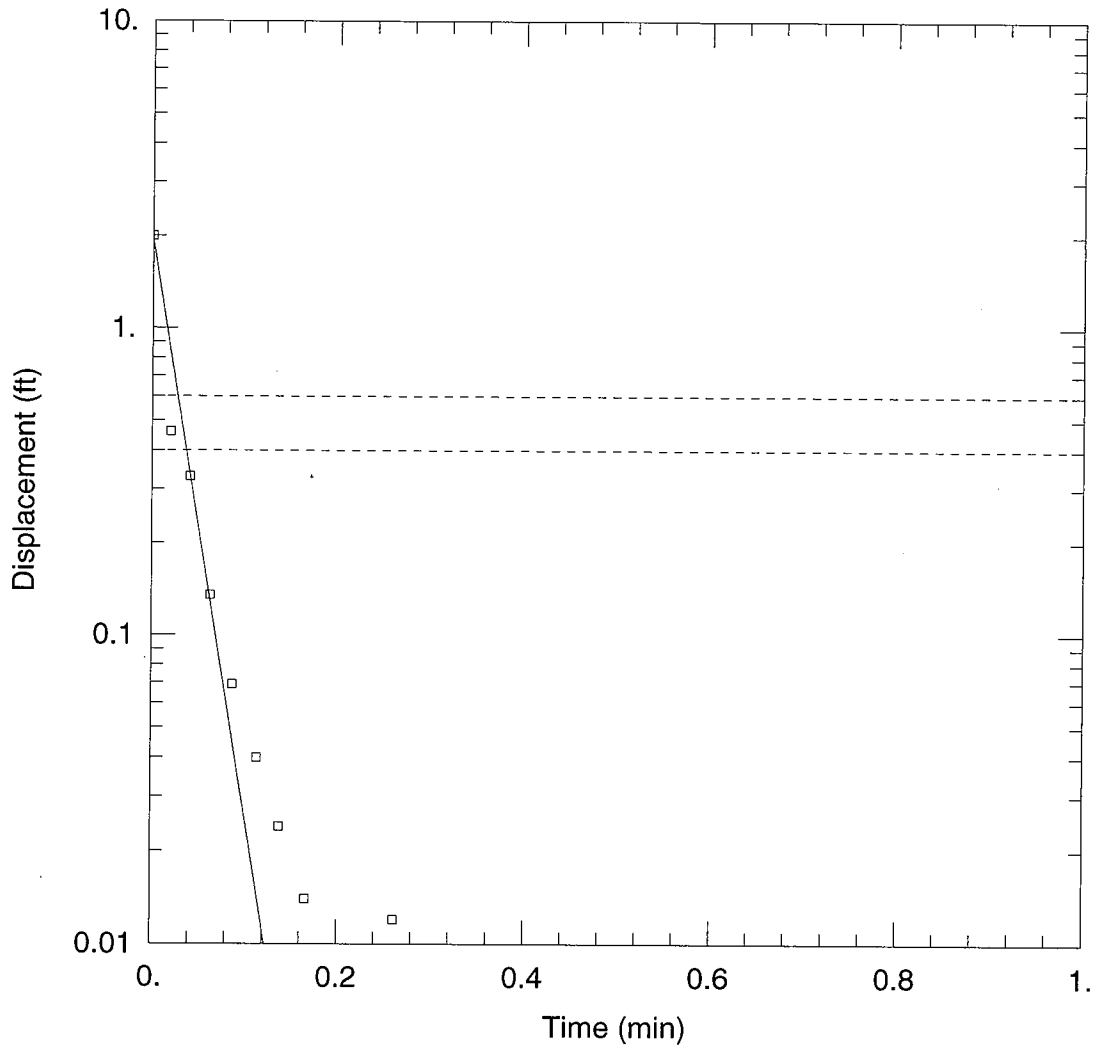
Saturated Thickness: 28. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (S43-MW01)

Initial Displacement: 2. ft
Total Well Penetration Depth: 13. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 13. ft
Screen Length: 10. ft
Wellbore Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 95.53 ft/day
y0 = 2.162 ft



WELL TEST ANALYSIS

Data Set: G:\Indian Head - Rob Sok\AQTESolv Files\S43-MW01_Rise_3.aqt
Date: 08/02/11 Time: 10:52:22

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: U.S. Navy
Project: 112G00771
Location: Indian Head - Site 43
Test Well: S43-MW01 - Rising 3
Test Date: 6/18/2011

AQUIFER DATA

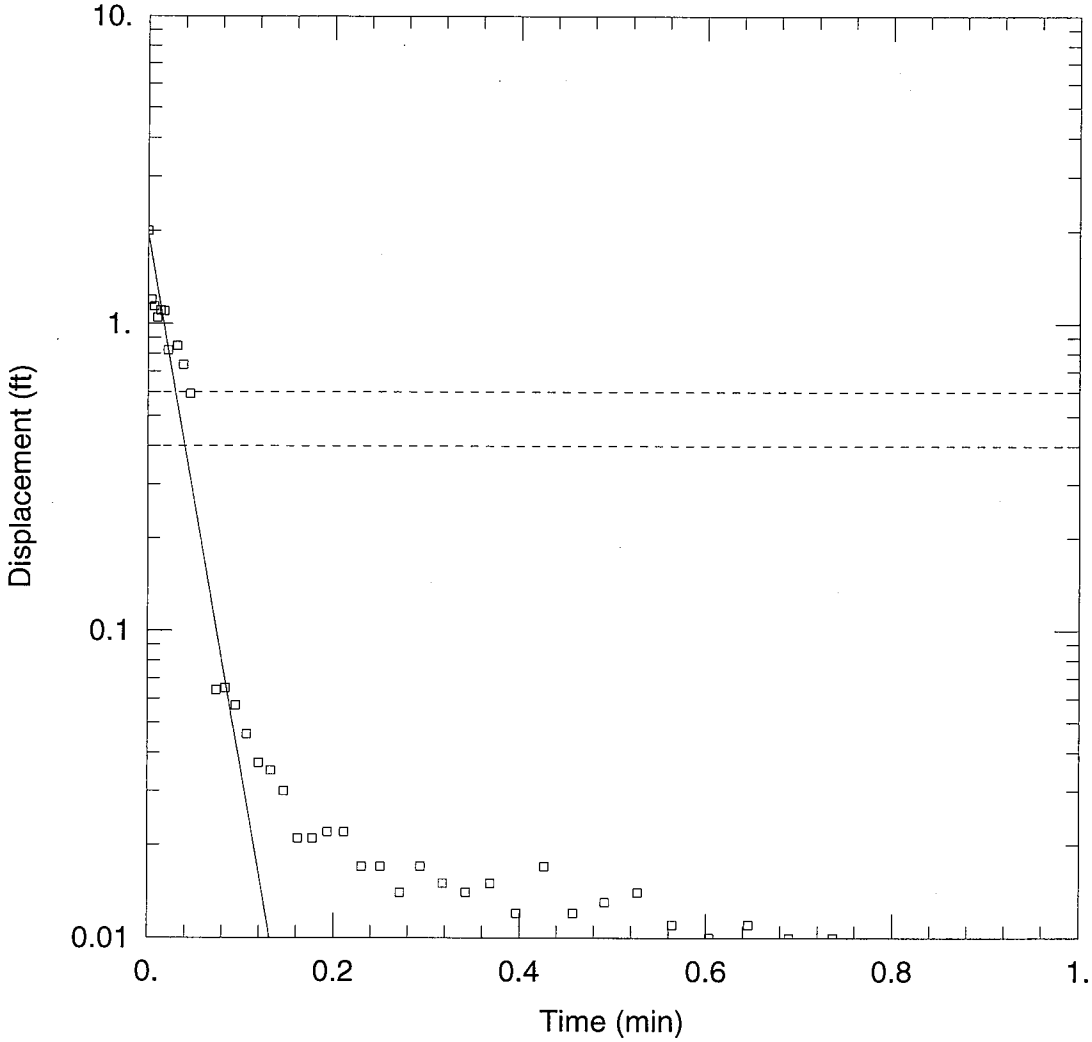
Saturated Thickness: 28. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (S43-MW01)

Initial Displacement: 2. ft
Total Well Penetration Depth: 13. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 13. ft
Screen Length: 10. ft
Wellbore Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 54.59 ft/day
y0 = 1.935 ft



WELL TEST ANALYSIS

Data Set: G:\Indian Head - Rob Sok\AQTESolv Files\S43-MW01_Fall_4.aqt
Date: 08/02/11 Time: 10:47:05

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: U.S. Navy
Project: 112G00771
Location: Indian Head - Site 43
Test Well: S43-MW01 - Falling 4
Test Date: 6/18/2011

AQUIFER DATA

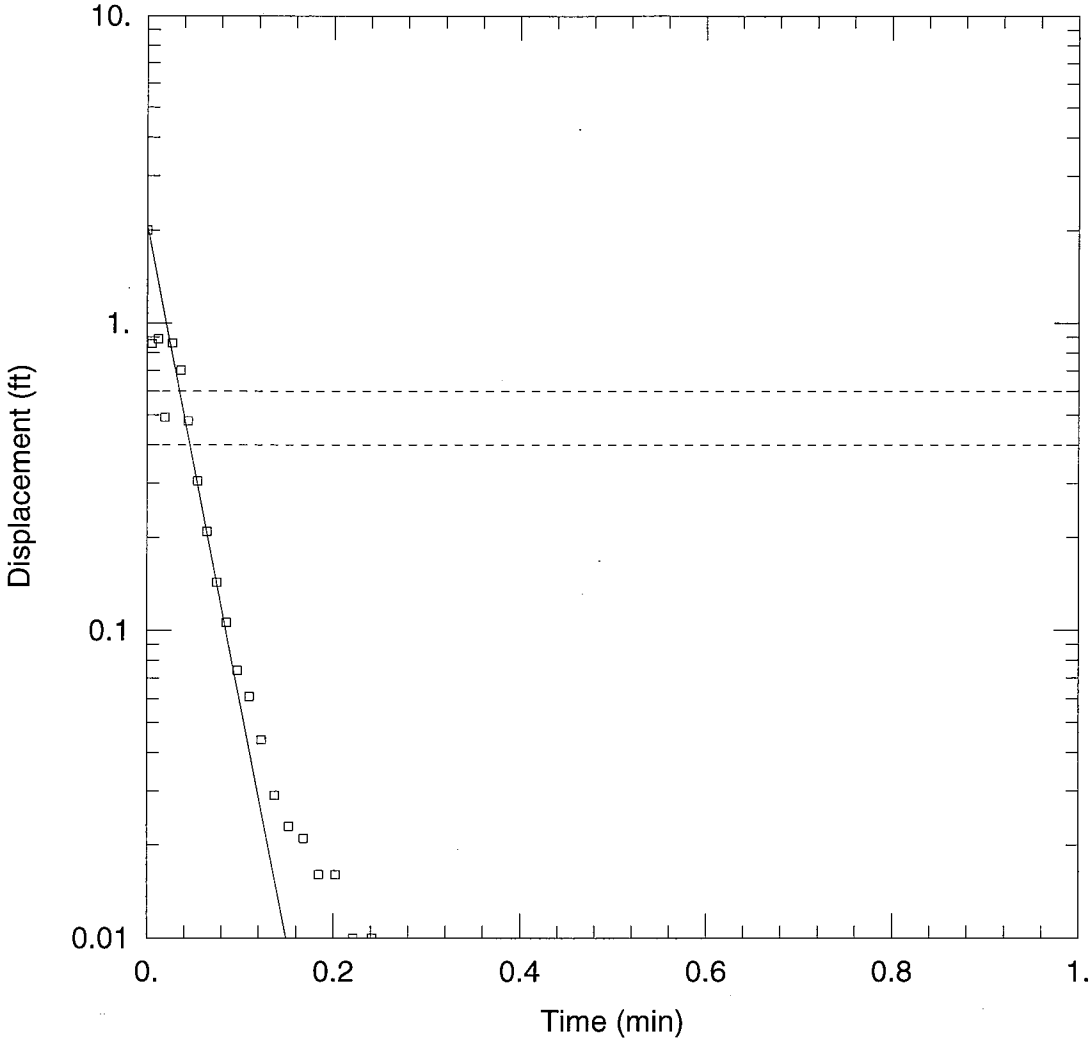
Saturated Thickness: 28. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (S43-MW01)

Initial Displacement: 2. ft
Total Well Penetration Depth: 13. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 13. ft
Screen Length: 10. ft
Wellbore Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 51. ft/day
y0 = 1.957 ft



WELL TEST ANALYSIS

Data Set: G:\Indian Head - Rob Sok\AQTESolv Files\S43-MW01_Rise_4.aqt
Date: 08/02/11 Time: 10:53:05

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: U.S. Navy
Project: 112G00771
Location: Indian Head - Site 43
Test Well: S43-MW01 - Rising 4
Test Date: 6/18/2011

AQUIFER DATA

Saturated Thickness: 28. ft
Anisotropy Ratio (Kz/Kr): 1.

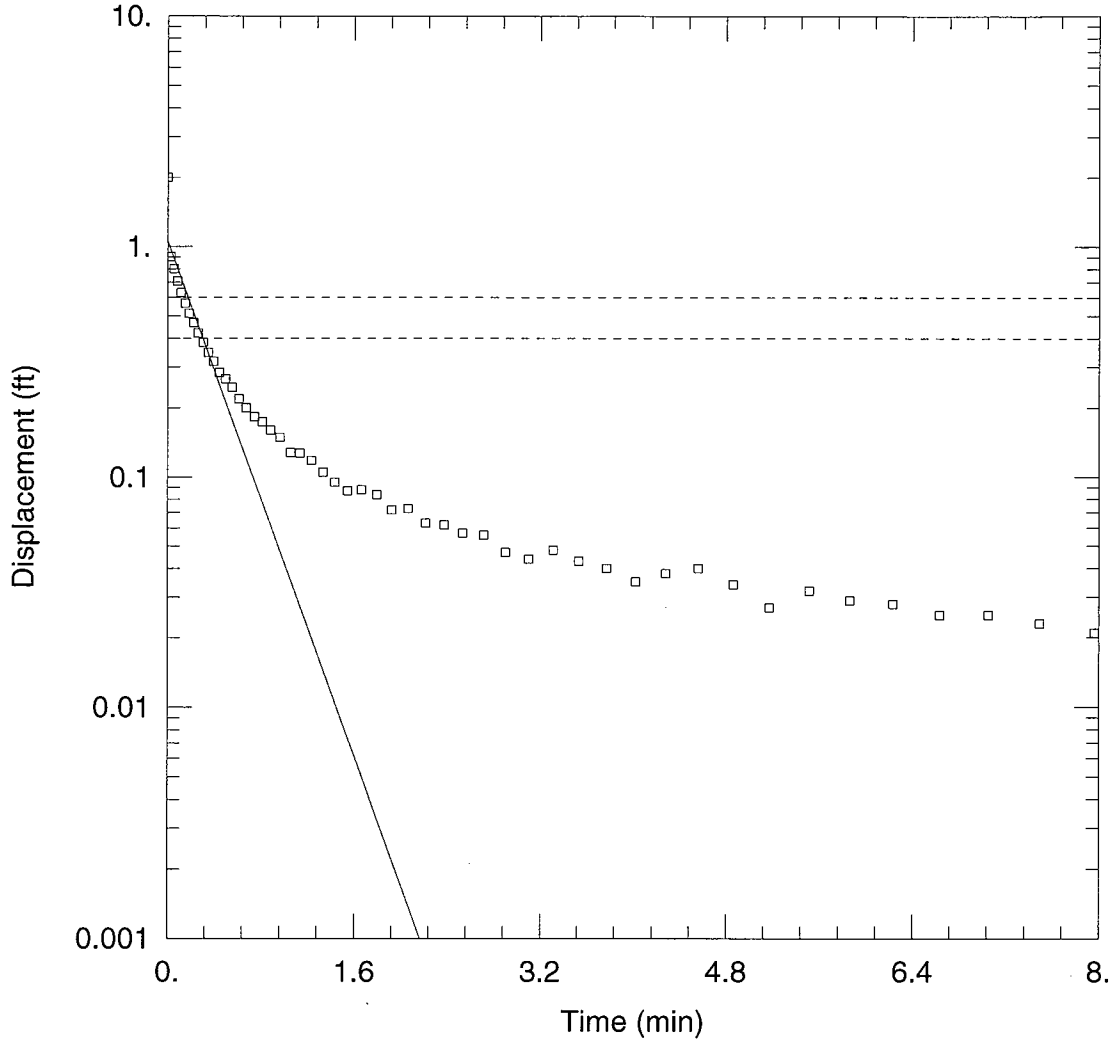
WELL DATA (S43-MW01)

Initial Displacement: 2. ft
Total Well Penetration Depth: 13. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 13. ft
Screen Length: 10. ft
Wellbore Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 45.46 ft/day
y0 = 2.074 ft



WELL TEST ANALYSIS

Data Set: G:\Indian Head - Rob Sok\AQTESolv Files\S43-MW03_Rise_1.aqt
Date: 08/02/11 Time: 10:46:55

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: U.S. Navy
Project: 112G00771
Location: Indian Head - Site 43
Test Well: S43-MW03 - Rising 1
Test Date: 6/18/2011

AQUIFER DATA

Saturated Thickness: 19. ft
Anisotropy Ratio (Kz/Kr): 1.

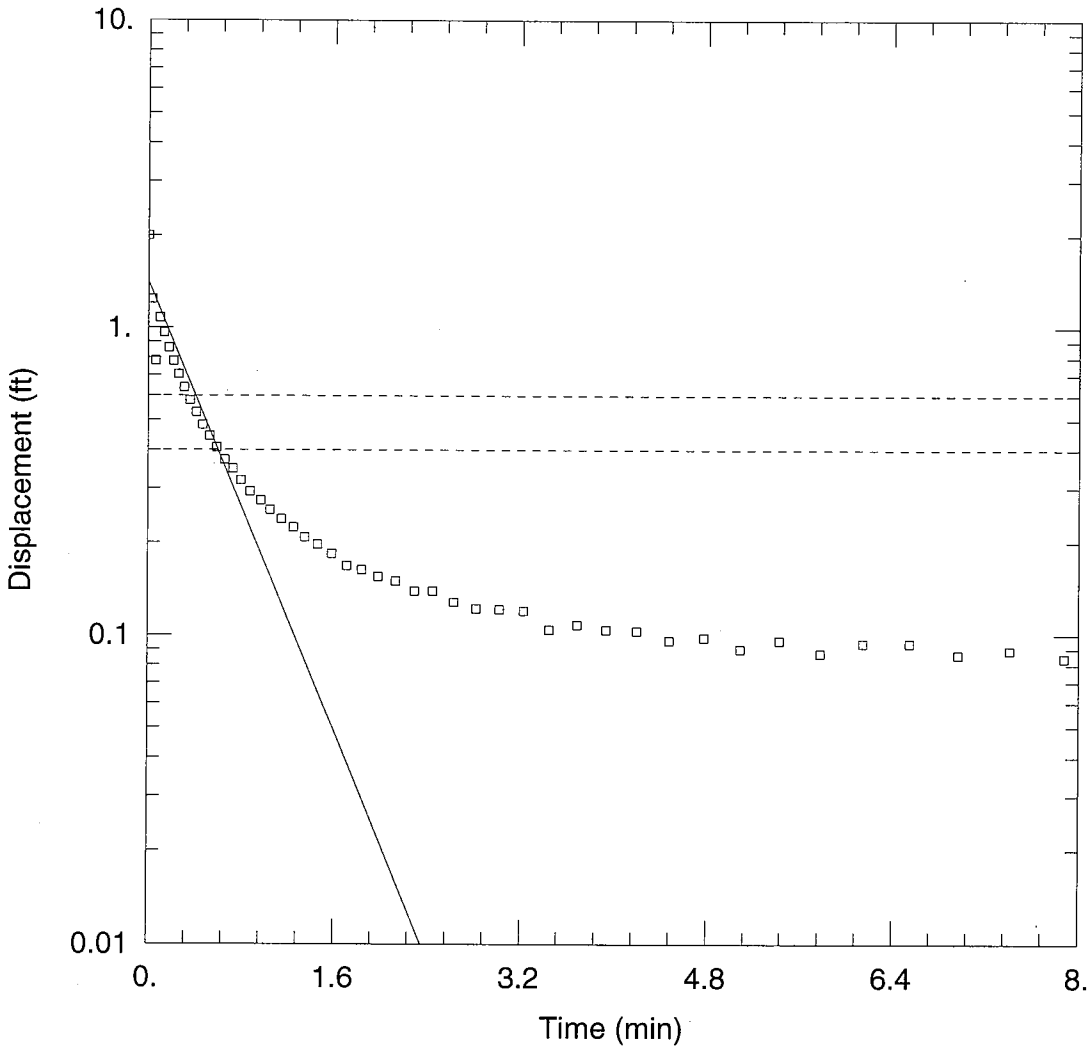
WELL DATA (S43-MW03)

Initial Displacement: 2. ft
Total Well Penetration Depth: 18. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 18. ft
Screen Length: 10. ft
Wellbore Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 4.699 ft/day
y0 = 1.051 ft



WELL TEST ANALYSIS

Data Set: G:\Indian Head - Rob Sok\AQTESolv Files\S43-MW03_Fall_2.aqt
Date: 08/02/11 Time: 10:47:02

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: U.S. Navy
Project: 112G00771
Location: Indian Head - Site 43
Test Well: S43-MW03 - Falling 2
Test Date: 6/18/2011

AQUIFER DATA

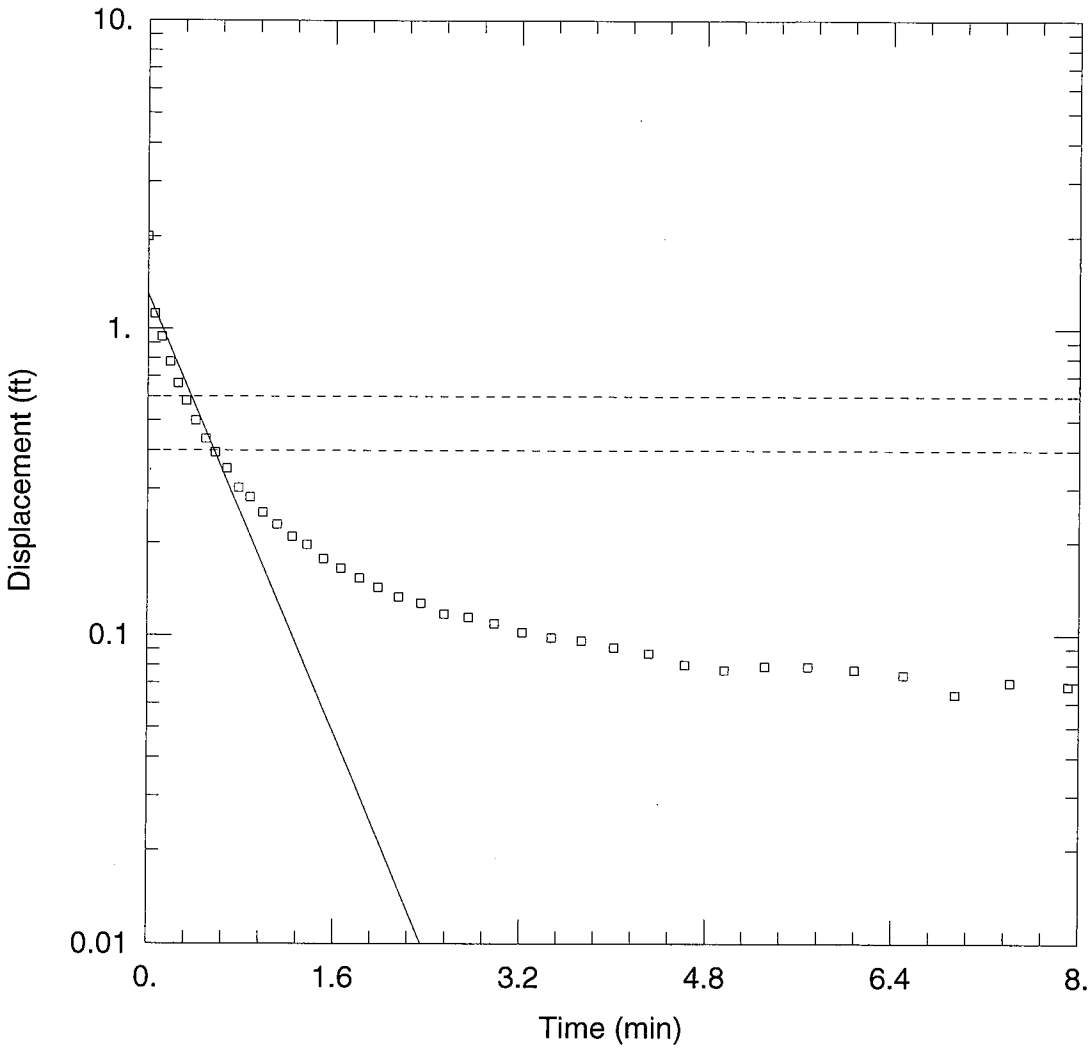
Saturated Thickness: 19. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (S43-MW03)

Initial Displacement: 2. ft
Total Well Penetration Depth: 18. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 18. ft
Screen Length: 10. ft
Wellbore Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 3.076 ft/day
y0 = 1.412 ft



WELL TEST ANALYSIS

Data Set: G:\Indian Head - Rob Sok\AQTESolv Files\S43-MW03_Fall_3.aqt
Date: 08/02/11 Time: 10:46:59

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: U.S. Navy
Project: 112G00771
Location: Indian Head - Site 43
Test Well: S43-MW03 - Falling 3
Test Date: 6/18/2011

AQUIFER DATA

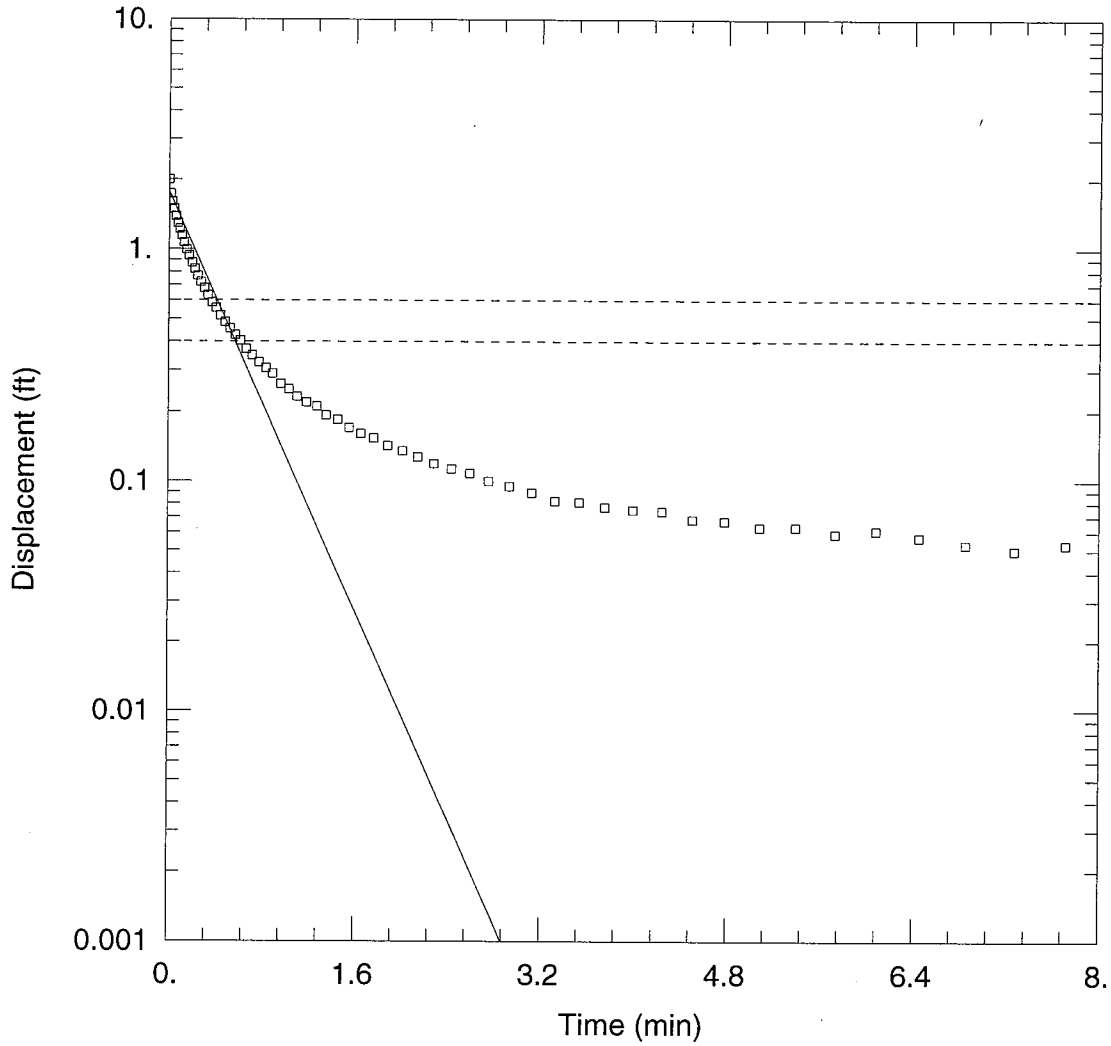
Saturated Thickness: 19. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (S43-MW03)

Initial Displacement: 2. ft
Total Well Penetration Depth: 18. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 18. ft
Screen Length: 10. ft
Wellbore Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 3.021 ft/day
y0 = 1.296 ft



WELL TEST ANALYSIS

Data Set: G:\Indian Head - Rob Sok\AQTESolv Files\S43-MW03_Rise_3.aqt
Date: 08/02/11 Time: 10:46:53

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: U.S. Navy
Project: 112G00771
Location: Indian Head - Site 43
Test Well: S43-MW03 - Rising 3
Test Date: 6/18/2011

AQUIFER DATA

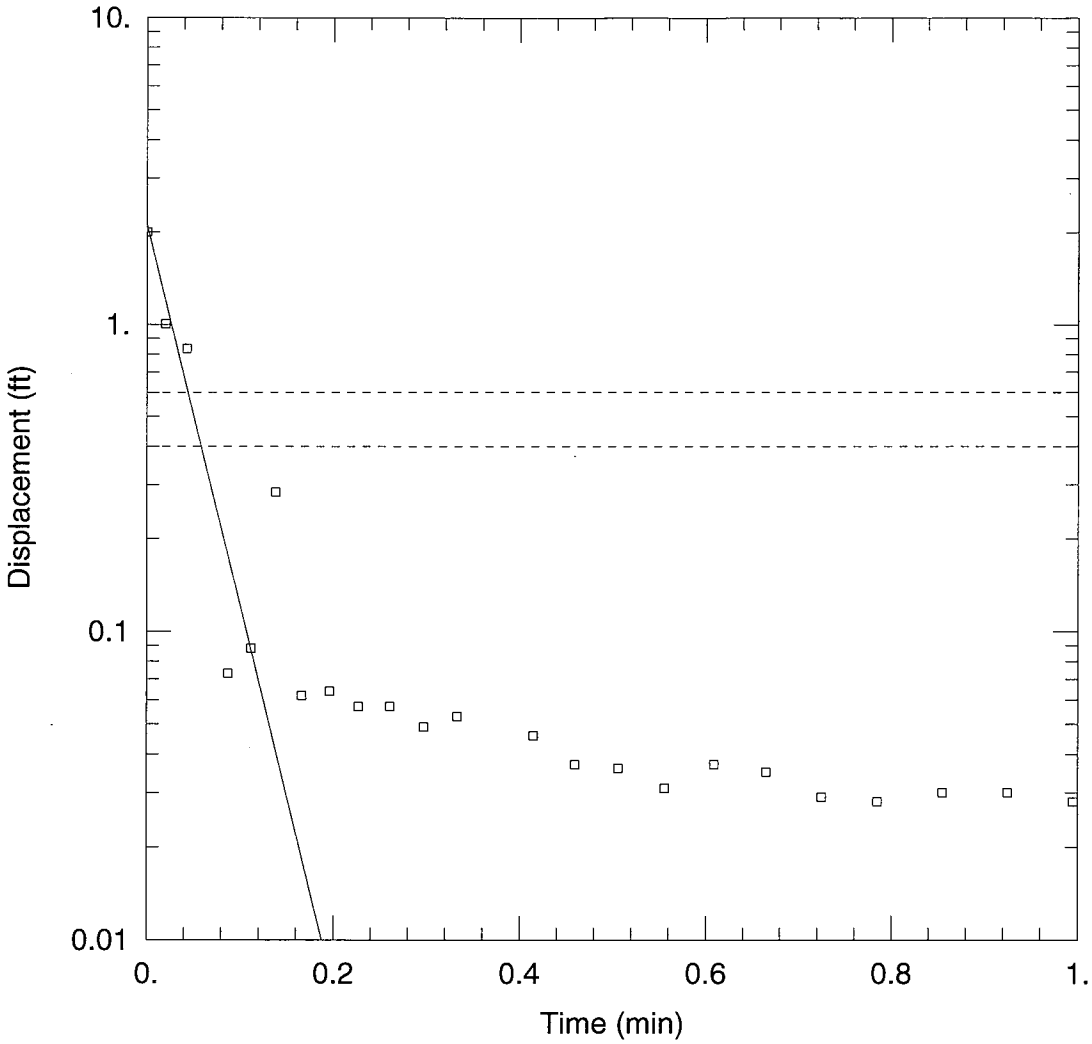
Saturated Thickness: 19. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (S43-MW03)

Initial Displacement: 2. ft
Total Well Penetration Depth: 18. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 18. ft
Screen Length: 10. ft
Wellbore Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 3.806 ft/day
y0 = 1.769 ft



WELL TEST ANALYSIS

Data Set: G:\Indian Head - Rob Sok\AQTESolv Files\S43-MW05_Fall_1.aqt
Date: 08/02/11 Time: 15:18:07

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: U.S. Navy
Project: 112G00771
Location: Indian Head - Site 43
Test Well: S43-MW05 - Falling 1
Test Date: 6/18/2011

AQUIFER DATA

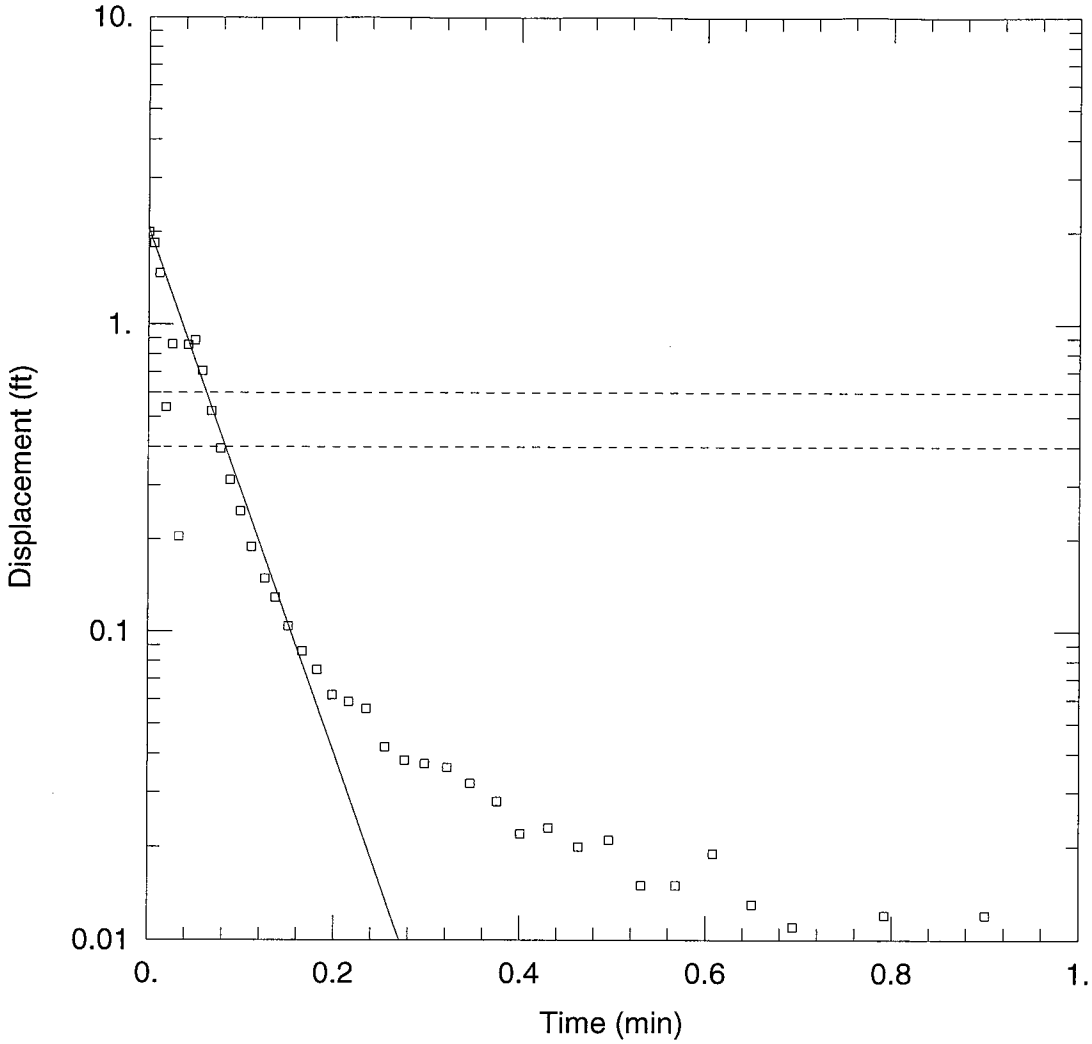
Saturated Thickness: 26. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (S43-MW05)

Initial Displacement: 2. ft
Total Well Penetration Depth: 23. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 23. ft
Screen Length: 10. ft
Wellbore Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 41.89 ft/day
y0 = 2.1 ft



WELL TEST ANALYSIS

Data Set: G:\Indian Head - Rob Sok\AQTESolv Files\S43-MW05_Rise_1.aqt
Date: 08/02/11 Time: 15:18:57

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: U.S. Navy
Project: 112G00771
Location: Indian Head - Site 43
Test Well: S43-MW05 - Rising 1
Test Date: 6/18/2011

AQUIFER DATA

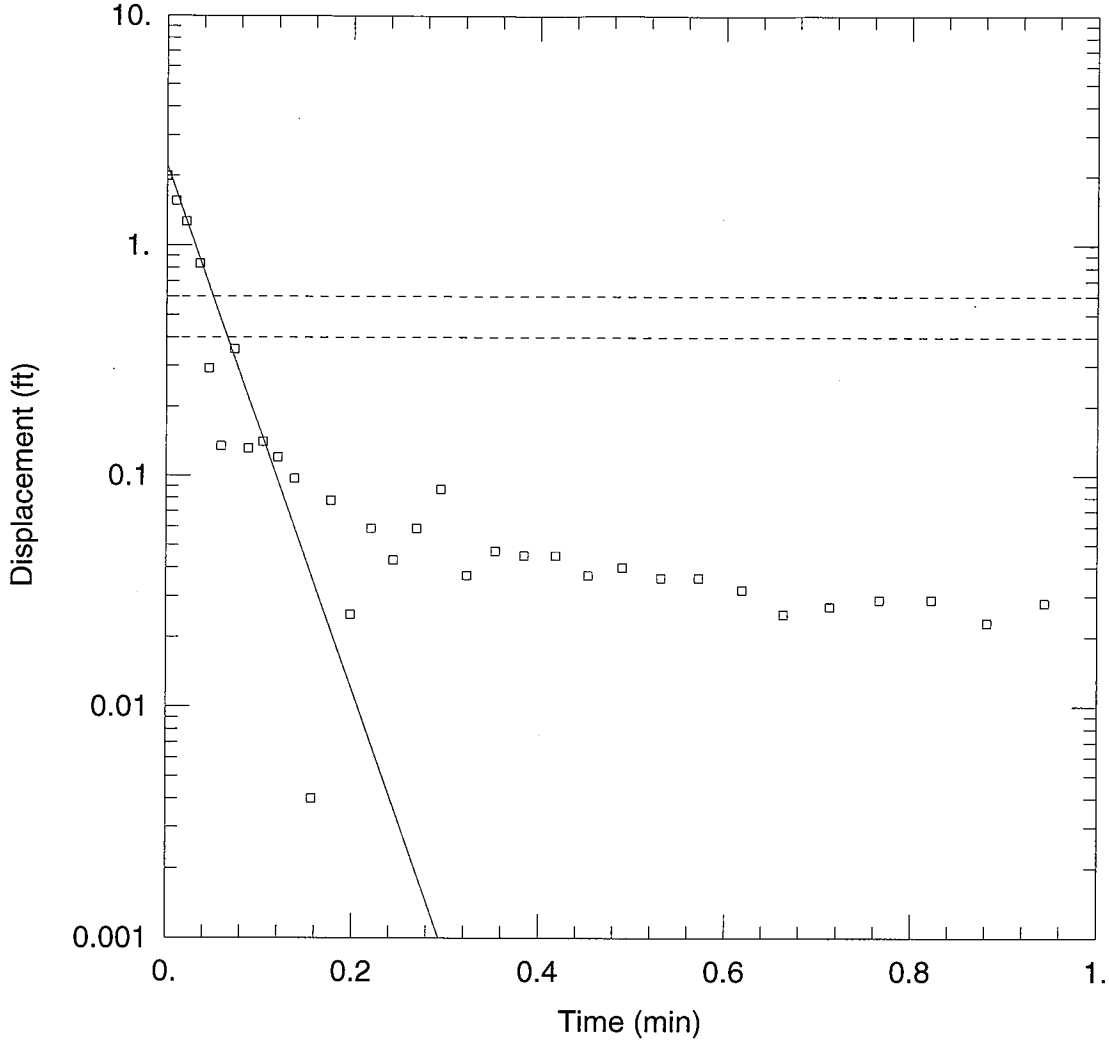
Saturated Thickness: 26. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (S43-MW05)

Initial Displacement: 2. ft
Total Well Penetration Depth: 23. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 23. ft
Screen Length: 10. ft
Wellbore Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 28.89 ft/day
y0 = 2.046 ft



WELL TEST ANALYSIS

Data Set: G:\Indian Head - Rob Sok\AQTESolv Files\S43-MW05_Fall_2.aqt
Date: 08/02/11 Time: 15:18:23

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: U.S. Navy
Project: 112G00771
Location: Indian Head - Site 43
Test Well: S43-MW05 - Falling 2
Test Date: 6/18/2011

AQUIFER DATA

Saturated Thickness: 26. ft
Anisotropy Ratio (Kz/Kr): 1.

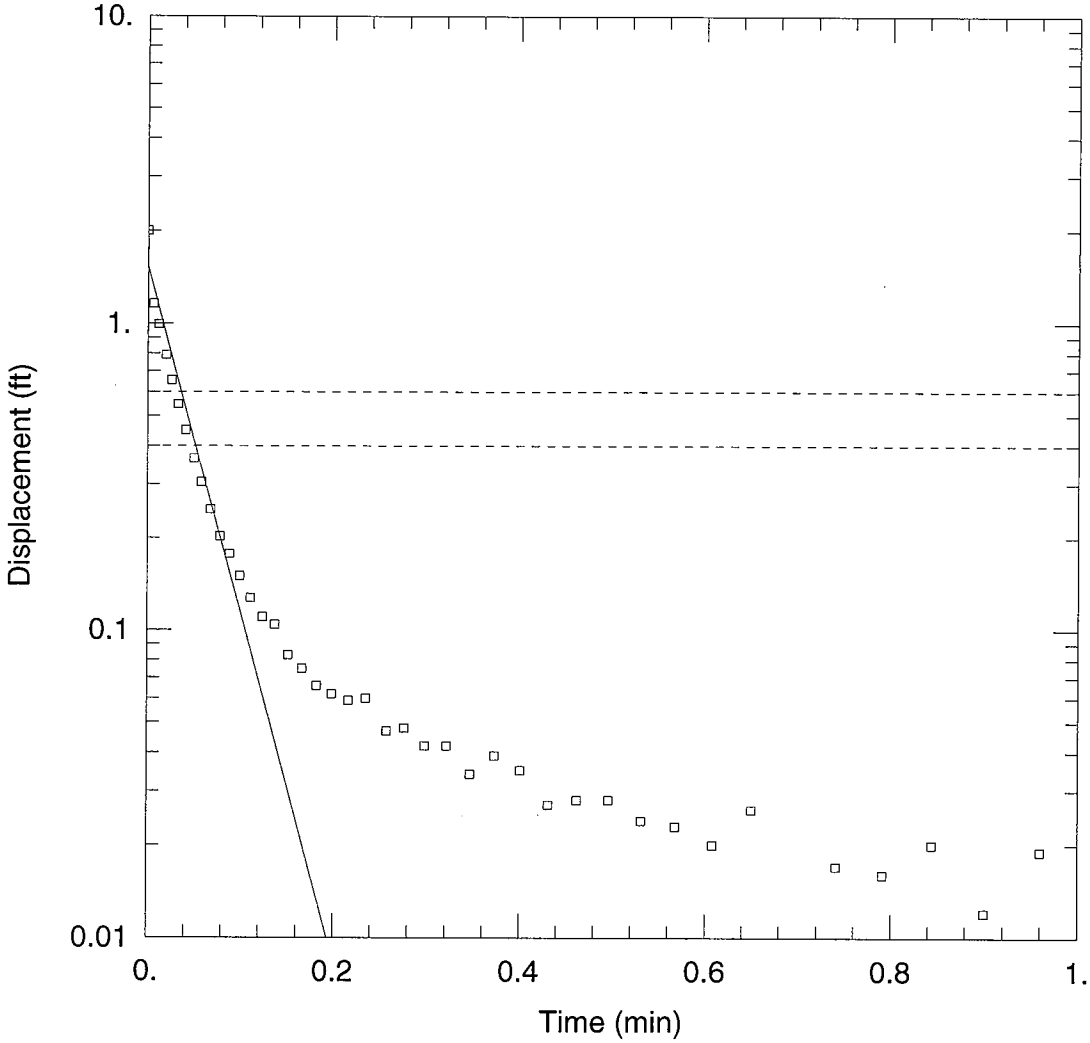
WELL DATA (S43-MW05)

Initial Displacement: 2. ft
Total Well Penetration Depth: 23. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 23. ft
Screen Length: 10. ft
Wellbore Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 38.61 ft/day
y0 = 2.228 ft



WELL TEST ANALYSIS

Data Set: G:\Indian Head - Rob Sok\AQTESolv Files\S43-MW05_Rise_2.aqt
Date: 08/02/11 Time: 15:19:10

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: U.S. Navy
Project: 112G00771
Location: Indian Head - Site 43
Test Well: S43-MW05 - Rising 2
Test Date: 6/18/2011

AQUIFER DATA

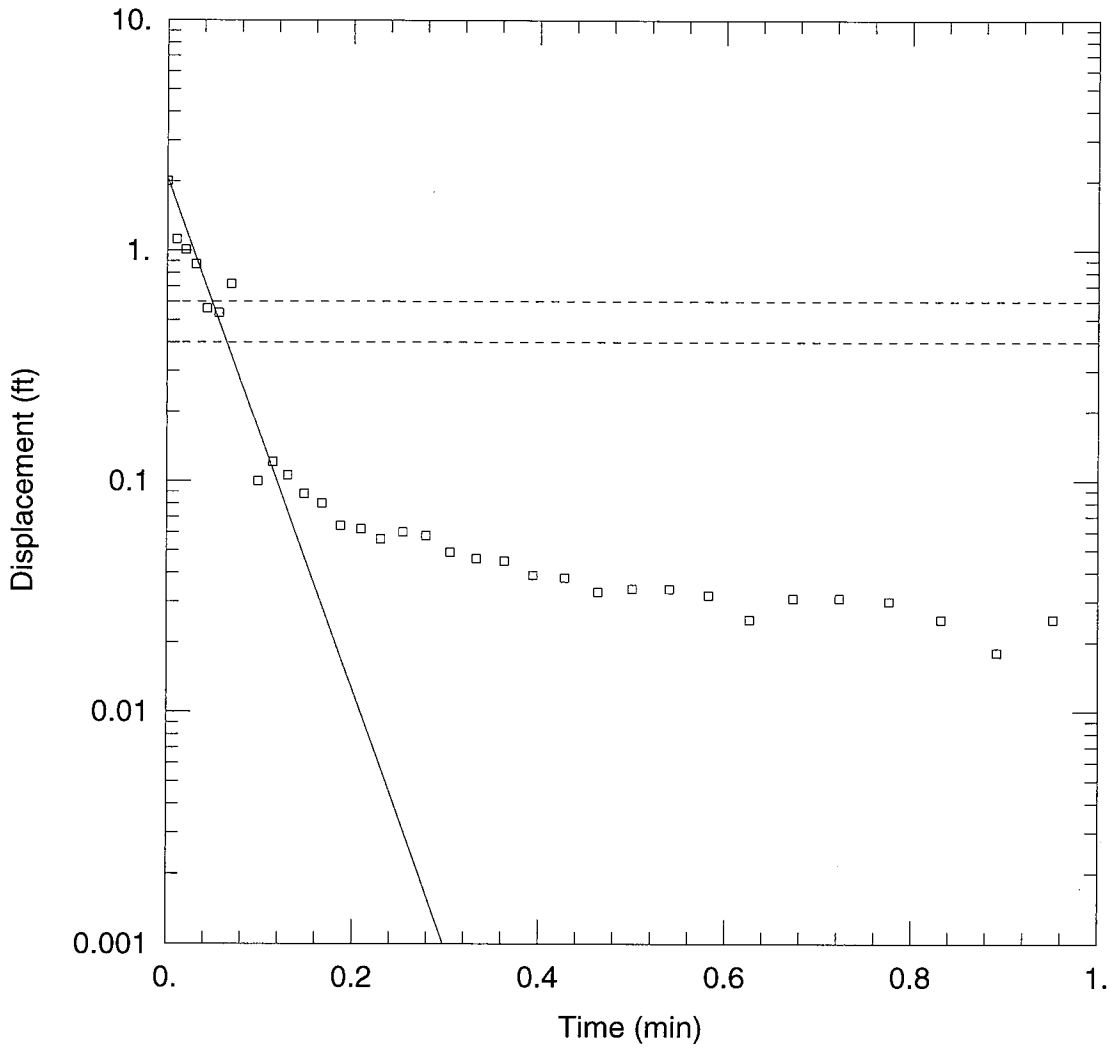
Saturated Thickness: 26. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (S43-MW05)

Initial Displacement: 2. ft
Total Well Penetration Depth: 23. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 23. ft
Screen Length: 10. ft
Wellbore Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 38.13 ft/day
y0 = 1.524 ft



WELL TEST ANALYSIS

Data Set: G:\Indian Head - Rob Sok\AQTESolv Files\S43-MW05_Fall_3.aqt
Date: 08/02/11 Time: 15:18:41

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: U.S. Navy
Project: 112G00771
Location: Indian Head - Site 43
Test Well: S43-MW05 - Falling 3
Test Date: 6/18/2011

AQUIFER DATA

Saturated Thickness: 26. ft
Anisotropy Ratio (Kz/Kr): 1.

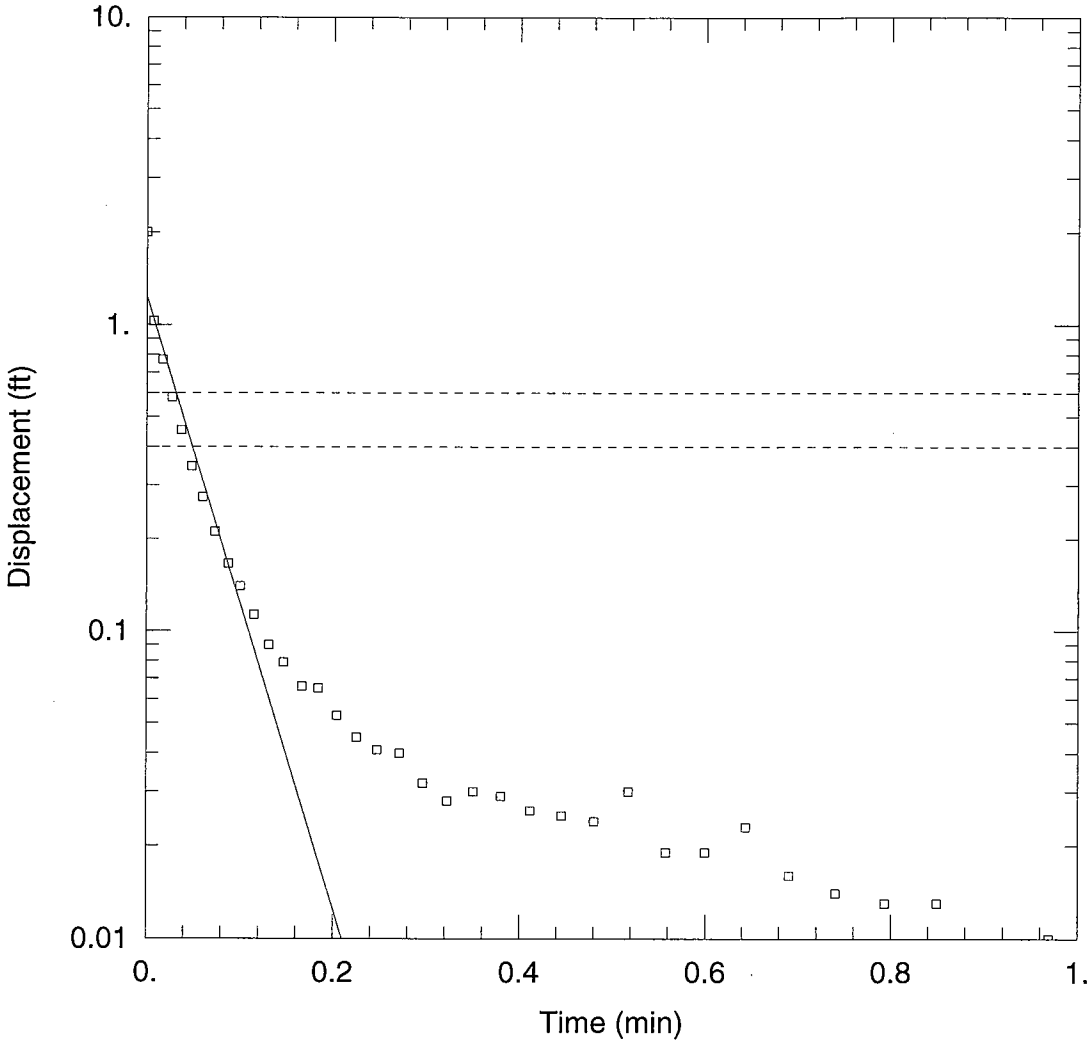
WELL DATA (S43-MW05)

Initial Displacement: 2. ft
Total Well Penetration Depth: 23. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 23. ft
Screen Length: 10. ft
Wellbore Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 37.63 ft/day
y0 = 2.066 ft



WELL TEST ANALYSIS

Data Set: G:\Indian Head - Rob Sok\AQTESolv Files\S43-MW05_Rise_3.aqt
Date: 08/02/11 Time: 15:19:32

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: U.S. Navy
Project: 112G00771
Location: Indian Head - Site 43
Test Well: S43-MW05 - Rising 3
Test Date: 6/18/2011

AQUIFER DATA

Saturated Thickness: 26. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (S43-MW05)

Initial Displacement: 2. ft
Total Well Penetration Depth: 23. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 23. ft
Screen Length: 10. ft
Wellbore Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 33.76 ft/day
y0 = 1.234 ft

Appendix I

Soil Gas, Indoor Air, and Outdoor Air Sample Log Sheets

Building 720

Soil Gas, Indoor Air, and Outdoor Air Sample Log Sheets

S43 ODA 01

Tetra Tech NUS, Inc. **SOIL GAS SAMPLING LOG SHEET**

Project Site Name: INDIAN HEAD SITE 43
Project No.: 112G00771

Sample ID No.: S43 ODA 01
Sample Location: SEE BELOW
Sampled By: KS - JB

SAMPLING DATA:

	Wind speed (Visual)	Wind Direction (estimated)	Ambient temperature (°F)	Barometric Pressure (in.)	Relative Humidity (%)	Other
Date: 6·1·11						
Time: 1445						
Method: 6 L SUMMA	<1 MPH	~~N~~ SW KS	85		85	

Summa Canister #	SR# 5705
Filter Type/Flow	~~30 min~~ 8 HRS

Duplicate (if collected): NO

11.5 ML/MIN VALVE (8 HR) w/ 2UM FILTER

Start Time Vacuum	-30+	in Hg	- 1040 AM	—	in Hg
End Time Vacuum	-1	in Hg	1445 PM (4 HRS 5 MIN)	—	in Hg

PID Readings	Time	Volume	Reading	Comments
#1		mL	ppm	
#2 NA OUTDOOR		mL	ppm	
#3 AIR		mL	ppm	
Helium Check	**Time**	**Volume**	**Reading**	**Comments**
#1		mL	ppm	
#2		mL	ppm	
#3		mL	ppm	

LAB FILE # 79439

MODIFIED EPA TO-15 METHOD

Notes:

LITTLE TO NO WIND HOT & HUMID
TO-CAN
CAT# 22107
RESTEK CORP, BELLEFONTE, PA

CAN @ 3.5' OFF GROUND HUNG ON STOP SIGN @ THE NE CORNER OF GALLERY RD & SCHUYLER RD.

Tetra Tech NUS, Inc. **SOIL GAS SAMPLING LOG SHEET**

Project Site Name: INDIAN HEAD SITE 43
Project No.: 112G00771

Sample ID No.: S43SG01 06
Sample Location: SG01
Sampled By: K. SIMPSON

SAMPLING DATA:

Date: 6-11-11	Wind speed	Wind Direction	Ambient temperature	Barometric Pressure	Relative Humidity	Other
Time: 1850	(Visual)	(estimated)	(°F)	(in.)	(%)	
Method: 6L SUMMA	2 MPH	SW	81		80	

Summa Canister #	SA#11880
Filter Type/Flow	30 min

Duplicate (if collected)

—	
—	

167 ML/MIN VALVE (½ HR) w/ 2UM FILTER

Start Time Vacuum	~~8~~ -30+	in Hg	1721
End Time Vacuum	~~18~~ -9	in Hg	1850

—	in Hg
—	in Hg

PID Readings	Time	Volume	Reading	Comments
#1	1715	50 mL	2.0 ppm	
#2	1717	50 mL	1.5 ppm	
#3	1719	50 mL	2.1 ppm	
Helium Check	**Time**	**Volume**	**Reading**	**Comments**
#1	1716	50 mL	250 ppm	
#2	1718	50 mL	200 ppm	
#3	1720	50 mL	800 ppm	

MODIFIED EPA TO-15 METHOD

Notes:

Tetra Tech NUS, Inc. **SOIL GAS SAMPLING LOG SHEET**

Project Site Name: INDIAN HEAD SITE 43
Project No.: 112G00771

Sample ID No.: 543 SG-02 06
Sample Location: SG-02
Sampled By: K. SIMPSON

SAMPLING DATA:

Date: 6·12·11 / Time:	Wind speed (Visual)	Wind Direction (estimated)	Ambient temperature (°F)	Barometric Pressure (in.)	Relative Humidity (%)	Other
Method: 6 L SUMMA	1-2 MPH	SW	77		60	

Summa Canister #	SR# 433		Duplicate (if collected)	SR#33988	
Filter Type/Flow	30 min			30 MIN	
Start Time Vacuum	-30+	in Hg	1015 ~~0917~~	-30+	in Hg
End Time Vacuum		in Hg			in Hg

167 ML/MIN VALVE (½ HR) w/ 2UM FILTER

NO SAMPLE

PID Readings	Time	Volume	Reading	Comments
#1	0910	50 mL	1.4 ppm	
#2	0912	50 mL	1.5 ppm	
#3	0914	50 mL	2.0 ppm	
Helium Check	**Time**	**Volume**	**Reading**	**Comments**
#1	0911	50 mL	5 ppm	
#2	0913	50 mL	7 ppm	
#3	0915	50 mL	3 ppm	

LET DRAW FOR 2 HRS
NO DROP ON VACUUM GAUGE
MODIFIED EPA
TO-15 METHOD

Notes:

DUP ID = ~~SG~~ KS 543 SG-02 06 - D MAY BE IN CLAY
NO MOVEMENT ON GAUGES (SAMPLE/DUP) IN 50 MIN. PULLED RODS TO 5' BGS (ADDITIONAL 6") RETRY

Tetra Tech NUS, Inc. **SOIL GAS SAMPLING LOG SHEET** SG-03

KS **Page 1 of 1**

Project Site Name: INDIAN HEAD SITE 43
Project No.: 112G00771

Sample ID No.: S43 SG-03 ~~06~~ 05
Sample Location: SG-03
Sampled By: KS - JB

SAMPLING DATA:

	Wind speed (Visual)	Wind Direction (estimated)	Ambient temperature (°F)	Barometric Pressure (in.)	Relative Humidity (%)	Other
Date: 6.11.11						
Time: 1500						
Method: 6 L SUMMA	SW	<1 MPH	85°		85	

Summa Canister #	S/N# 3731	**Duplicate** (if collected)	—
Filter Type/Flow	30 min		—

167 ML/MIN VALVE (½ HR) w/ 2uM FILTER

Start Time Vacuum	-30+	in Hg	1355	—	in Hg
End Time Vacuum	-1	in Hg	1500	—	in Hg

PID Readings	Time	Volume	Reading	Comments
#1 1352	0	50 mL	0 ppm	
#2 1354	1.0	50 mL	1.0 ppm	
#3 1356	0.8	50 mL	0.8 ppm	
Helium Check	**Time**	**Volume**	**Reading**	**Comments**
#1 1353		50 mL	10 ppm	
#2 1355		50 mL	20 ppm	
#3 1357		50 mL	15 ppm	

MODIFIED EPA TO-15 METHOD

Notes:

LITTLE TO NO WIND HOT & HUMID

Tetra Tech NUS, Inc. **SOIL GAS SAMPLING LOG SHEET**

Project Site Name: INDIAN HEAD SITE 43
Project No.: 112G00771

Sample ID No.: S43 SG04 06
Sample Location: SG-04
Sampled By: K. SIMPSON

SAMPLING DATA:

	MPH Wind speed (Visual)	Wind Direction (estimated)	Ambient temperature (°F)	Barometric Pressure (in.)	Relative Humidity (%)	Other
Date: 6.11.11						
Time: 1705						
Method: 6 L SUMMA	1 TO 2	SW	90		85	

Summa Canister #	SR# 34201
Filter Type/Flow	30 min

Duplicate (if collected)

—	
—	

167 ML/MIN VALVE (½ HR) W/ 2 UM FILTER

Start Time Vacuum	-30+	in Hg	1522	—	in Hg
End Time Vacuum	-9	in Hg	~~1650~~ 1705 KS	—	in Hg

PID Readings	Time	Volume	Reading	Comments
#1	1514	50 mL	21.5 ppm	
#2	1516	50 mL	46.2 ppm	
#3	1519	50 mL	349.0 ppm	
Helium Check	**Time**	**Volume**	**Reading**	**Comments**
#1	1515	50 mL	1575 ppm	
#2	1517	50 mL	203 ppm	
#3	1520	50 mL	480 ppm	

MODIFIED EPA TO-15 METHOD

Notes:

Tetra Tech

INDOOR/OUTDOOR AIR SAMPLING LOG SHEET

Project Site Name:	NSF Indian Head Site 43	**Sample ID No.:**	5430DA02
Project/CTO No.:	Project #112G00771 / CTO-114	**Sample Location:**	Site 43 / Building 720
Company:	Tetra Tech	**Sampled By:**	Rob Sok / Jacob Birkett

SAMPLING DATA:

	Wind speed (Visual)	Wind Direction (estimated)	Ambient temperature (°F)	Barometric Pressure (in.)	Relative Humidity (%)	Weather Description
Date: 4/20/12 **Time:** 1315						
Container Type: 6 L Summa	0-3 mph	SSW	70 (61-72)	29.85-30.16	44-71	Mostly clear w/ Fog in AM on 4-20-13

Duplicate Sample (if collected)

Canister #	25304	**Canister #**	NA
Filter Type/Flow	24 hour	**Filter Type/Flow**	

Start Time Vacuum	1351 -30	in Hg	4-19-12	NA	in Hg
End Time Vacuum	1315 -9	in Hg	4-20-12		in Hg

Purge Data (Time)	Flow Rate (mL/minute)	Total volume	PID Reading (ppm)	Helium Reading (ppm)	Comments/Observations
NA					

Notes:

Collected from corner of Gallery & Schulyer Rd's, canister hung on Stop sign.

Tetra Tech

INDOOR/OUTDOOR AIR SAMPLING LOG SHEET

Project Site Name:	NSF Indian Head Site 43	**Sample ID No.:**	S43INDO1
Project/CTO No.:	Project #112G00771 / CTO-114	**Sample Location:**	Site 43 Building 720
Company:	Tetra Tech	**Sampled By:**	Rob Sok

SAMPLING DATA:

	Wind speed (Visual)	Wind Direction (estimated)	Ambient temperature (°F)	Barometric Pressure (in.)	Relative Humidity (%)	Weather Description
Date: 4/20/12 **Time:** 1200						
Container Type: 6 L Summa	0-3 mph	SSW	70	—	—	—

Duplicate Sample (if collected)

Canister #	~~[illegible]~~ 33668	**Canister #**	34460
Filter Type/Flow	24 hour	**Filter Type/Flow**	24 hr

Start Time Vacuum	1400	in Hg -31	4-19-12	1401	in Hg -31
End Time Vacuum	1200	in Hg -9	4-20-12	1200	in Hg -8

Purge Data (Time)	Flow Rate (mL/minute)	Total volume	PID Reading (ppm)	Helium Reading (ppm)	Comments/Observations
NA					

Notes:

Collected on North end of Building 720.

Tetra Tech

INDOOR/OUTDOOR AIR SAMPLING LOG SHEET

Project Site Name:	NSF Indian Head Site 43	**Sample ID No.:**	543INDOR
Project/CTO No.:	Project #112G00771 / CTO-114	**Sample Location:**	Site 43 Building 720
Company:	Tetra Tech	**Sampled By:**	Rob Sok

SAMPLING DATA:

	Wind speed (Visual)	Wind Direction (estimated)	Ambient temperature (°F)	Barometric Pressure (in.)	Relative Humidity (%)	Weather Description
Date: 4/20/12 **Time:** 1204						
Container Type: 6 L Summa	0-3 mph	SSW	70	—	—	—

Duplicate Sample (if collected)

Canister #	~~[illegible]~~ 12959	**Canister #**	NA
Filter Type/Flow	24 hour	**Filter Type/Flow**	

Start Time Vacuum	1404	in Hg -31	4-19-12	NA	in Hg
End Time Vacuum	1204	in Hg -10	4-20-13		in Hg

Purge Data (Time)	Flow Rate (mL/minute)	Total volume	PID Reading (ppm)	Helium Reading (ppm)	Comments/Observations
NA					

Notes:

Collected in the southern portion of Northern most bay of Building 720.

OSR – 3

Site43 - Building 72C

NEW YORK STATE DEPARTMENT OF HEALTH
INDOOR AIR QUALITY QUESTIONNAIRE AND BUILDING INVENTORY
CENTER FOR ENVIRONMENTAL HEALTH

This form must be completed for each residence involved in indoor air testing.

Preparer's Name Robert Sok Date/Time Prepared 4/19/12

Preparer's Affiliation Tetra Tech Inc. Phone No. (757) 466-4904

Purpose of Investigation Evaluate potential VI into Building 720

1. OCCUPANT:

Interviewed: Y (N)

Last Name: _____ First Name: _____

Address: _____

County: _____

Home Phone: _____ Office Phone: _____

Number of Occupants/persons at this location _____ Age of Occupants _____

NA

2. OWNER OR LANDLORD: (Check if same as occupant ___)

Interviewed: (Y) / N

Last Name: Carros First Name: Nicholas

Address: 3972 Ward Rd, Suite 101, Indian Head, MD 20640

County: Charles Co., MD

Home Phone: NA Office Phone (301) 744-2263

3. BUILDING CHARACTERISTICS

Type of Building: (Circle appropriate response)

Residential	School	Commercial/Multi-use
(Industrial)	Church	Other: Government (US)

If the property is residential, type? (Circle appropriate response)

Ranch	2-Family	3-Family
Raised Ranch	Split Level	Colonial
Cape Cod	Contemporary	Mobile Home
Duplex	Apartment House	Townhouses/Condos
Modular	Log Home	Other:_____

NA

If multiple units, how many? NA

If the property is commercial, type?

Business Type(s) US Gov't building (Management and assembly of energetics)

Does it include residences (i.e., multi-use)? Y / N If yes, how many? NA

Other characteristics:

Number of floors 2 (40ft high) Building age ~60 years (1953)

Is the building insulated? Y / N How air tight? Tight / Average / Not Tight

4. AIRFLOW

Use air current tubes or tracer smoke to evaluate airflow patterns and qualitatively describe:

Airflow between floors

Open flow with no discernable patterns

Airflow near source

NA

Outdoor air infiltration

Large doors with no seals allow air (outside) to infiltrate easily

Infiltration into air ducts

NA

5. BASEMENT AND CONSTRUCTION CHARACTERISTICS (Circle all that apply)

a. Above grade construction:	wood frame	concrete	stone	brick
b. Basement type:	full	crawlspace	slab	other _____
c. Basement floor:	concrete	dirt	stone	other _____
d. Basement floor:	uncovered	covered	covered with _____	
e. Concrete floor:	unsealed	sealed	sealed with _____	
f. Foundation walls:	poured	block	stone	other _____
g. Foundation walls:	unsealed	sealed	sealed with _____	
h. The basement is:	wet	damp	dry	moldy
i. The basement is:	finished	unfinished	partially finished	
j. Sump present?	Y / N			
k. Water in sump?	Y / N / not applicable			

Basement/Lowest level depth below grade: _____ (feet)

Identify potential soil vapor entry points and approximate size (e.g., cracks, utility ports, drains)

_____

6. HEATING, VENTING and AIR CONDITIONING (Circle all that apply)

Type of heating system(s) used in this building: (circle all that apply – note primary)

Hot air circulation	Heat pump	Hot water baseboard	
Space Heaters	Stream radiation	Radiant floor	
Electric baseboard	Wood stove	Outdoor wood boiler	Other _____

The primary type of fuel used is:

Natural Gas	Fuel Oil	Kerosene
Electric	Propane	Solar
Wood	Coal	

Domestic hot water tank fueled by: _____

Boiler/furnace located in: Basement Outdoors Main Floor Other _____

Air conditioning: Central Air Window units Open Windows None

Are there air distribution ducts present? Y (N)

Describe the supply and cold air return ductwork, and its condition where visible, including whether there is a cold air return and the tightness of duct joints. Indicate the locations on the floor plan diagram. NA

7. OCCUPANCY (Work conducted in shifts 8-10hrs)

Is basement/lowest level occupied? Full-time Occasionally Seldom Almost Never

Level	**General Use of Each Floor (e.g., familyroom, bedroom, laundry, workshop, storage)**
Basement	NA
1st Floor	All operations (assembly & managment of Engetics)
2nd Floor	Mostly for storage (parts, etc.)
3rd Floor	NA
4th Floor	NA

8. FACTORS THAT MAY INFLUENCE INDOOR AIR QUALITY

a. Is there an attached garage? Y / (N)

b. Does the garage have a separate heating unit? Y / N / (NA)

c. Are petroleum-powered machines or vehicles stored in the garage (e.g., lawnmower, atv, car) (Y) / N / NA Please specify Diesel Fork lift used in Southern Bay's to move supplies & equip

d. Has the building ever had a fire? Y / (N) When? unknown

e. Is a kerosene or unvented gas space heater present? Y / (N) Where? _____

f. Is there a workshop or hobby/craft area? (Y) / N Where & Type? Entire building Indu

g. Is there smoking in the building? ~~(Y)~~ / (N) How frequently? None

h. Have cleaning products been used recently? Y / (N) When & Type? _____

i. Have cosmetic products been used recently? Y / (N) When & Type? _____

j. Has painting/staining been done in the last 6 months? Y / N Where & When? _____

k. Is there new carpet, drapes or other textiles? Y / N Where & When? _____

l. Have air fresheners been used recently? Y / N When & Type? _____

m. Is there a kitchen exhaust fan? Y / N If yes, where vented? _____

n. Is there a bathroom exhaust fan? Y / N If yes, where vented? _____

o. Is there a clothes dryer? Y / N If yes, is it vented outside? Y / N

p. Has there been a pesticide application? Y / N When & Type? arsenic based outside around building

Are there odors in the building? Y / N
If yes, please describe: _____

Do any of the building occupants use solvents at work? Y / N ☆ This is their workplace
(e.g., chemical manufacturing or laboratory, auto mechanic or auto body shop, painting, fuel oil delivery, boiler mechanic, pesticide application, cosmetologist

If yes, what types of solvents are used? TCE, acetone, toluene

If yes, are their clothes washed at work? Y / N

Do any of the building occupants regularly use or work at a dry-cleaning service? (Circle appropriate response)

Yes, use dry-cleaning regularly (weekly) No
Yes, use dry-cleaning infrequently (monthly or less) Unknown
Yes, work at a dry-cleaning service

Is there a radon mitigation system for the building/structure? Y / N Date of Installation: _____
Is the system active or passive? Active/Passive

9. WATER AND SEWAGE

Water Supply: Public Water Drilled Well Driven Well Dug Well Other: _____

Sewage Disposal: Public Sewer Septic Tank Leach Field Dry Well Other: _____

10. RELOCATION INFORMATION (for oil spill residential emergency)

NA

a. Provide reasons why relocation is recommended: _____

b. Residents choose to: remain in home relocate to friends/family relocate to hotel/motel

c. Responsibility for costs associated with reimbursement explained? Y / N

d. Relocation package provided and explained to residents? Y / N

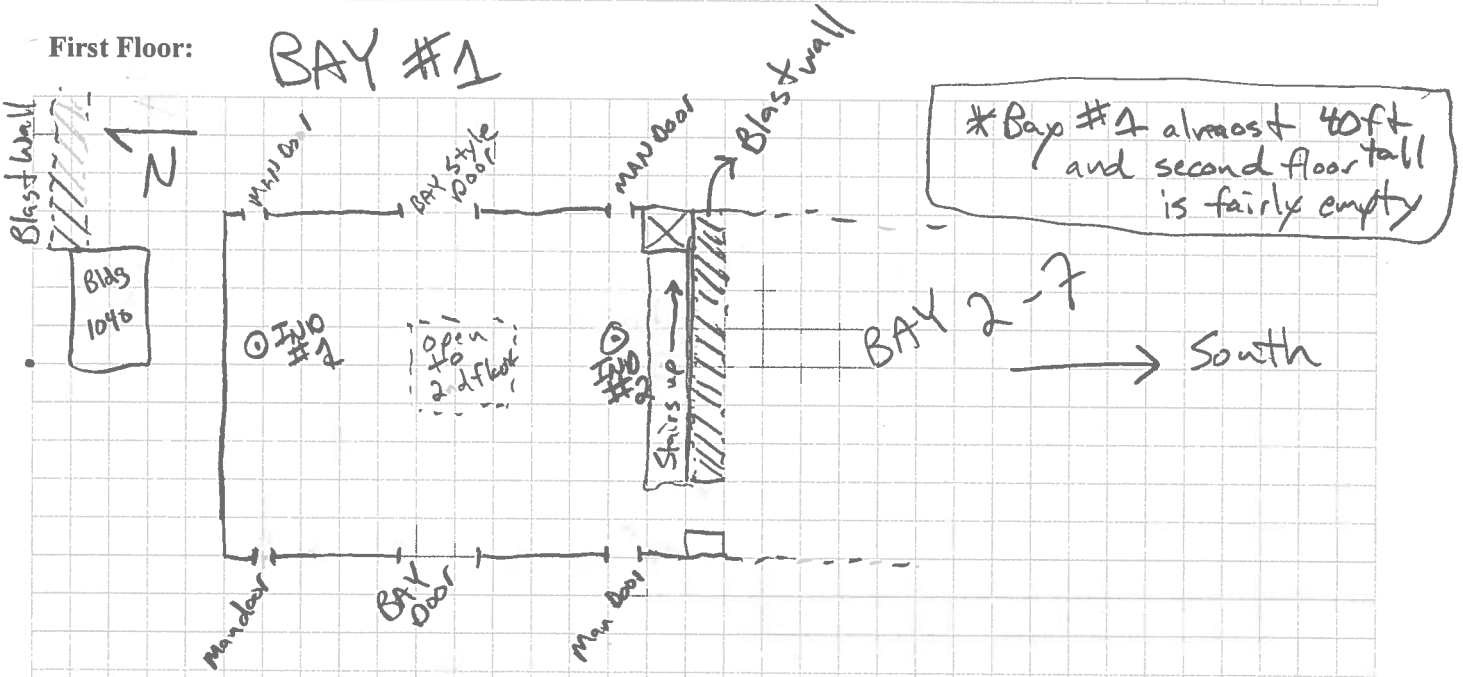
11. FLOOR PLANS

Draw a plan view sketch of the basement and first floor of the building. Indicate air sampling locations, possible indoor air pollution sources and PID meter readings. If the building does not have a basement, please note.

Basement:

NA

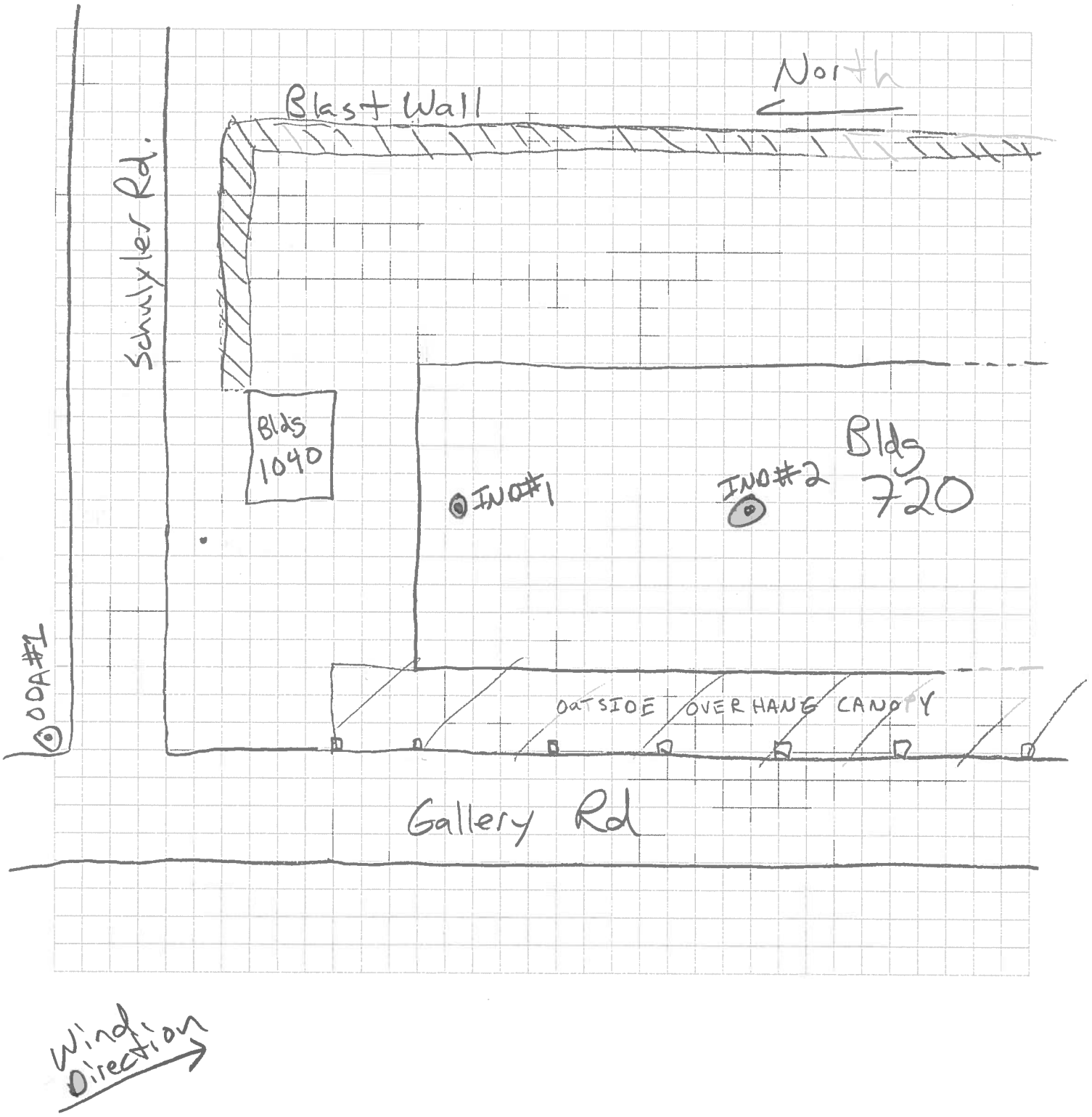
First Floor:



12. OUTDOOR PLOT

Draw a sketch of the area surrounding the building being sampled. If applicable, provide information on spill locations, potential air contamination sources (industries, gas stations, repair shops, landfills, etc.), outdoor air sampling location(s) and PID meter readings.

Also indicate compass direction, wind direction and speed during sampling, the locations of the well and septic system, if applicable, and a qualifying statement to help locate the site on a topographic map.



13. PRODUCT INVENTORY FORM

Make & Model of field instrument used: Mini RAE

List specific products found in the residence that have the potential to affect indoor air quality.

☆ Only Bay 1

Location	Product Description	Size (units)	Condition*	Chemical Ingredients	Field Instrument Reading (units) ppm	Photo** Y / N
	PLIO Bond 20	tube	used	unknown	NA	N
	PLIO Bond 30	tube	used	unknown	NA	
	Loctite 2760	tube	used	unknown	NA	
	Acetone			Not in Bay 1 during sampling	NA	
	Dow Corning 111	5gal	~~used~~	unknown	NA	
	WD-40	few cans	~~new~~ used	unknown	NA	
Bldg 1040	Acetone	?		small can <10gals	NA	
Bay 1	GE RTV 100 Series	tube	used	silicone rubber adhesive		

* Describe the condition of the product containers as **Unopened (UO), Used (U),** or **Deteriorated (D)**
** Photographs of the **front and back** of product containers can replace the handwritten list of chemical ingredients. However, the photographs must be of good quality and ingredient labels must be legible.

Building 716

Soil Gas, Indoor Air, and Outdoor Air Sample Log Sheets

Tetra Tech Inc.

SOIL VAPOR SAMPLE LOG SHEET

Project Site Name: Site 43 Toluene Disposal Area
Project Number: 112G00771
Sample Location: S605

Sample ID Number: S43S605 0708
Sampled By: CM

DESCRIPTION OF SAMPLE LOCATION

Indoor

Location: N/A
Basement: yes / no
Room size (ftxft):
Floor material: concrete / wood / dirt / other
Slab Thickness (ft):
Visible Cracks: yes / no
Subslab Material: dirt / gravel

Outdoor

Location: Beside Building 716
Depth to Water (ft): 8 feet
Soil type: VF-F sand trace silt
Odor: None
Color: Light Brown

PROBE INSTALLATION

Date: 5/6/13
Method: Geoprobe
Diameter: 0.25 inch
Depth: 8 ft
Packing Material: Bentonite
Initial PID Reading: 0.0
Post PID Reading: 0.0

LOCATION SKETCH

PURGE/LEAK TEST DATA

Date: 5/6/13
Time: 1640 1650
Rate: 36 ml/min
Volume: 360 ~~ml/min~~ ml
PID = 0.1 0.1 0.1 180
He = 0 1100 2250 180

SAMPLE COLLECTION

Start Time: 1650 1200 (Dupoi) End Time: 1810 1230 (Dupoi)
Starting Pressure: -29 -30 End Pressure: -8.5 -8
Rate:
Volume: 6 Liter Summa
Canister Description: 6 Liter Summa

OBSERVATIONS / NOTES:

	Start	End		Static Test	Start Pressure	End Pressure
Barometric Pressure	29.87	29.91	Regulator Number			
Temperature	62	62	FC00846 FC00609 DUPOI	Helium Shroud	Start 11.5	Mid 7.3	Post 3.9
Canister Number	34439	9417 DUPOI				

Observations:

Signature(s):

Tetra Tech Inc.

SOIL VAPOR SAMPLE LOG SHEET

Project Site Name: Site 43 Toluene Disposal Area
Project Number: 112G00771
Sample Location: S606

Sample ID Number: S43S6060607
Sampled By: Chuck Meyer

DESCRIPTION OF SAMPLE LOCATION

Indoor

Location: N/A
Basement: yes / no
Room size (ftxft):
Floor material: concrete / wood / dirt / other
Slab Thickness (ft):
Visible Cracks: yes / no
Subslab Material: dirt / gravel

Outdoor

Location: Building Front
Depth to Water (ft): 7'
Soil type:
Odor: None
Color: Lt Brown

PROBE INSTALLATION

Date: 5/7/13
Method: Geoprobe
Diameter: 0.25 inch
Depth: 7'
Packing Material: Bentonite
Initial PID Reading: 0.0
Post PID Reading:

PURGE/LEAK TEST DATA

Date: 5/7/13
Time: 0825 - 0835
Rate: 36 ml/min
Volume: 360 ml
PID = 0.1 0.3 0.5 180ml
He = 0, 250, 356 180 ml

SAMPLE COLLECTION

Start Time: 0835
End Time: 0917
Starting Pressure: -30
End Pressure: -3
Rate:
Volume: 6 Liter Summa
Canister Description: 6 Liter Summa

LOCATION SKETCH

OBSERVATIONS / NOTES:

	Start	End	Regulator Number	Static Test	Start Pressure	End Pressure	
Barometric Pressure	29.59	29.59					
Temperature	59	59	FC00331	Helium Shroud	Start	Mid	Post
				30.7	30.7	7.9	4.1
Canister Number	34384						

Observations:

Signature(s):

Tetra Tech Inc.

SOIL VAPOR SAMPLE LOG SHEET

Project Site Name: Site 43 Toluene Disposal Area
Project Number: 112G00771
Sample Location: SG07
Sample ID Number: S43SG071011
Sampled By: Chuck Meyer

DESCRIPTION OF SAMPLE LOCATION

Indoor

Location: N/A
Basement: yes / no
Room size (ftxft):
Floor material: concrete / wood / dirt / other
Slab Thickness (ft):
Visible Cracks: yes / no
Subslab Material: dirt / gravel

Outdoor

Location: Downstream Building Side
Depth to Water (ft): 11.5
Soil type: silty VF sand trace Clay
Odor: None
Color: Gray to Light Brown

PROBE INSTALLATION

Date: 5/6/13
Method: Geoprobe
Diameter: 0.25 inch
Depth: 11 feet
Packing Material: Bentonite
Initial PID Reading: 0.0
Post PID Reading: 0.0

LOCATION SKETCH

PURGE/LEAK TEST DATA

Date: 5/6/13
Time: 1620 1625
Rate: 70
Volume: 360
PID = 0.2 0.3 0.6 / 180 PID = 0.7 0.6 0.3 / 180

SAMPLE COLLECTION

Start Time: 1630 End Time: 1710
Starting Pressure: -30 End Pressure: -3
Rate:
Volume: 6 Liter Summa
Canister Description: 6 Liter Summa

OBSERVATIONS / NOTES:

	Start	End		Static Test	Start Pressure	End Pressure	
Barometric Pressure	29.68	29.85	Regulator Number				
Temperature	60	61	40682	Helium Shroud	Start	Mid	Post
Canister Number	3727						

Observations: No Helium test was run on this location

Signature(s):

Tetra Tech NUS, Inc.

SOIL VAPOR SAMPLE LOG SHEET

Project Site Name: Indian Head Site 41.3
Project Number: 112600771
Sample Location: 8608
Sample ID Number: 5435608 0008
Sampled By: Chuck Meyer

DESCRIPTION OF SAMPLE LOCATION

Indoor

Location: N/A
Basement: yes / no
Room size (ftxft):
Floor material: concrete / wood / dirt / other
Slab Thickness (ft):
Visible Cracks: yes / no
Subslab Material: dirt / gravel

Outdoor

Location: Behind Building
Depth to Water (ft): 8'
Soil type: Sandy Clay
Odor: None
Color: Brown Gray

PROBE INSTALLATION

Date: 5/6/13
Method: Geoprobe
Diameter: 0.5 inch
Depth: 8 feet
Packing Material: Bentonite
Initial PID Reading: 0.0
Post PID Reading: 0.1

LOCATION SKETCH

PURGE/LEAK TEST DATA

Date: 5/6/13
Time: 1450 - 1500
Rate: 28 ml/min
Volume: 360
PID = 0 0.2 0.6 180 ml
He = 125 250 250 180 ml

SAMPLE COLLECTION

Start Time: 1502
End Time: 1608
Starting Pressure: -30
End Pressure: -7
Rate:
Volume: 6 Liter Summa
Canister Description: 6 Liter Summa

OBSERVATIONS / NOTES:

	Start	End
Barometric Pressure	29.73	29.75
Temperature	65	65
Canister Number	1580	

Regulator Number 40838 40838

Helium Shroud

Start	Mid	End
30.3	9.1	4.3

Signature(s):

Tetra Tech

INDOOR/OUTDOOR AIR SAMPLING LOG SHEET

Project Site Name:	NSF Indian Head Site 43	**Sample ID No.:**	S43-716-IND02
Project/CTO No.:	Project #112G00771 / CTO-114	**Sample Location:**	On shelf along NE wall ~40' from door
Company:	Tetra Tech	**Sampled By:**	J. Birkett, R. Sok

SAMPLING DATA:

		Wind speed (Visual)	Wind Direction (estimated)	Ambient temperature (°F)	Barometric Pressure (in.)	Relative Humidity (%)	Weather Description
Date: 7-25-13	Dup 7-25-13						
Time: 1010	1200						
Container Type: Summa Canister-24hour		—	—	—	—	—	—

Duplicate Sample (if collected) S43-716-Dup01

Canister # 14875		**Canister #**	12695
Filter Type/Flow 24 hour		**Filter Type/Flow**	24 hour

Start Time Vacuum	1030	in Hg -30.5	7-24-13	1030	in Hg -29.5	7-24-13
End Time Vacuum	1010	in Hg -3	7-25-13	1010	in Hg -8	7-25-13

Purge Data (Time)	Flow Rate (mL/minute)	Total volume	PID Reading (ppm)	Helium Reading (ppm)	Comments/Observations
—	—	—	—	—	
NA					

Notes:

Placed on shelf (4' off ground) on NE wall 40' from SE wall
PID 0.0ppm

Tetra Tech

INDOOR/OUTDOOR AIR SAMPLING LOG SHEET

Project Site Name:	NSF Indian Head Site 43	**Sample ID No.:**	S43-716-INDO1
Project/CTO No.:	Project #112G00771 / CTO-114	**Sample Location:**	Southern corner of Bldg on table
Company:	TetraTech	**Sampled By:**	J. Birkett, R. Sok

SAMPLING DATA:

	Wind speed (Visual)	Wind Direction (estimated)	Ambient temperature (°F)	Barometric Pressure (in.)	Relative Humidity (%)	Weather Description
Date: 7-25-13 **Time:** 0935						
Container Type: Somma Cannister-24hr	—	—	—	—	—	—

Duplicate Sample (if collected)

Canister #	23928	**Canister #**	
Filter Type/Flow	24 hour	**Filter Type/Flow**	

Start Time Vacuum	1005 ~~-31~~	in Hg -31	7-24-13		in Hg
End Time Vacuum	0935	in Hg -10	7-25-13		in Hg

Purge Data (Time)	Flow Rate (mL/minute)	Total volume	PID Reading (ppm)	Helium Reading (ppm)	Comments/Observations
—	—	—	—	—	—
NA					

Notes:

Set on table in southern corner of Bldg 716 20' From NW wall and 35' From SW wall

PID = 0.0ppm

Tetra Tech

INDOOR/OUTDOOR AIR SAMPLING LOG SHEET

Project Site Name:	NSF Indian Head Site 43	**Sample ID No.:**	S43-716-ODA01
Project/CTO No.:	Project #112G00771 / CTO-114	**Sample Location:**	North of Bldg 716 along fence inside gate
Company:	TetraTech	**Sampled By:**	J. Birkett, R. Sak

SAMPLING DATA:

	Wind speed (Visual)	Wind Direction (estimated)	Ambient temperature (°F)	Barometric Pressure (in.)	Relative Humidity (%)	Weather Description
Date: 7-25-13						
Time: 0930						
Container Type: Summa Cannister	calm to 5mph	N-NW	80°F			Cloudy

Duplicate Sample (if collected)

Canister # 4220		**Canister #**	
Filter Type/Flow 24 hour		**Filter Type/Flow**	

Start Time Vacuum	1045	in Hg -30.5	7-24-13		in Hg
End Time Vacuum	0930	in Hg -10	7-25-13		in Hg

Purge Data (Time)	Flow Rate (mL/minute)	Total volume	PID Reading (ppm)	Helium Reading (ppm)	Comments/Observations
—	—	—	—	—	—
NA					

Notes:

Placed can north of Bldg 716 on a metal cage ~10' of fence

PID 0.0ppm

Site43- Building 716

NEW YORK STATE DEPARTMENT OF HEALTH
INDOOR AIR QUALITY QUESTIONNAIRE AND BUILDING INVENTORY
CENTER FOR ENVIRONMENTAL HEALTH

This form must be completed for each residence involved in indoor air testing.

* Compiled from two other forms also (Chuck Meyer, TT, 5/13/13 and Nicholas Carr on 7/18/13

Preparer's Name Robert Sok Date/Time Prepared 7/24/13

Preparer's Affiliation Tetra Tech Phone No. (757) 466-4904

Purpose of Investigation Evaluate potential VI into Building 716

1. OCCUPANT:

Interviewed: (Y) N

Last Name: Miller First Name: Larry (Bay #1 - Southern portion of Bldg 716)

Address: NA

County: NA

Home Phone: NA Office Phone: NA

Number of Occupants/persons at this location 0 Age of Occupants NA

2. OWNER OR LANDLORD: (Check if same as occupant ___)

Interviewed: (Y) N

Last Name: Spriggs First Name: James (Bay #2 - Northern portion of Bldg 716)

Address: NA

County: NA

Home Phone: NA Office Phone: NA

3. BUILDING CHARACTERISTICS

Type of Building: (Circle appropriate response)

Residential	School	Commercial/Multi-use
Industrial	Church	Other: ___

If the property is residential, type? (Circle appropriate response)

Ranch	2-Family	3-Family
Raised Ranch	Split Level	Colonial
Cape Cod	Contemporary	Mobile Home
Duplex	Apartment House	Townhouses/Condos
Modular	Log Home	Other:_____

If multiple units, how many? 2 (warehouse type building

If the property is commercial, type?

Business Type(s) Storage and Electronic shop Area in Bay #1

Does it include residences (i.e., multi-use)? Y / N If yes, how many? _____

Other characteristics:

Number of floors 1 Building age ~30yrs

Is the building insulated? Y / N How air tight? Tight / Average / Not Tight

4. AIRFLOW

Use air current tubes or tracer smoke to evaluate airflow patterns and qualitatively describe:

Airflow between floors

NA

Airflow near source

NA

Outdoor air infiltration

Windows, roll up doors (garage type), and man doors are fairly well sealed, but would create good air flow if open

Infiltration into air ducts

Steam radiation (Heat), AC units for each side of building (forced air units)

5. BASEMENT AND CONSTRUCTION CHARACTERISTICS (Circle all that apply)

a. Above grade construction:	wood frame	concrete	stone	brick
b. Basement type: NA	full	crawlspace	slab	other _____
c. ~~Basement~~ floor:	concrete	dirt	stone	other _____
d. ~~Basement~~ floor:	uncovered	covered	covered with _____	
e. Concrete floor:	unsealed	sealed	sealed with _____	
f. Foundation walls:	poured	block	stone	other _____
g. Foundation walls:	unsealed	sealed	sealed with _____	
h. The basement is: NA	wet	damp	dry	moldy
i. The basement is: NA	finished	unfinished	partially finished	
j. Sump present?	Y / N			
k. Water in sump?	Y / N / ~~not applicable~~			

Basement/Lowest level depth below grade: NA (feet)

Identify potential soil vapor entry points and approximate size (e.g., cracks, utility ports, drains)

Some minor cracks in floor, no utility penetrations in floor, AC & steam lines above grade

6. HEATING, VENTING and AIR CONDITIONING (Circle all that apply)

Type of heating system(s) used in this building: (circle all that apply – note primary)

Hot air circulation	Heat pump	Hot water baseboard	
Space Heaters	Stream radiation	Radiant floor	
Electric baseboard	Wood stove	Outdoor wood boiler	Other Steam (radient heat)

The primary type of fuel used is:

Natural Gas	Fuel Oil	Kerosene
Electric	Propane	~~Solar~~
Wood	Coal	Steam

Domestic hot water tank fueled by: Steam Plant

Boiler/furnace located in: Basement Outdoors Main Floor Other Boiler Plant

Air conditioning: Central Air Window units Open Windows None

Forced Air Unit on southside

Front office

Are there air distribution ducts present? Y / N

Describe the supply and cold air return ductwork, and its condition where visible, including whether there is a cold air return and the tightness of duct joints. Indicate the locations on the floor plan diagram.

heating system - overhead lines from steam plant (steam powered space heaters th space

AC - Unit on southside of building (looks in good condition)

7. OCCUPANCY

Is basement/lowest level occupied? Full-time Occasionally Seldom Almost Never

Level	**General Use of Each Floor (e.g., familyroom, bedroom, laundry, workshop, storage)**
~~Basement~~	NA
1st Floor	2 times a week (1-2 people) < 30min each
~~2nd Floor~~	NA
~~3rd Floor~~	NA
~~4th Floor~~	NA

8. FACTORS THAT MAY INFLUENCE INDOOR AIR QUALITY

a. Is there an attached garage? Y / N

b. Does the garage have a separate heating unit? Y / N / NA

c. Are petroleum-powered machines or vehicles stored in the garage (e.g., lawnmower, atv, car) Y / N NA Please specify_____

d. Has the building ever had a fire? Y / N When?_____

e. Is a kerosene or unvented gas space heater present? Y / N Where?_____

f. Is there a workshop or hobby/craft area? Y / N Where & Type? Bay #1, south, electrical shop

g. Is there smoking in the building? Y / N How frequently?_____

h. Have cleaning products been used recently? Windex periodically Y / N When & Type?_____

i. Have cosmetic products been used recently? Y / N When & Type?_____

j. Has painting/staining been done in the last 6 months? Y / N Where & When? _____

k. Is there new carpet, drapes or other textiles? Y / N Where & When? _____

l. Have air fresheners been used recently? Y / N When & Type? _____

m. Is there a kitchen exhaust fan? Y / N If yes, where vented? _____

n. Is there a bathroom exhaust fan? Y / N If yes, where vented? _____

o. Is there a clothes dryer? Y / N If yes, is it vented outside? Y / N

p. Has there been a pesticide application? Y / N When & Type? _____

Are there odors in the building? Y / N
If yes, please describe: _____

Do any of the building occupants use solvents at work? Y N
(e.g., chemical manufacturing or laboratory, auto mechanic or auto body shop, painting, fuel oil delivery, boiler mechanic, pesticide application, cosmetologist

If yes, what types of solvents are used? spray paints, degreasers tetrafluromethylene ammonia

If yes, are their clothes washed at work? Y / N

Do any of the building occupants regularly use or work at a dry-cleaning service? (Circle appropriate response)

Yes, use dry-cleaning regularly (weekly) No
Yes, use dry-cleaning infrequently (monthly or less) Unknown
Yes, work at a dry-cleaning service

Is there a radon mitigation system for the building/structure? Y / N Date of Installation: _____
Is the system active or passive? Active/Passive

9. WATER AND SEWAGE

Water Supply: Public Water Drilled Well Driven Well Dug Well Other: River water Fire Suppression

Sewage Disposal: Public Sewer Septic Tank Leach Field Dry Well Other: _____

10. RELOCATION INFORMATION (for oil spill residential emergency)

a. Provide reasons why relocation is recommended: _____

b. Residents choose to: remain in home relocate to friends/family relocate to hotel/motel

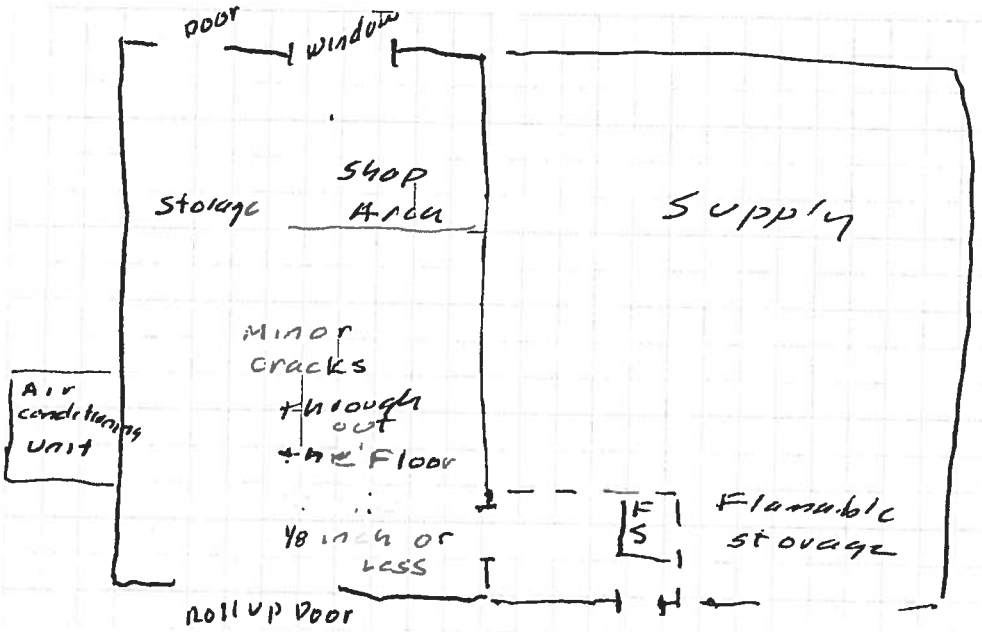
c. Responsibility for costs associated with reimbursement explained? Y / N

d. Relocation package provided and explained to residents? Y / N

11. FLOOR PLANS

Draw a plan view sketch of the basement and first floor of the building. Indicate air sampling locations, possible indoor air pollution sources and PID meter readings. If the building does not have a basement, please note.

Basement:



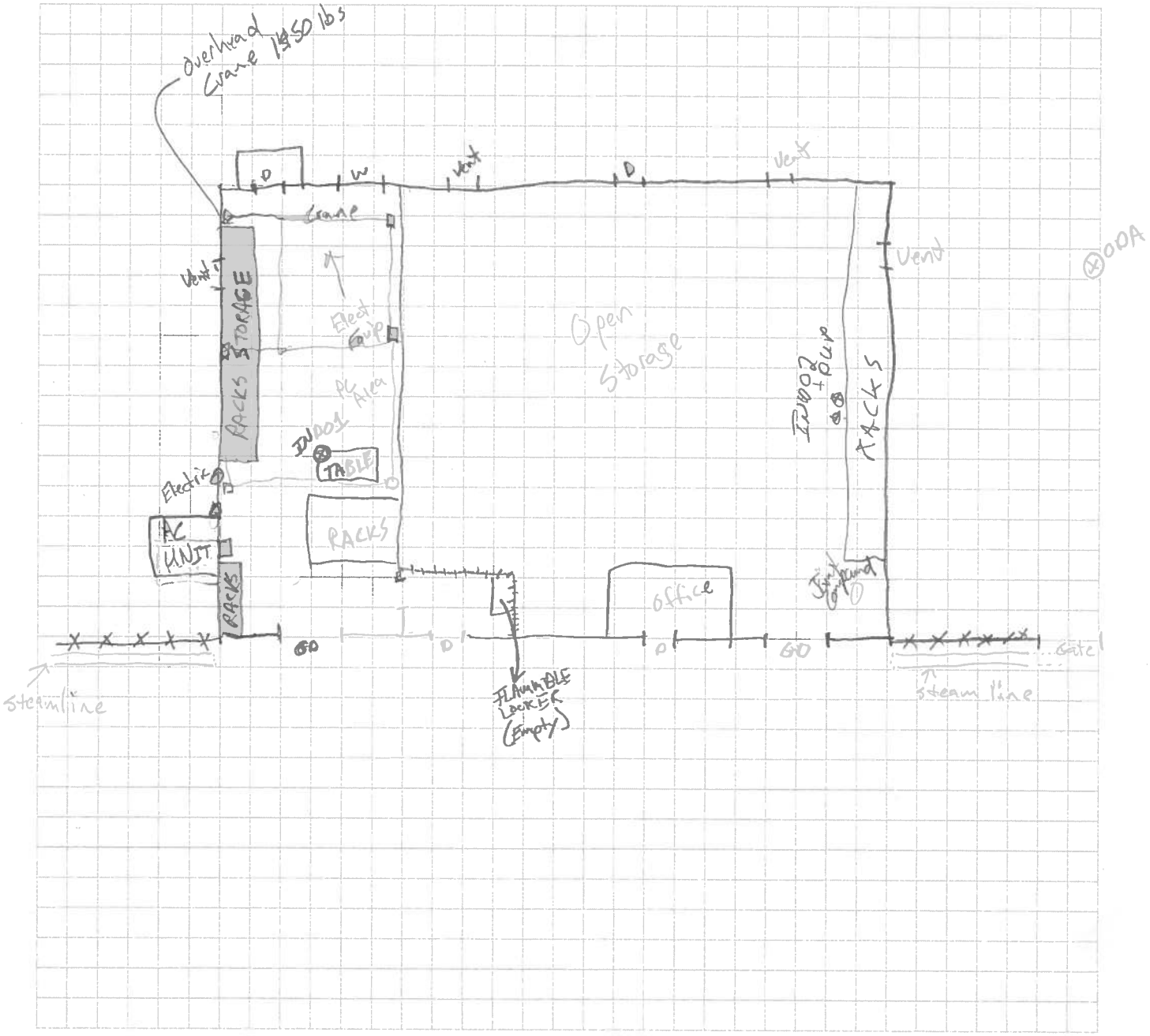
First Floor:

Cros MSDS 8316
Echonox

12. OUTDOOR PLOT

Draw a sketch of the area surrounding the building being sampled. If applicable, provide information on spill locations, potential air contamination sources (industries, gas stations, repair shops, landfills, etc.), outdoor air sampling location(s) and PID meter readings.

Also indicate compass direction, wind direction and speed during sampling, the locations of the well and septic system, if applicable, and a qualifying statement to help locate the site on a topographic map.



13. PRODUCT INVENTORY FORM

Make & Model of field instrument used: Mini Rae 2000

List specific products found in the residence that have the potential to affect indoor air quality.

Location	Product Description	Size (units)	Condition*	Chemical Ingredients	Field Instrument Reading (units)	Photo** Y / N
Bay #1	Misc Adhesives	small tubes	new/used		—	
	misc lubricants	tubes	used		—	
	degreaser's	few cans	used		—	
	spray paints	few cans	new/used		—	

* Describe the condition of the product containers as **Unopened (UO), Used (U),** or **Deteriorated (D)**
** Photographs of the **front and back** of product containers can replace the handwritten list of chemical ingredients. However, the photographs must be of good quality and ingredient labels must be legible.

Appendix J

Seep, Surface Water, and Sediment Sample Log Sheets

Tetra Tech NUS, Inc.

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: NSF-Indian Head Site 43
Project No.: 112G00771

[] Stream
[] Spring
[] Pond
[] Lake
[X] Other: Seep
[] QA Sample Type:

Sample ID No.: S43SP01-01
Sample Location: S43SP01
Sampled By: J. Birkett
C.O.C. No.:

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

SAMPLING DATA:

	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (^{0}C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	Other
Date: 6-20-2012 Time: 1723 Depth: — Method: Fill from Seep Location	Clear	—	—	—	—	—	—	—

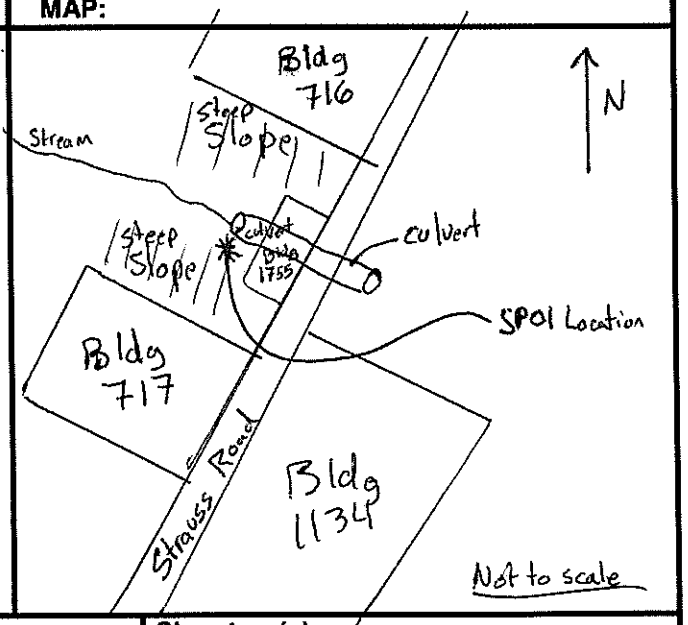
SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Quick Turn VOCs	HCl	3 40mL glass vials	yes

OBSERVATIONS / NOTES:

- Location of seep is on south side of culvert, ~1 foot below culvert.
- Approximately 4 seeps all around culvert
- Only a drip coming out of culvert
- Seep producing ~0.5-1 gpm a minute
  - Cumulative seeps ~2 gpm
- Extremely clear and cold
- Lots of gravel around seep

MAP:



Circle if Applicable:

MS/MSD —
Duplicate ID No.: —

Signature(s):

Tetra Tech NUS, Inc.

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: NSF-Indian Head Site 43
Project No.: 112G00771

[] Stream
[] Spring
[] Pond
[] Lake
[X] Other: Seep
[] QA Sample Type:

Sample ID No.: S43SP02-01
Sample Location: S43SP02
Sampled By: J. Birkett
C.O.C. No.:

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

SAMPLING DATA:

	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	Other
Date: 6-21-12								
Time: 1630								
Depth: —	orangish brown	—	—	—	—	—	—	—
Method: Fill from seep location								

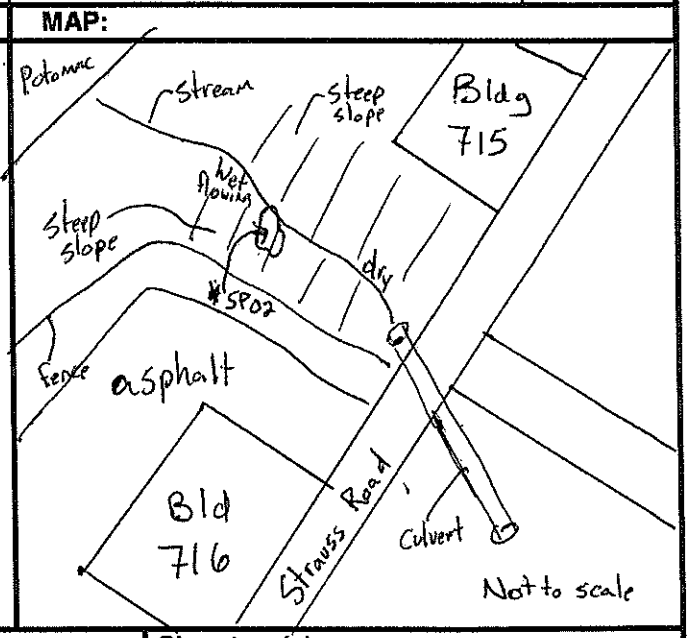
SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Quick Turn VOCs	HCl	3 40 mL VOCs	yes

OBSERVATIONS / NOTES:

- Between Bldg 715 and 716
- South slope
- No water (dry) near culvert
- SP02 producing some but not all water in stream
- Not furthest upstream location where there is water
- Orangish brown w/ some org sediment

MAP:



Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech

SEEP SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43-SP0102
Sample Location: S43SP01
Sampled By: JB and CM
C.O.C. No.:

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

SAMPLING DATA:

		Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Date:	5/10/2013								
Time:	1010	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Depth:	—	Clear	--	--	--	--	--	--	--
Method:	Stainless Steel DrivePoint								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes
Total Metal	HNO3	1 250-mL poly bottle	yes

OBSERVATIONS / NOTES:

Drove in 4' stainless steel drive point 2.5 into slope horizontally at 0945. Let water clear up before sampling.

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech

SEEP SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43-SP0202
Sample Location: S43SP02
Sampled By: JB and CM
C.O.C. No.:

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

SAMPLING DATA:

		Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (^{0}C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Date:	5/10/2013								
Time:	1110								
Depth:	———	Clear	--	--	--	--	--	--	--
Method:	Stainless Steel DrivePoint								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40-mL glass vials	yes
Total Metal	HNO3	1 250-mL poly bottle	yes

OBSERVATIONS / NOTES:

Drove in 4' stainless steel drive point 2.5 into slope horizontally at 1040. Let water clear up before sampling.

MAP:

Circle if Applicable:

MS/MSD ——

Duplicate ID No.: ——

Signature(s):

Tetra Tech

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Stream
[] Spring
[] Pond
[] Lake
[X] Other: Culvert
[] QA Sample Type:

Sample ID No.: S43-CL01
Sample Location: S43-CL01
Sampled By: JB/CM
C.O.C. No.:

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

SAMPLING DATA:

	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (^{0}C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Date: 5-10-13 Time: 1000 Depth: — Method: Direct Fill	Tan Tint	--	--	--	--	--	--	--

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCL	3 40-mL glass vials	yes
Total Metals	HNO3	1 250-mL poly bottle	yes

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43-SW01
Sample Location: S43-SW01
Sampled By: JB/CM
C.O.C. No.:

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

SAMPLING DATA:

Date: 5-10-13
Time: 0915
Depth: ——
Method: Direct Fill

Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (^{0}C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
clear	--	--	--	--	--	--	--

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCL	3 40-mL glass vials	yes
Total Metals	HNO3	1 250-mL poly bottle	yes

OBSERVATIONS / NOTES:

located in lower energy pool where sediment accumulates

MAP:

Circle if Applicable:

MS/MSD

Duplicate ID No.: Time ~~0927~~ 0917
S43-SW01-D

Signature(s):

Tetra Tech

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43-SW02
Sample Location: S43-SW02
Sampled By: JB/CM
C.O.C. No.:

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

SAMPLING DATA:

Date: 5-10-13
Time: 0900
Depth: ——
Method: Direct Fill

Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (^{0}C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Tan Color	--	--	--	--	--	--	--

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCL	3 40-mL glass vials	yes
Total Metals	HNO3	1 250-mL poly bottle	yes

OBSERVATIONS / NOTES:

located right before downed branch which is daming water

MAP:

Circle if Applicable:

MS/MSD —

Duplicate ID No.: —

Signature(s):

Tetra Tech

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43-SW04
Sample Location: S43-SW04
Sampled By: JB/CM
C.O.C. No.:

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

SAMPLING DATA:

	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (^{0}C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Date: 5-10-13 Time: 1020 Depth: — Method: Direct Fill	clear	--	--	--	--	--	--	--

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCL	9 40-mL glass vials	yes
Total Metals	HNO3	3 250-mL poly bottle	yes

OBSERVATIONS / NOTES:

located directly before stream dives down to beach in a small pond

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
yes	—

Signature(s):

Tetra Tech

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

[] Stream
[] Spring
[] Pond
[] Lake
[X] Other: Concrete Outfall to Potomac River
[] QA Sample Type:

Sample ID No.: S43-OF01
Sample Location: S43-OF01
Sampled By: JB/CM
C.O.C. No.:

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

SAMPLING DATA:

	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (^{0}C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Date: 5-10-13								
Time: 1200								
Depth: —	clear w/ tan tint	--	--	--	--	--	--	--
Method: Direct Fill								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCL	3 40-mL glass vials	yes
Total Metals	HNO3	1 250-mL poly bottle	yes

OBSERVATIONS / NOTES:

Slow flow out of outfall ~500mL/min

MAP:

Circle if Applicable:

MS/MSD —

Duplicate ID No.: —

Signature(s):

Tetra Tech

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43-SD01
Sample Location: S43-SD01
Sampled By: JB/CM
C.O.C. No.:

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

GRAB SAMPLE DATA:

Date: 5/10/13	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 0925 Method: Trowel and Soil Grabber Monitor Reading (ppm): --	0-0.5	light brown	VF-M sand tr. Organics and small pebbles

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs	2 40mL glass vials w/ sodium bisulfate		
	1 40mL glass vial w/ methanol	yes	
Total Metals	1 4-oz glass jar	yes	

OBSERVATIONS / NOTES:

collected with S43-SW01

MAP:

Circle if Applicable:

MS/MSD

Duplicate ID No.: Time 0927
S43-SD01-D

Signature(s):

Tetra Tech

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43-SD02
Sample Location: S43-SD02
Sampled By: JB/CM
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 5/10/13 Time: 0910 Method: Trowel and Soil Grabber Monitor Reading (ppm): --	0-0.5	light brown	VF-F sand tr. Organics and C. sand

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs	2 40mL glass vials w/ sodium bisulfate		
	1 40mL glass vial w/ methanol	yes	
Total Metals	1 4-oz glass jar	yes	

OBSERVATIONS / NOTES:

collected with S43-SW02

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

Tetra Tech

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43-SD04
Sample Location: S43-SD04
Sampled By: JB/CM
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 5/10/13 Time: 0925 Method: Trowel and Soil Grabber Monitor Reading (ppm): --	0-0.5	light brown	VF-F sand tr. Organics and silt

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs	6 40mL glass vials w/ sodium bisulfate		
	3 40mL glass vial w/ methanol	yes	
Total Metals	3 4-oz glass jar	yes	

OBSERVATIONS / NOTES:

collected with S43-SW04

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
yes	

Signature(s):

Appendix K

Survey Table

Appendix K
2011 Survey Data

Point Id.	North	East	Elev. @ Gnd	Elev. @ Top Case	Description	Elev. @ Gnd	Elev. @ Top Case
						Local (BASE)	Local (BASE)
IH43_MW01	330542.477	1254738.81	33.218	32.982	mwell	34.218	33.982
IH43_MW01A	330542.591	1254738.766	32.982		sdinv	32.982	0
IH43_MW02	329983.522	1254244.252	34.05	33.677	mwell	34.05	33.677
IH43_MW02A	329983.415	1254244.233	33.677		sdinv	33.677	0
IH43_MW03	330469.721	1254534.708	33.967	36.497	mwell	33.967	36.497
IH43_MW04	330588.308	1254591.08	33.226	35.519	mwell	33.226	35.519
IH43_MW04A	330589.346	1254590.885	35.519		sdinv	35.519	0
IH43_MW05	330710.769	1254749.063	33.855	33.412	mwell	33.855	33.412
IH43_MW05A	330710.835	1254748.959	33.412		sdinv	33.412	0
IH43_MW06	330466.787	1254853.12	33.043	32.838	mwell	33.043	32.838
IH43_MW06A	330466.7	1254853.099	32.838		sdinv	32.838	0
IH43_TW06	330609.119	1254626.888	32.727		twell	32.727	
IH43_TW07	330584.804	1254679.093	33.241		twell	33.241	
IH43_TW08	330549.035	1254648.491	33.353		twell	33.353	
IH43_TW11	330514.18	1254781.634	32.799		twell	32.799	
IH43_TW12	330525.708	1254800.612	33.191		twell	33.191	

								Difference
IH_0314	331132.887	1254587.266	35.479		GPS	36.439		-0.96
IH_1167	330812.523	1255205.355	36.574		GPS	37.559		-0.985
IH_1217	330084.341	1254338.032	32.924		GPS	33.98		-1.056
907	330422.774	1254958.434	33.812		tr			
MAPS51	330598.002	1254645.11	32.919		tr			

Vertical Adjustment difference -1

Notes:

Moody and Associates survey data August 2011

Appendix K
2012 Survey Table

314	331135	1254584.88	36.44	CMF /	
573	330534.47	1254156.59	34.03	Nail	
582	330606.3	1253592.9	7.22	RBCS	
1167	330813.06	1255204.25	37.56	RBCF /	
4000	330377.23	1254987.87	28.49	SB /28	
4001	330243.52	1255023.61	34.61	MW /09D PVC	
4002	330243.66	1255023.8	31.76	GS	
4003	330243.5	1255023.66	34.78	TOC	
4004	330247.52	1255027.95	34.83	MW /09S PVC	
4005	330247.61	1255028.06	31.77	GS	
4006	330247.53	1255027.85	35.02	TOC	
4007	330280.11	1254818.06	35.46	MW /10 PVC	
4008	330279.87	1254818.01	32.71	GS	
4009	330280.15	1254818.03	35.78	TOC	
4010	330467.27	1254852.06	33.33	MW /6 PVC	
4011	330467.57	1254851.78	33.55	RIM	
4012	330543.27	1254737.71	33.47	MW /1 PVC	
4013	330542.8	1254737.69	33.68	RIM	
4014	330562.91	1254705.17	33.61	SB /23	
4015	330553	1254987.92	37.51	MW /08 PVC	
4016	330552.7	1254988.1	35.07	GS	
4017	330552.81	1254988.11	37.85	TOC	
4018	330544.09	1254930.54	34.21	TW 17	
4019	330614.04	1254805.92	36.4	MW /07 PVC	
4020	330614.27	1254806.13	34.15	GS	
4021	330614	1254805.82	36.6	TOC	
4022	330711.33	1254747.93	33.95	MW /5 PVC	
4023	330711.43	1254747.73	34.39	RIM	
4024	330589.15	1254589.84	36.56	MW /4 PVC	
4025	330589.03	1254589.61	34.24	GS	
4026	330588.97	1254589.97	37.04	TOC	
4027	330470.31	1254533.27	37.54	MW /3 PVC	
4028	330470.23	1254534.52	34.93	GS	
4029	330470.36	1254533.29	37.82	TOC	
4030	330084.79	1254336.89	33.98		1217
4031	330338.38	1254405.25	38.22	MW /21 PVC	
4032	330338.26	1254405.08	35	GS	
4033	330338.1	1254405.42	38.42	TOC	
4034	330342.33	1254636.51	33.84	MW /12 PVC	
4035	330342.49	1254636.62	34.06	RIM	
4036	330697.16	1254403.35	37.39	MW /11 PVC	
4037	330697.07	1254403.48	37.6	TOC	
4038	330697.5	1254403.72	34.33	GS	
4039	330581.3	1254389.49	36.94	MW /17D PVC	
4040	330581.34	1254389.32	34.03	GS	
4041	330581.16	1254389.49	37.14	TOC	
4042	330583.92	1254392.51	37.24	MW /17S PVC	
4043	330583.99	1254392.51	37.47	TOC	
4044	330583.73	1254392.55	34.2	GS	
4045	330043.3	1254247.94	39.09	MW /13 PVC	
4046	330043.71	1254247.92	36.71	GS	
4047	330043.15	1254248.02	39.57	TOC	

4048	330008.51	1254294.83	36.65	MW /14 PVC
4049	330008.31	1254294.53	33.82	GS
4050	330008.42	1254294.73	37.15	TOC
4052	329983.97	1254242.92	34.72	MW /02 PVC
4053	329983.79	1254243.3	35.08	RIM
4054	329940.68	1254237.2	34.97	MW /15 PVC
4055	329940.18	1254237.2	35.22	RIM
4056	329961.6	1254206.02	37.91	MW /16 PVC
4057	329961.7	1254205.55	35.05	GS
4058	329961.76	1254205.94	38.12	TOC
4059	330813.72	1254142.48	37.43	MW /18 PVC
4060	330813.78	1254142.58	34.17	GS
4061	330813.83	1254142.41	37.63	TOC
4062	330578.56	1254053.23	36.43	MW /19D PVC
4063	330578.69	1254053.24	33.77	GS
4064	330578.5	1254053.17	36.73	TOC
4065	330582.2	1254056.12	36.76	MW /19S PVC
4066	330582.42	1254056.31	33.76	GS
4067	330582.26	1254056.22	36.92	TOC
4068	330497.56	1253974.26	33.7	TW 42
4069	330360.17	1253922.5	32.63	TW 54
4070	330363.82	1253905.42	36.8	MW /23 PVC
4071	330364.05	1253905.17	33.96	GS
4072	330363.8	1253905.45	37.03	TOC
4073	330319.98	1254147.76	37.33	MW /20 PVC
4074	330319.91	1254147.71	33.87	GS
4075	330320.16	1254147.61	37.5	TOC
4076	330619.49	1254002.38	21.46	INV /15" RCP
4077	330672.43	1253944.79	14.25	SP/02
4078	330250.86	1254070.19	33.34	TW 56
4079	330140.92	1254050	36.15	MW /22 PVC
4080	330140.39	1254050.61	36.42	TOC
4081	330140.69	1254050.11	32.99	GS
4082	330386.57	1253852.6	14.34	SP/01
4083	330533.04	1253853.08	36.79	MW /26 PVC
4084	330533.12	1253854.4	33.68	GS
4085	330533.27	1253852.46	37.06	TOC
4086	330133.91	1253672.5	36.64	MW /24 PVC
4087	330133.75	1253672.18	33.93	GS
4088	330133.76	1253672.45	36.93	TOC
4089	330375.97	1253642.11	19.93	MW /25 PVC
4090	330375.87	1253641.66	16.92	GS
4091	330376.05	1253641.92	20.16	TOC
4092	330582.11	1253638.73	6.28	FLC
4093	330626.68	1253603.63	3.62	FLC
4094	330675.06	1253597.07	3.45	TOP OUTFLL
4095	330587.42	1253570.16	1.23	INV /36" RCP
4096	330586.89	1253570.9	4.69	TOP
4097	330590.15	1253565.43	-0.26	GS
4098	330587.41	1253555.13	-0.9	WSE
4099	330536.52	1253502.26	2.62	INV /18" CPP
4100	330519.53	1253570.5	10.6	TW/52

Appendix K
2013 August Survey Table

Point ID	North	East	Elev,	Elev. (Top Case)	Description
S43MW27	330231.4	1255230.2	38.64	38.42	MWELL
101	330231.0	1255230.5	34.82		CONC
S43MW28	330022.0	1255204.9	35.97	35.75	MWELL
102	330022.3	1255204.5	32.53		CONC
S43MW29	329999.9	1255045.9	35.27	35.05	MWELL
103	329999.9	1255045.5	31.46		CONC
S43MW30	330537.4	1253853.8	38.25	38.12	MWELL
108	330537.3	1253854.1	34.99		CONC
PZ01	330927.0	1254005.9	9.76		MWELL
106	330927.2	1254005.8	6.83		PE
PZ02	330808.8	1253851.9	9.20		MWELL
104	330808.9	1253851.9	5.87		PE
PZ03	330688.1	1253685.9	7.27		MWELL
105	330688.3	1253685.9	4.26		PE
PZ04	330465.7	1253520.5	16.40		MWELL
107	330465.6	1253520.8	13.06		PE
SG01	330538.5	1253928.3	35.10		
SG02	330455.2	1253947.7	35.54		
SG03	330444.0	1253860.0	34.72		
SG04	330519.7	1253845.0	34.74		

Appendix K
2013 September Survey Table

1	330160.552	1253633.083	34.97	TRV
3	330569.053	1253608.722	9.46	TRV
6	330021.022	1253699.290	36.28	TRV
161	330410.545	1254949.186	34.67	MNF
167	330410.561	1254922.370	34.43	MNS
173	330535.023	1254155.492	35.20	MNS
178	330005.071	1253672.833	36.29	MNS
179	330250.009	1253622.807	32.24	MNS
907	330423.235	1254957.332	34.73	TRV
909	330523.479	1255002.435	35.11	MNF
IH43-MW01A	330542.921	1254737.689	34.14	MWELL
IH43-MW01B	330543.036	1254737.645	33.90	TCSE
IH43-MW02A	329983.898	1254243.171	34.97	MWELL
IH43-MW02B	329983.792	1254243.150	34.60	TCSE
IH43-MW03B	330469.719	1254533.620	37.43	TCSE
IH43-MW04A	330588.739	1254589.949	34.15	MWELL
IH43-MW04B	330589.777	1254589.755	36.44	TCSE
IH43-MW05A	330711.220	1254747.926	34.78	MWELL
IH43-MW05B	330711.286	1254747.822	34.33	TCSE
IH43-MW06A	330467.240	1254852.010	33.96	MWELL
IH43-MW06ASTKE	330467.256	1254852.021	33.97	MWELL
IH43-MW06B	330467.153	1254851.989	33.76	TCSE
IH43-MW06BSTKE	330467.166	1254851.997	33.74	TCSE
IH43-MW08A	330552.997	1254987.835	38.25	MWELL
IH43-MW08B	330553.134	1254987.889	37.88	TCSE
IH43-MW08C	330552.778	1254987.748	35.28	PE
IH43-MW09DA	330243.696	1255023.823	35.19	MWELL
IH43-MW09DB	330243.851	1255023.808	35.01	TCSE
IH43-MW09DC	330243.763	1255024.199	32.18	PE
IH43-MW09SA	330247.635	1255028.098	35.45	MWELL
IH43-MW09SB	330247.584	1255027.959	35.23	TCSE
IH43-MW09SC	330247.639	1255028.454	32.21	PE
IH43-MW10A	330279.985	1254818.298	36.20	MWELL
IH43-MW10B	330280.086	1254818.419	35.86	TCSE
IH43-MW10C	330280.071	1254817.988	33.12	PE
IH43-MW11A	330697.131	1254401.585	38.78	MWELL
IH43-MW11B	330697.159	1254401.602	38.55	TCSE
IH43-MW11C	330697.403	1254401.795	35.48	CONC
IH43-MW17DA	330581.021	1254387.825	38.29	MWELL
IH43-MW17DB	330581.058	1254387.795	38.08	TCSE
IH43-MW17DC	330581.215	1254387.618	35.16	CONC
IH43-MW17SA	330584.411	1254390.860	38.65	MWELL
IH43-MW17SB	330584.405	1254390.872	38.43	TCSE
IH43-MW17SC	330584.382	1254390.563	35.36	PE
IH43-MW18A	330814.210	1254140.956	38.78	MWELL
IH43-MW18B	330814.253	1254140.935	38.59	TCSE
IH43-MW18C	330814.245	1254141.214	35.35	CONC
IH43-MW19DA	330578.948	1254052.105	37.89	MWELL
IH43-MW19DB	330579.077	1254052.149	37.57	TCSE
IH43-MW19DC	330579.226	1254052.305	34.96	CONC
IH43-MW19SA	330582.558	1254054.910	38.08	MWELL
IH43-MW19SB	330582.541	1254054.964	37.90	TCSE
IH43-MW19SC	330582.847	1254055.097	34.92	CONC
IH43-MW20A	330320.567	1254147.160	38.66	MWELL
IH43-MW20B	330320.558	1254147.175	38.50	TCSE
IH43-MW20C	330320.132	1254147.215	35.00	PE
IH43-MW22A	330141.394	1254049.508	31.87	MWELL
IH43-MW22B	330141.544	1254049.630	37.29	TCSE
IH43-MW22C	330141.077	1254049.650	34.18	PE
IH43-MW23A	330364.017	1253904.638	38.20	MWELL
IH43-MW23B	330364.029	1253904.643	37.95	TCSE
IH43-MW23C	330364.408	1253904.749	35.13	CONC
IH43-MW24A	330133.609	1253672.165	38.06	MWELL
IH43-MW24B	330133.645	1253672.186	37.79	TCSE
IH43-MW24C	330133.897	1253671.834	35.05	CONC
IH43-MW25A	330375.839	1253641.595	21.28	MWELL
IH43-MW25B	330375.840	1253641.628	21.03	TCSE
IH43-MW25C	330376.095	1253641.638	18.05	CONC

Appendix K
2013 September Survey Table

IH43-MW26A	330533.269	1253851.836	38.28	MWELL		
IH43-MW26B	330533.398	1253851.934	37.98	TCSE		
IH43-MW26C	330532.966	1253852.144	35.01	CONC		
IH43-MW27A	330231.362	1255230.232	38.64	MWELL	.22 TOPCASE	Subtract 0.22 from 38.64 to get PVC TOC
IH43-MW27C	330231.014	1255230.496	34.82	CONC		
IH43-MW28A	330022.046	1255204.858	35.97	MWELL	.22 TOP CASE	Subtract 0.22 from 38.64 to get PVC TOC
IH43-MW28C	330022.312	1255204.533	32.53	CONC		
IH43-MW29A	329999.941	1255045.912	35.27	MWELL	.22 TOP CASE	Subtract 0.22 from 38.64 to get PVC TOC
IH43-MW29C	329999.883	1255045.477	31.46	CONC		
IH43-MW30A	330537.428	1253853.755	38.25	MWELL	.13 TOP CASE	Subtract 0.13 from 38.64 to get PVC TOC
IH43-MW30C	330537.261	1253854.139	34.99	CONC		
IH43-PZ01	330926.957	1254005.786	9.59	MWELL		
IH43-PZ01C	330927.082	1254005.620	6.66	PE		
IH43-PZ02	330808.678	1253851.788	9.03	MWELL		
IH43-PZ02C	330808.812	1253851.783	5.70	PE		
IH43-PZ03	330687.955	1253685.756	7.10	MWELL		
IH43-PZ03C	330688.201	1253685.757	4.09	PE		
IH43-PZ04	330465.555	1253520.384	16.23	MWELL		
IH43-PZ04C	330465.446	1253520.672	12.89	PE		
IH43-SG01	330538.544	1253928.253	35.10	PE		Check where SGs plot to get number
IH43-SG02	330455.219	1253947.774	35.54	PE		Should be SG05 - SG08
IH43-SG03	330443.953	1253860.015	34.72	PE		
IH43-SG04	330519.674	1253844.989	34.74	PE		
IH43-TW06	330609.554	1254625.757	33.65	MWELL		
IH43-TW07	330585.243	1254677.966	34.16	MWELL		
IH43-TW08	330549.470	1254647.366	34.27	MWELL		
IH43-TW11	330514.627	1254780.517	33.72	MWELL		
IH43-TW12	330526.158	1254799.495	34.11	MWELL		
IH0314BM	331135.000	1254584.875	36.44	TRV		
IH1007	330308.531	1255632.250	31.53	TRV		
IH1167	330813.063	1255204.250	37.56	TRV		
IH1200	330315.656	1253635.875	25.59	TRV		
IH1215	329789.656	1255301.375	29.25	TRV		
IH1216	330153.813	1254750.750	33.56	TRV		
IH1217	330084.781	1254336.875	33.98	TRV		
IH1218	330592.313	1254085.125	34.94	TRV		

Appendix L

QA Sample Log Sheets

Tetra Tech NUS, Inc.

QA SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project Number: 112G00771
Sample Location:
QA Sample Type:

Sample ID Number: S43TB01-20110603
Sampled By: JB/KS
C.O.C. Number:

[X] Trip Blank
[] Source Water Blank
[] Rinsate Blank
[] Other Blank

SAMPLING DATA:

Date: 6-3-11
Time: 1000
Method: Lab prepared

WATER SOURCE:

[X] Laboratory Prepared
[] Purchased
[] Other
[] Tap
[] Fire Hydrant

PURCHASED WATER INFORMATION (If Applicable as Source or Rinsate Water):

Product Name:
Supplier:
Manufacturer:
Order Number:
Lot Number:
Expiration Date:

RINSATE INFORMATION (If Applicable):

Media Type:
Equipment Used:
Equipment Type:
[] Dedicated
[] Reusable

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Volatiles	Cool 4°C & HCl	2 40mL glass vial	YES / NO
Semivolatiles	Cool 4°C		YES / NO
Pesticide / PCB	Cool 4°C		YES / NO
Metals	Cool 4°C & HNO_3		YES / NO
Cyanide	Cool 4°C & NaOH		YES / NO

OBSERVATIONS / NOTES:

Signature(s):

Tetra Tech NUS, Inc.

QA SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project Number: 112G00771
Sample Location:
QA Sample Type:

Sample ID Number: S43TB02-20110604
Sampled By: JB/KS
C.O.C. Number:

[X] Trip Blank
[] Source Water Blank
[] Rinsate Blank
[] Other Blank

SAMPLING DATA:

Date: 6-4-11
Time: 0830
Method: Lab prepared

WATER SOURCE:

[X] Laboratory Prepared
[] Purchased
[] Other
[] Tap
[] Fire Hydrant

PURCHASED WATER INFORMATION (If Applicable as Source or Rinsate Water):

Product Name:
Supplier:
Manufacturer:
Order Number:
Lot Number:
Expiration Date:

RINSATE INFORMATION (If Applicable):

Media Type:
Equipment Used:
Equipment Type:
[] Dedicated
[] Reusable

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Volatiles	Cool 4°C & HCl	2 40mL vials	(YES) / NO
Semivolatiles	Cool 4°C		YES / NO
Pesticide / PCB	Cool 4°C		YES / NO
Metals	Cool 4°C & HNO_3		YES / NO
Cyanide	Cool 4°C & NaOH		YES / NO

OBSERVATIONS / NOTES:

Signature(s):

Tetra Tech NUS, Inc.

QA SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project Number: 112G00771
Sample Location:
QA Sample Type:

Sample ID Number: S43TB03-20110610
Sampled By: JB/KS
C.O.C. Number:

[X] Trip Blank
[] Source Water Blank
[] Rinsate Blank
[] Other Blank

SAMPLING DATA:

Date: 6-10-11
Time: 0840
Method: Lab prepared

WATER SOURCE:

[X] Laboratory Prepared
[] Purchased
[] Other
[] Tap
[] Fire Hydrant

PURCHASED WATER INFORMATION (If Applicable as Source or Rinsate Water):

Product Name:
Supplier:
Manufacturer:
Order Number:
Lot Number:
Expiration Date:

RINSATE INFORMATION (If Applicable):

Media Type:
Equipment Used:
Equipment Type:
[] Dedicated
[] Reusable

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Volatiles	Cool 4°C & HCl	2 40 mL glass vial	YES / NO
Semivolatiles	Cool 4°C		YES / NO
Pesticide / PCB	Cool 4°C		YES / NO
Metals	Cool 4°C & HNO_3		YES / NO
Cyanide	Cool 4°C & NaOH		YES / NO

OBSERVATIONS / NOTES:

Signature(s):

Tetra Tech NUS, Inc.

QA SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project Number: 112G00771
Sample Location:
QA Sample Type:

Sample ID Number: TB 061311-01
Sampled By: JB/KS
C.O.C. Number:

[X] Trip Blank
[] Source Water Blank
[] Rinsate Blank
[] Other Blank

SAMPLING DATA:

Date: 6-13-2011
Time: 1000
Method: Lab prepared

WATER SOURCE:

[X] Laboratory Prepared
[] Purchased
[] Other
[] Tap
[] Fire Hydrant

PURCHASED WATER INFORMATION (If Applicable as Source or Rinsate Water):

Product Name:
Supplier:
Manufacturer:
Order Number:
Lot Number:
Expiration Date:

RINSATE INFORMATION (If Applicable):

Media Type:
Equipment Used:
Equipment Type:
[] Dedicated
[] Reusable

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Volatiles	Cool 4°C & HCl	2 40 mL glass vials	YES / NO
Semivolatiles	Cool 4°C		YES / NO
Pesticide / PCB	Cool 4°C		YES / NO
Metals	Cool 4°C & HNO_3		YES / NO
Cyanide	Cool 4°C & NaOH		YES / NO

OBSERVATIONS / NOTES:

Signature(s):

Tetra Tech NUS, Inc.

QA SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project Number: 112G00771
Sample Location:
QA Sample Type:

Sample ID Number: S43 RB01-20110605
Sampled By: JB/KS
C.O.C. Number:

[] Trip Blank
[] Source Water Blank
[X] Rinsate Blank
[] Other Blank

SAMPLING DATA:

Date: 6-5-11
Time: 1345
Method: Pour through equipment

WATER SOURCE:

[] Laboratory Prepared
[X] Purchased
[] Other
[] Tap
[] Fire Hydrant

PURCHASED WATER INFORMATION (If Applicable as Source or Rinsate Water):

Product Name: CVS Distilled water
Supplier: CVS Pharmacy
Manufacturer: Roaring Spring ~~Bottl~~ Water Co.
Order Number: 6300 52042111 0 3
Lot Number: 0351 1
Expiration Date: 5-9-2013

RINSATE INFORMATION (If Applicable):

Media Type: Water
Equipment Used: Hardened steel cutting shoe and geoprobe liner
Equipment Type:
[X] Dedicated and
[X] Reusable

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Volatiles	Cool 4°C & HCl	3 40ml vials	YES / NO
~~Semivolatiles~~ Explosives	Cool 4°C	2 1L Amber	YES / NO
~~Pesticide / PCB~~ Perchlorate (0.45 Filtered)	Cool 4°C	1 250mL poly	YES / NO
Metals Total	Cool 4°C & HNO_3	1 250mL poly	YES / NO
Cyanide Total	Cool 4°C & NaOH	1 250mL poly	YES / NO
Metals Filtered (0.45 filtered)	4°C HNO_3	1 250mL poly	yes

OBSERVATIONS / NOTES:

Purified by distillation and 0.2-micron filtered and ozonated

2" inner diameter cutting shoe

Poured through liner and shoe into bottle

For filtered samples, used empty CVS distilled bottle to transfer water

Signature(s):

Tetra Tech NUS, Inc.

QA SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project Number: 112G00771
Sample Location:
QA Sample Type:

Sample ID Number: S43RB02-20110612
Sampled By: JB/KS
C.O.C. Number:

[] Trip Blank
[] Source Water Blank
[X] Rinsate Blank
[] Other Blank

SAMPLING DATA:

Date: 6-12-11
Time: 1550
Method: Direct pour

WATER SOURCE:

[] Laboratory Prepared
[X] Purchased
[] Other
[] Tap
[] Fire Hydrant

PURCHASED WATER INFORMATION (If Applicable as Source or Rinsate Water):

Product Name: CVS Distilled Water
Supplier: CVS Pharmacy
Manufacturer: Roaring Spring Water Co.
Order Number: 6300520421103
Lot Number: 08511
Expiration Date: 5-9-2013

RINSATE INFORMATION (If Applicable):

Media Type: Water
Equipment Used: Temporary Well Stainless Steel Screen
Equipment Type:
[] Dedicated
[X] Reusable

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Volatiles	Cool 4°C & HCl	3 40 mL vials	(YES) NO
~~Semivolatiles~~ Explosives	Cool 4°C	2 1L amber glass	(YES) NO
~~Pesticide / PCB~~ Perchlorate (0.2 µm Filter)	Cool 4°C	1 250 mL poly	(YES) NO
Metals Total	Cool 4°C & HNO_3	1 250 mL poly	(YES) NO
Cyanide Total	Cool 4°C & NaOH	1 250 mL poly	(YES) NO
Metals Filtered (0.45 filtered)	4°C HNO_3	1 250mL poly	yes

OBSERVATIONS / NOTES:

Purified by distillation and 0.2-micron filtered and ozonated

4'x 1" expendable S.S. screen
Poured over screen into bottle
For filtered samples, used empty CVS distilled bottle to transfer water

Signature(s):

Tetra Tech NUS, Inc.

QA SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project Number: 112G00771
Sample Location:
QA Sample Type:

Sample ID Number: S43 FB01 - 20110605
Sampled By: JB/KS
C.O.C. Number:

[] Trip Blank
[X] Source Water Blank
[] Rinsate Blank
[] Other Blank

SAMPLING DATA:

Date: 6-5-11
Time: 1405
Method: Direct Pour

WATER SOURCE:

[] Laboratory Prepared
[] Purchased
[X] Other Men's Restroom Building 21 Faucet
[] Tap
[] Fire Hydrant

PURCHASED WATER INFORMATION (If Applicable as Source or Rinsate Water):

Product Name:
Supplier:
Manufacturer:
Order Number:
Lot Number:
Expiration Date:

RINSATE INFORMATION (If Applicable):

Media Type:
Equipment Used:
Equipment Type:
[] Dedicated
[] Reusable

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Volatiles	Cool 4°C & HCl	3 40 mL Vials	YES / NO
Semivolatiles	Cool 4°C		YES / NO
Pesticide / PCB	Cool 4°C		YES / NO
Metals	Cool 4°C & HNO_3		YES / NO
Cyanide	Cool 4°C & NaOH		YES / NO

OBSERVATIONS / NOTES:

water used for decon

Signature(s):

Tetra Tech NUS, Inc.

QA SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project Number: 112G00771
Sample Location:
QA Sample Type:

Sample ID Number: S43 FB02-20110605
Sampled By: JB/KS
C.O.C. Number:

[] Trip Blank
[X] Source Water Blank
[] Rinsate Blank
[] Other Blank

SAMPLING DATA:

Date: 6-5-11
Time: 1430
Method: Direct Pour

WATER SOURCE:

[] Laboratory Prepared
[X] Purchased
[] Other
[] Tap
[] Fire Hydrant

PURCHASED WATER INFORMATION (If Applicable as Source or Rinsate Water):

Product Name: CVS Distilled water
Supplier: CVS Pharmacy
Manufacturer: Roaring Spring Water Co
Order Number: 6300520421110 3
Lot Number: 08511
Expiration Date: 5-9-2013

RINSATE INFORMATION (If Applicable):

Media Type:
Equipment Used:
Equipment Type:
[] Dedicated
[] Reusable

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Volatiles	Cool 4°C & HCl	3 40mL vial	(YES) NO
Semivolatiles	Cool 4°C		YES / NO
Pesticide / PCB	Cool 4°C		YES / NO
Metals	Cool 4°C & HNO_3		YES / NO
Cyanide	Cool 4°C & NaOH		YES / NO

OBSERVATIONS / NOTES:

Water used for S43RB01-20110605

Signature(s):

Tetra Tech, Inc.

QA SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project Number: 112G00771
Sample Location:
QA Sample Type:

Sample ID Number: S43TB 01-20120420
Sampled By: J. Birkett
C.O.C. Number:

[X] Trip Blank
[] Source Water Blank
[] Rinsate Blank
[] Other Blank

SAMPLING DATA:

Date: 4-20-2012
Time: 0800
Method: Lab Prepared

WATER SOURCE:

[X] Laboratory Prepared
[] Purchased
[] Other
[] Tap
[] Fire Hydrant

PURCHASED WATER INFORMATION (If Applicable as Source or Rinsate Water):

Product Name:
Supplier:
Manufacturer:
Order Number:
Lot Number:
Expiration Date:

RINSATE INFORMATION (If Applicable):

Media Type:
Equipment Used:
Equipment Type:
[] Dedicated
[] Reusable

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Volatiles	Cool 4°C & HCl	3 40-mL glass vials	yes

OBSERVATIONS / NOTES:

Signature(s):

Tetra Tech, Inc.

QA SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project Number: 112G00771
Sample Location:
QA Sample Type:

Sample ID Number: S43TB02-20120427
Sampled By: J. Birkett
C.O.C. Number:

[X] Trip Blank
[] Source Water Blank
[] Rinsate Blank
[] Other Blank

SAMPLING DATA:

Date: 4-27-12
Time: 0800
Method: Lab Prepared

WATER SOURCE:

[X] Laboratory Prepared
[] Purchased
[] Other
[] Tap
[] Fire Hydrant

PURCHASED WATER INFORMATION (If Applicable as Source or Rinsate Water):

Product Name:
Supplier:
Manufacturer:
Order Number:
Lot Number:
Expiration Date:

RINSATE INFORMATION (If Applicable):

Media Type:
Equipment Used:
Equipment Type:
[] Dedicated
[] Reusable

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Volatiles	Cool 4°C & HCl	3 40-mL glass vials	yes

OBSERVATIONS / NOTES:

Signature(s):

Tetra Tech, Inc.

QA SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project Number: 112G00771
Sample Location: NSF-IH S43
QA Sample Type:

Sample ID Number: S43TB03
Sampled By: ~~J. Birkett~~ R. Sok
C.O.C. Number:

[X] Trip Blank
[] Source Water Blank
[] Rinsate Blank
[] Other Blank

SAMPLING DATA:

Date: 5-4-2012
Time: 1200
Method: Lab Prepared

WATER SOURCE:

[X] Laboratory Prepared
[] Purchased
[] Other
[] Tap
[] Fire Hydrant

PURCHASED WATER INFORMATION (If Applicable as Source or Rinsate Water):

Product Name:
Supplier:
Manufacturer:
Order Number:
Lot Number:
Expiration Date:

RINSATE INFORMATION (If Applicable):

Media Type:
Equipment Used:
Equipment Type:
[] Dedicated
[] Reusable

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Volatiles	Cool 4°C & HCl	3 40-mL glass vials	yes

OBSERVATIONS / NOTES:

Signature(s): [signature] for Rob Sok

Tetra Tech, Inc.

QA SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Sample ID Number: S43TB04-20120511
Project Number: 112G00771
Sampled By: J. Birkett
Sample Location:
C.O.C. Number:
QA Sample Type:

[X] Trip Blank
[] Rinsate Blank
[] Source Water Blank
[] Other Blank

SAMPLING DATA:

Date: 5-11-12
Time: 0800
Method: Lab Prepared

WATER SOURCE:

[X] Laboratory Prepared
[] Tap
[] Purchased
[] Fire Hydrant
[] Other

PURCHASED WATER INFORMATION (If Applicable as Source or Rinsate Water):

Product Name:
Supplier:
Manufacturer:
Order Number:
Lot Number:
Expiration Date:

RINSATE INFORMATION (If Applicable):

Media Type:
Equipment Used:
Equipment Type:
[] Dedicated
[] Reusable

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Volatiles	Cool 4°C & HCl	3 40-mL glass vials	yes

OBSERVATIONS / NOTES:

Signature(s):

Tetra Tech, Inc.

QA SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Sample ID Number: S43TB05-20120601
Project Number: 112G00771
Sampled By: J. Birkett
Sample Location:
C.O.C. Number:
QA Sample Type:

[X] Trip Blank
[] Rinsate Blank
[] Source Water Blank
[] Other Blank

SAMPLING DATA:

Date: 6-1-12
Time: 0900
Method: Lab Prepared

WATER SOURCE:

[X] Laboratory Prepared
[] Tap
[] Purchased
[] Fire Hydrant
[] Other

PURCHASED WATER INFORMATION (If Applicable as Source or Rinsate Water):

Product Name:
Supplier:
Manufacturer:
Order Number:
Lot Number:
Expiration Date:

RINSATE INFORMATION (If Applicable):

Media Type:
Equipment Used:
Equipment Type:
[] Dedicated
[] Reusable

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Volatiles	Cool 4°C & HCl	3 40-mL glass vials	yes

OBSERVATIONS / NOTES:

Signature(s):

Tetra Tech, Inc.

QA SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project Number: 112G00771
Sample Location:
QA Sample Type:

Sample ID Number: S43TB06-20120618
Sampled By: J. Birkett
C.O.C. Number:

[X] Trip Blank
[] Source Water Blank
[] Rinsate Blank
[] Other Blank

SAMPLING DATA:

Date: 6-18-12
Time: 0700
Method: Lab Prepared

WATER SOURCE:

[X] Laboratory Prepared
[] Purchased
[] Other
[] Tap
[] Fire Hydrant

PURCHASED WATER INFORMATION (If Applicable as Source or Rinsate Water):

Product Name:
Supplier:
Manufacturer:
Order Number:
Lot Number:
Expiration Date:

RINSATE INFORMATION (If Applicable):

Media Type:
Equipment Used:
Equipment Type:
[] Dedicated
[] Reusable

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Volatiles	Cool 4°C & HCl	3 40-mL glass vials	yes

OBSERVATIONS / NOTES:

Signature(s):

Tetra Tech, Inc.

QA SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project Number: 112G00771
Sample Location:
QA Sample Type:

Sample ID Number: S43TB07-20120619
Sampled By: J. Birkett
C.O.C. Number:

[X] Trip Blank
[] Source Water Blank
[] Rinsate Blank
[] Other Blank

SAMPLING DATA:

Date: 6-19-12
Time: 0730
Method: Lab Prepared

WATER SOURCE:

[X] Laboratory Prepared
[] Purchased
[] Other
[] Tap
[] Fire Hydrant

PURCHASED WATER INFORMATION (If Applicable as Source or Rinsate Water):

Product Name:
Supplier:
Manufacturer:
Order Number:
Lot Number:
Expiration Date:

RINSATE INFORMATION (If Applicable):

Media Type:
Equipment Used:
Equipment Type:
[] Dedicated
[] Reusable

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Volatiles	Cool 4°C & HCl	3 40-mL glass vials	yes

OBSERVATIONS / NOTES:

Signature(s):

Tetra Tech, Inc.

QA SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project Number: 112G00771
Sample Location:
QA Sample Type:

Sample ID Number: S43TB08-20120620
Sampled By: J. Birkett
C.O.C. Number:

[X] Trip Blank
[] Source Water Blank
[] Rinsate Blank
[] Other Blank

SAMPLING DATA:

Date: 6-20-12
Time: 0730
Method: Lab Prepared

WATER SOURCE:

[X] Laboratory Prepared
[] Purchased
[] Other
[] Tap
[] Fire Hydrant

PURCHASED WATER INFORMATION (If Applicable as Source or Rinsate Water):

Product Name:
Supplier:
Manufacturer:
Order Number:
Lot Number:
Expiration Date:

RINSATE INFORMATION (If Applicable):

Media Type:
Equipment Used:
Equipment Type:
[] Dedicated
[] Reusable

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Volatiles	Cool 4°C & HCl	3 40-mL glass vials	yes

OBSERVATIONS / NOTES:

Signature(s):

Tetra Tech NUS, Inc.

QA SAMPLE LOG SHEET

Project Site Name: NSF-Indian Head Site43
Project Number: 112G00771
Sample Location:
QA Sample Type:

Sample ID Number: S43TB09-20120621
Sampled By: J. Birkett
C.O.C. Number:

[X] Trip Blank
[] Source Water Blank
[] Rinsate Blank
[] Other Blank

SAMPLING DATA:

Date: 6-21-12
Time: 0730
Method: Lab prepared

WATER SOURCE:

[X] Laboratory Prepared
[] Purchased
[] Other
[] Tap
[] Fire Hydrant

PURCHASED WATER INFORMATION (If Applicable as Source or Rinsate Water):

Product Name:
Supplier:
Manufacturer:
Order Number:
Lot Number:
Expiration Date:

RINSATE INFORMATION (If Applicable):

Media Type:
Equipment Used:
Equipment Type:
[] Dedicated
[] Reusable

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Volatiles	Cool 4°C & HCl	2 40mL glass vials	YES / NO
Semivolatiles	Cool 4°C		YES / NO
Pesticide / PCB	Cool 4°C		YES / NO
Metals	Cool 4°C & HNO_3		YES / NO
Cyanide	Cool 4°C & NaOH		YES / NO

OBSERVATIONS / NOTES:

Signature(s):

Tetra Tech

QA SAMPLE LOG SHEET

Project Site Name: NSF-Indian Head Site43
Sample ID Number: 543TB10-20120709
Project Number: 112G00771
Sampled By: Lab
Sample Location:
C.O.C. Number:
QA Sample Type:

[X] Trip Blank
[] Rinsate Blank
[] Source Water Blank
[] Other Blank

SAMPLING DATA:

Date: 7-9-12
Time: 0700
Method: Lab prepared

WATER SOURCE:

[X] Laboratory Prepared
[] Tap
[] Purchased
[] Fire Hydrant
[] Other

PURCHASED WATER INFORMATION (If Applicable as Source or Rinsate Water):

Product Name:
Supplier:
Manufacturer:
Order Number:
Lot Number:
Expiration Date:

RINSATE INFORMATION (If Applicable):

Media Type:
Equipment Used:
Equipment Type:
[] Dedicated
[] Reusable

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	2 40mL glass vials	yes

OBSERVATIONS / NOTES:

Signature(s):

Tetra Tech NUS, Inc.

QA SAMPLE LOG SHEET

Project Site Name: NSF-Indian Head Site43
Sample ID Number: S437B11-20120718
Project Number: N2G00771
Sampled By: Lab/JB
Sample Location: Lab
C.O.C. Number:
QA Sample Type:

[X] Trip Blank
[] Rinsate Blank
[] Source Water Blank
[] Other Blank

SAMPLING DATA:

Date: 7-18-12
Time: 1400
Method: Lab prepared

WATER SOURCE:

[X] Laboratory Prepared
[] Tap
[] Purchased
[] Fire Hydrant
[] Other

PURCHASED WATER INFORMATION (If Applicable as Source or Rinsate Water):

Product Name:
Supplier:
Manufacturer:
Order Number:
Lot Number:
Expiration Date:

RINSATE INFORMATION (If Applicable):

Media Type:
Equipment Used:
Equipment Type:
[] Dedicated
[] Reusable

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Volatiles	Cool 4°C & HCl	3 40 mL glass vials	YES / NO
Semivolatiles	Cool 4°C		YES / NO
Pesticide / PCB	Cool 4°C		YES / NO
Metals	Cool 4°C & HNO_3		YES / NO
Cyanide	Cool 4°C & NaOH		YES / NO

OBSERVATIONS / NOTES:

Signature(s):

Tetra Tech NUS, Inc.

QA SAMPLE LOG SHEET

Project Site Name: NSF-Indian Head Site 43
Sample ID Number: S43TB12-20120721
Project Number: 112G00771
Sampled By: Lab/JB
Sample Location: Lab
C.O.C. Number:
QA Sample Type:

[X] Trip Blank
[] Rinsate Blank
[] Source Water Blank
[] Other Blank

SAMPLING DATA:

Date: 7-21-12
Time: 0900
Method: Lab prepared

WATER SOURCE:

[X] Laboratory Prepared
[] Tap
[] Purchased
[] Fire Hydrant
[] Other

PURCHASED WATER INFORMATION (If Applicable as Source or Rinsate Water):

Product Name:
Supplier:
Manufacturer:
Order Number:
Lot Number:
Expiration Date:

RINSATE INFORMATION (If Applicable):

Media Type:
Equipment Used:
Equipment Type:
[] Dedicated
[] Reusable

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Volatiles	Cool 4°C & HCl	3 40mL glass vials	(YES) / NO
Semivolatiles	Cool 4°C		YES / (NO)
Pesticide / PCB	Cool 4°C		YES / (NO)
Metals	Cool 4°C & HNO_3		YES / (NO)
Cyanide	Cool 4°C & NaOH		YES / (NO)

OBSERVATIONS / NOTES:

Signature(s):

Tetra Tech, Inc.

QA SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project Number: 112G00771
Sample Location:
QA Sample Type:

Sample ID Number: S43FBG1-20120422
Sampled By: J. Birkett
C.O.C. Number:

[] Trip Blank
[X] Source Water Blank
[] Rinsate Blank
[] Other Blank

SAMPLING DATA:

Date: 4-22-12
Time: 1430
Method: Direct Pour

WATER SOURCE:

[] Laboratory Prepared
[X] Purchased
[] Other
[] Tap
[] Fire Hydrant

PURCHASED WATER INFORMATION (If Applicable as Source or Rinsate Water):

Product Name: NERL Reagent Water
Supplier: Scientific Sales Inc
Manufacturer: Thermo Scientific
Order Number: 9800-5
Lot Number: 080099
Expiration Date: 9-2012

RINSATE INFORMATION (If Applicable):

Media Type:
Equipment Used:
Equipment Type:
[] Dedicated
[] Reusable

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Volatiles	Cool 4°C & HCl	3 40-mL glass vials	yes
Total Metals	Cool 4°C & HNO_3	1 250-mL poly bottle	yes
Filtered Metals	Cool 4°C & HNO_3	1 250-mL poly bottle	yes
Explosives	Cool 4°C	2 1-L Amber glass bottle	yes

OBSERVATIONS / NOTES:

Signature(s):

Tetra Tech, Inc.

QA SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project Number: 112G00771
Sample Location:
QA Sample Type:

[] Trip Blank
[X] Source Water Blank

Sample ID Number: S43FB02-20120422
Sampled By: J. Birkett
C.O.C. Number:

[] Rinsate Blank
[] Other Blank

SAMPLING DATA:

Date: 4-22-12
Time: 1600
Method: Direct Pour

WATER SOURCE:

[] Laboratory Prepared
[] Purchased
[] Other
[X] Tap Driller's Shop
[] Fire Hydrant

PURCHASED WATER INFORMATION (If Applicable as Source or Rinsate Water):

Product Name:
Supplier:
Manufacturer:
Order Number:
Lot Number:
Expiration Date:

RINSATE INFORMATION (If Applicable):

Media Type:
Equipment Used:
Equipment Type:
[] Dedicated
[] Reusable

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Volatiles	Cool 4°C & HCl	3 40-mL glass vials	yes
Total Metals	Cool 4°C & HNO_3	1 250-mL poly bottle	yes
Filtered Metals	Cool 4°C & HNO_3	1 250-mL poly bottle	yes
Explosives	Cool 4°C	2 1-L Amber glass bottle	yes

OBSERVATIONS / NOTES:

Filled bottles through a garden hose from the tank the drillers used to decon. Water is from Vironex's shop

Signature(s):

Tetra Tech, Inc.

QA SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project Number: 112G00771
Sample Location: NSF-IH S43
QA Sample Type:

[] Trip Blank
[X] Source Water Blank

Sample ID Number: S43FB 03
Sampled By: ~~J. Birkett~~ R. Sok
C.O.C. Number:

[] Rinsate Blank
[] Other Blank

SAMPLING DATA:

Date: 5-6-2012
Time: 1440
Method: Direct Pour

WATER SOURCE:

[] Laboratory Prepared
[] Purchased
[] Other
[X] Tap
[] Fire Hydrant

PURCHASED WATER INFORMATION (If Applicable as Source or Rinsate Water):

Product Name:
Supplier:
Manufacturer:
Order Number:
Lot Number:
Expiration Date:

RINSATE INFORMATION (If Applicable):

Media Type:
Equipment Used:
Equipment Type:
[] Dedicated
[] Reusable

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Volatiles	Cool 4°C & HCl	3 40-mL glass vials	yes
Total Metals	Cool 4°C & HNO_3	1 250-mL poly bottle	no
Filtered Metals	Cool 4°C & HNO_3	1 250-mL poly bottle	no
Explosives	Cool 4°C	2 1-L Amber glass bottle	no

OBSERVATIONS / NOTES:

Water Source - Driller's shop used for decon

Signature(s): for Rob Sok

Tetra Tech, Inc.

QA SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Sample ID Number: S43FB04-20120513
Project Number: 112G00771
Sampled By: J. Birkett
Sample Location:
C.O.C. Number:
QA Sample Type:

[] Trip Blank
[X] Source Water Blank
[] Rinsate Blank
[] Other Blank

SAMPLING DATA:

Date: 5-13-12
Time: 1515
Method: Direct Pour

WATER SOURCE:

[X] Laboratory Prepared
[] Purchased
[] Other
[] Tap
[] Fire Hydrant

PURCHASED WATER INFORMATION (If Applicable as Source or Rinsate Water):

Product Name: NERL Reagent grade water
Supplier: Scientific Sales
Manufacturer: Thermo scientific
Order Number: 98005
Lot Number: 080099
Expiration Date: 9-2012

RINSATE INFORMATION (If Applicable):

Media Type:
Equipment Used:
Equipment Type:
[] Dedicated
[] Reusable

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Volatiles	Cool 4°C & HCl	3 40-mL glass vials	yes
Total Metals	Cool 4°C & HNO_3	1 250-mL poly bottle	yes
Filtered Metals	Cool 4°C & HNO_3	1 250-mL poly bottle	~~yes~~ no
Explosives	Cool 4°C	2 1-L Amber glass bottle	yes

OBSERVATIONS / NOTES:

Direct Pour

Signature(s):

Tetra Tech, Inc.

QA SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project Number: 112G00771
Sample Location:
QA Sample Type:

[] Trip Blank
[X] Source Water Blank

Sample ID Number: S43FB05-20120603
Sampled By: J. Birkett
C.O.C. Number:

[] Rinsate Blank
[] Other Blank

SAMPLING DATA:

Date: 6-3-12
Time: 1140
Method: Direct Pour

WATER SOURCE:

[] Laboratory Prepared
[] Purchased
[] Other
[X] Tap
[] Fire Hydrant

PURCHASED WATER INFORMATION (If Applicable as Source or Rinsate Water):

Product Name:
Supplier:
Manufacturer:
Order Number:
Lot Number:
Expiration Date:

RINSATE INFORMATION (If Applicable):

Media Type:
Equipment Used:
Equipment Type:
[] Dedicated
[] Reusable

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Volatiles	Cool 4°C & HCl	3 40-mL glass vials	yes
Total Metals	Cool 4°C & HNO_3	1 250-mL poly bottle	no
Filtered Metals	Cool 4°C & HNO_3	1 250-mL poly bottle	no
Explosives	Cool 4°C	2 1-L Amber glass bottle	no

OBSERVATIONS / NOTES:

Water collect from spigot at bathroom at Site 43

Signature(s):

Tetra Tech, Inc.

QA SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project Number: 112G00771
Sample Location:
QA Sample Type:

Sample ID Number: S43FB06-20120603
Sampled By: J. Birkett
C.O.C. Number:

[] Trip Blank
[X] Source Water Blank
[] Rinsate Blank
[] Other Blank

SAMPLING DATA:

Date: 6-22-12
Time: 1235
Method: Direct Pour

WATER SOURCE:

[] Laboratory Prepared
[] Purchased
[] Other
[X] Tap
[] Fire Hydrant

PURCHASED WATER INFORMATION (If Applicable as Source or Rinsate Water):

Product Name:
Supplier:
Manufacturer:
Order Number:
Lot Number:
Expiration Date:

RINSATE INFORMATION (If Applicable):

Media Type:
Equipment Used:
Equipment Type:
[] Dedicated
[] Reusable

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Volatiles	Cool 4°C & HCl	3 40-mL glass vials	yes
Total Metals	Cool 4°C & HNO_3	1 250-mL poly bottle	no
Filtered Metals	Cool 4°C & HNO_3	1 250-mL poly bottle	no
Explosives	Cool 4°C	2 1-L Amber glass bottle	no

OBSERVATIONS / NOTES:

Direct Fill from water spiguot in gravel lot (north) west of Bldg 720 east of Bldg 715
- Driller used for decon and water tanks

Signature(s):

Tetra Tech, Inc.

QA SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Sample ID Number: S43RB01-20120422
Project Number: 112G00771
Sampled By: J. Birkett
Sample Location:
C.O.C. Number:
QA Sample Type:

[] Trip Blank
[X] Rinsate Blank
[] Source Water Blank
[] Other Blank

SAMPLING DATA:

Date: 4-22-12
Time: 1415
Method: Direct pour over equipment into bottle

WATER SOURCE:

[] Laboratory Prepared
[] Tap
[X] Purchased
[] Fire Hydrant
[] Other

PURCHASED WATER INFORMATION (If Applicable as Source or Rinsate Water):

Product Name: NERL Reagent Grade Water
Supplier: Scientific Sales Inc.
Manufacturer: Thermo Scientific
Order Number: 9800-5
Lot Number: 080099
Expiration Date: 9-2012

RINSATE INFORMATION (If Applicable):

~~Media Type:~~ Equipment Used: Stainless Steel Screen
~~Equipment Used:~~ Media Type: Aqueous
Equipment Type:
[] Dedicated
[X] Reusable

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Volatiles	Cool 4°C & HCl	3 40-mL glass vials	yes
Total Metals	Cool 4°C & HNO_3	1 250-mL poly bottle	no
Filtered Metals	Cool 4°C & HNO_3	1 250-mL poly bottle	no
Explosives	Cool 4°C	2 1-L Amber glass bottle	no

OBSERVATIONS / NOTES:

Used deconned TW stainless steel screen

Signature(s):

Tetra Tech

QA SAMPLE LOG SHEET

Project Site Name: NSF-Indian Head Site43
Sample ID Number: 543FB07-20120722
Project Number: 112G00771
Sampled By: J. Birkett E. Wu
Sample Location: Outside Bldg 1040
C.O.C. Number:
QA Sample Type:

[] Trip Blank
[] Source Water Blank
[] Rinsate Blank
[X] Other Blank Field Blank

SAMPLING DATA:

Date: 7-22-12
Time: 1640
Method: Peristaltic

WATER SOURCE:

[X] Laboratory Prepared
[] Purchased
[] Other
[] Tap
[] Fire Hydrant

PURCHASED WATER INFORMATION (If Applicable as Source or Rinsate Water):

Product Name: NERL Reagent Water
Supplier: Scientific Sales Inc
Manufacturer: Thermo Scientific
Order Number: 9800-5
Lot Number: 080099
Expiration Date: 9-2012

RINSATE INFORMATION (If Applicable):

Media Type:
Equipment Used:
Equipment Type:
[] Dedicated
[] Reusable

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOC	HCl	3 40mL glass vials	yes
Total Metals	HNO_3	1 500mL poly bottle	yes
Dissolved Metals (Filtered)	HNO_3	1 500mL poly bottle	yes
Explosives	None	2 1L amber glass bottles	yes

OBSERVATIONS / NOTES:

Used tubing and peristaltic pump to collect sample from source water

"-F" Added to ID for Filtered sample

Signature(s):

Tetra Tech, Inc.

QA SAMPLE LOG SHEET

S43RB03

Project Site Name: Indian Head Site 43
Project Number: 112G00771
Sample Location: NSF-IH 543
QA Sample Type:

Sample ID Number: S43~~DB~~RB03
Sampled By: ~~J. Birkett~~ R. Sok
C.O.C. Number:

[] Trip Blank
[] Source Water Blank
[X] Rinsate Blank
[] Other Blank

SAMPLING DATA:

Date: 5-6-2012
Time: 1436
Method: Direct pour over equipment into bottle

WATER SOURCE:

[] Laboratory Prepared
[X] Purchased
[] Other
[] Tap
[] Fire Hydrant

PURCHASED WATER INFORMATION (If Applicable as Source or Rinsate Water):

Product Name: NERL Reagent Grade Water
Supplier: Scientific Sales
Manufacturer: Thermo Scientific
Order Number: 98005
Lot Number: 080099
Expiration Date: 9-2012

RINSATE INFORMATION (If Applicable):

Media Type: Aqueous
Equipment Used: Stainless Steel TW screen (decon'd)
Equipment Type:
[] Dedicated
[X] Reusable

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Volatiles	Cool 4°C & HCl	3 40-mL glass vials	yes
Total Metals	Cool 4°C & HNO_3	1 250-mL poly bottle	No
Filtered Metals	Cool 4°C & HNO_3	1 250-mL poly bottle	No
Explosives	Cool 4°C	2 1-L Amber glass bottle	No

OBSERVATIONS / NOTES:

Signature(s): [signature]
for Rob Sok

Tetra Tech, Inc.

QA SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Sample ID Number: S43RB03-20120513
Project Number: 112G00771
Sampled By: J. Birkett
Sample Location: Site 43
C.O.C. Number:
QA Sample Type:

[] Trip Blank
[X] Rinsate Blank
[] Source Water Blank
[] Other Blank

SAMPLING DATA:

Date: 5-13-12
Time: 1435
Method: Direct pour over equipment into bottle

WATER SOURCE:

[] Laboratory Prepared
[] Tap
[X] Purchased
[] Fire Hydrant
[] Other

PURCHASED WATER INFORMATION (If Applicable as Source or Rinsate Water):

Product Name: NERL Reagent Grade Water
Supplier: Scientific Sales
Manufacturer: Thermo Scientific
Order Number: 98005
Lot Number: 080099
Expiration Date: 9-2012

RINSATE INFORMATION (If Applicable):

Media Type: Soils
Equipment Used: macro core cutting shoe (decon)
Equipment Type:
[] Dedicated
[X] Reusable

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Volatiles	Cool 4°C & HCl	3 40-mL glass vials	yes
Total Metals	Cool 4°C & HNO_3	1 250-mL poly bottle	yes
Filtered Metals	Cool 4°C & HNO_3	1 250-mL poly bottle	no
Explosives	Cool 4°C	2 1-L Amber glass bottle	yes

OBSERVATIONS / NOTES:

Ran water over shoe into container

Signature(s):

Tetra Tech, Inc.

QA SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Sample ID Number: S43RB04-20120603
Project Number: 112G00771
Sampled By: J. Birkett
Sample Location:
C.O.C. Number:
QA Sample Type:

[] Trip Blank
[X] Rinsate Blank
[] Source Water Blank
[] Other Blank

SAMPLING DATA:

Date: 6-3-12
Time: 1130
Method: Direct pour over equipment into bottle

WATER SOURCE:

[] Laboratory Prepared
[] Tap
[X] Purchased
[] Fire Hydrant
[] Other

PURCHASED WATER INFORMATION (If Applicable as Source or Rinsate Water):

Product Name: NERL Reagent Grade Water
Supplier: Scientific Sales
Manufacturer: Thermo Scientific
Order Number: 98005
Lot Number: 080099
Expiration Date: 9-2012

RINSATE INFORMATION (If Applicable):

Media Type: Aqueous
Equipment Used: Stain Steel TW Screen
Equipment Type:

[] Dedicated
[X] Reusable

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Volatiles	Cool 4°C & HCl	3 40-mL glass vials	yes
Total Metals	Cool 4°C & HNO_3	1 250-mL poly bottle	no
Filtered Metals	Cool 4°C & HNO_3	1 250-mL poly bottle	no
Explosives	Cool 4°C	2 1-L Amber glass bottle	no

OBSERVATIONS / NOTES:

Water poured over SS. TW screen into vials

Signature(s):

Tetra Tech, Inc.

QA SAMPLE LOG SHEET

Project Site Name: Indian Head Site 43
Project Number: 112G00771
Sample Location:
QA Sample Type:

Sample ID Number: S43RB 05-20120622
Sampled By: J. Birkett
C.O.C. Number:

[] Trip Blank
[] Source Water Blank
[X] Rinsate Blank
[] Other Blank

SAMPLING DATA:

Date: 6-22-12
Time: 1015
Method: Direct pour over equipment into bottle

WATER SOURCE:

[] Laboratory Prepared
[X] Purchased
[] Other
[] Tap
[] Fire Hydrant

PURCHASED WATER INFORMATION (If Applicable as Source or Rinsate Water):

Product Name: NERL Reagent Water
Supplier:
Manufacturer:
Order Number:
Lot Number:
Expiration Date:

RINSATE INFORMATION (If Applicable):

Media Type: Aqueous
Equipment Used: Stainless Steel TW Screen
Equipment Type:
[X] Dedicated
[] Reusable

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Volatiles	Cool 4°C & HCl	3 40-mL glass vials	yes
Total Metals	Cool 4°C & HNO_3	1 250-mL poly bottle	no
Filtered Metals	Cool 4°C & HNO_3	1 250-mL poly bottle	no
Explosives	Cool 4°C	2 1-L Amber glass bottle	no

OBSERVATIONS / NOTES:

Direct pour over cleaned (steam) screen into vials

Signature(s):

Tetra Tech

QA SAMPLE LOG SHEET

Project Site Name: NSF-Indian Head Site 43
Project Number: 112G00771
Sample Location: Lab
QA Sample Type:

Sample ID Number: S43TB01-20130429
Sampled By: JB/Lab
C.O.C. Number:

[X] Trip Blank
[] Source Water Blank
[] Rinsate Blank
[] Other Blank

SAMPLING DATA:

Date: 5- 4-29-13
Time: 1200
Method: Lab Prepared

WATER SOURCE:

[X] Laboratory Prepared
[] Purchased
[] Other
[] Tap
[] Fire Hydrant

PURCHASED WATER INFORMATION (If Applicable as Source or Rinsate Water):

Product Name:
Supplier:
Manufacturer:
Order Number:
Lot Number:
Expiration Date:

RINSATE INFORMATION (If Applicable):

Media Type:
Equipment Used:
Equipment Type:
[] Dedicated
[] Reusable

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Volatiles	Cool 4°C & HCl	3 40mL glass vials	YES

OBSERVATIONS / NOTES:

Signature(s):

Tetra Tech

QA SAMPLE LOG SHEET

Project Site Name: NSF-Indian Head Site 43
Project Number: 112G00771
Sample Location: Lab
QA Sample Type:

Sample ID Number: S43TB02-20130508
Sampled By: JB/Lab
C.O.C. Number:

[X] Trip Blank
[] Source Water Blank
[] Rinsate Blank
[] Other Blank

SAMPLING DATA:

Date: 5-8-13
Time: 1300
Method: Lab Prepared

WATER SOURCE:

[X] Laboratory Prepared
[] Purchased
[] Other
[] Tap
[] Fire Hydrant

PURCHASED WATER INFORMATION (If Applicable as Source or Rinsate Water):

Product Name:
Supplier:
Manufacturer:
Order Number:
Lot Number:
Expiration Date:

RINSATE INFORMATION (If Applicable):

Media Type:
Equipment Used:
Equipment Type:
[] Dedicated
[] Reusable

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Volatiles	Cool 4°C & HCl	3 40mL glass vials	YES

OBSERVATIONS / NOTES:

Signature(s):

Tetra Tech

QA SAMPLE LOG SHEET

Project Site Name: NSF-Indian Head Site 43
Project Number: 112G00771
Sample Location: Lab
QA Sample Type:

Sample ID Number: S43TB03-20130509
Sampled By: JB/Lab
C.O.C. Number:

[X] Trip Blank
[] Source Water Blank
[] Rinsate Blank
[] Other Blank

SAMPLING DATA:

Date: 5-9-13
Time: 1015
Method: Lab Prepared

WATER SOURCE:

[X] Laboratory Prepared
[] Purchased
[] Other
[] Tap
[] Fire Hydrant

PURCHASED WATER INFORMATION (If Applicable as Source or Rinsate Water):

Product Name:
Supplier:
Manufacturer:
Order Number:
Lot Number:
Expiration Date:

RINSATE INFORMATION (If Applicable):

Media Type:
Equipment Used:
Equipment Type:
[] Dedicated
[] Reusable

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Volatiles	Cool 4°C & HCl	3 40mL glass vials	YES

OBSERVATIONS / NOTES:

Signature(s):

Tetra Tech

QA SAMPLE LOG SHEET

Project Site Name: NSF-Indian Head Site 43
Project Number: 112G00771
Sample Location: Lab
QA Sample Type:

Sample ID Number: S43TB0 5-20130519
Sampled By: JB/Lab
C.O.C. Number:

[X] Trip Blank
[] Source Water Blank
[] Rinsate Blank
[] Other Blank

SAMPLING DATA:

Date: 5-19-13
Time: 0840
Method: Lab Prepared

WATER SOURCE:

[X] Laboratory Prepared
[] Purchased
[] Other
[] Tap
[] Fire Hydrant

PURCHASED WATER INFORMATION (If Applicable as Source or Rinsate Water):

Product Name:
Supplier:
Manufacturer:
Order Number:
Lot Number:
Expiration Date:

RINSATE INFORMATION (If Applicable):

Media Type:
Equipment Used:
Equipment Type:
[] Dedicated
[] Reusable

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Volatiles	Cool 4°C & HCl	3 40mL glass vials	YES

OBSERVATIONS / NOTES:

Signature(s):

Tetra Tech

QA SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Sample ID Number: S43FB01-20130509
Project Number: 112G0077 1
Sampled By: J.B.
Sample Location: MW26
C.O.C. Number:
QA Sample Type:

[] Trip Blank
[] Rinsate Blank
[] Source Water Blank
[X] Other Blank Field Blank

SAMPLING DATA:

Date: 5-9-13
Time: 1620
Method: Direct Pour

WATER SOURCE:

[] Laboratory Prepared
[X] Purchased
[] Tap
[] Fire Hydrant
[] Other

PURCHASED WATER INFORMATION (If Applicable as Source or Rinsate Water):

Product Name: NERL Reagent Grade Water
Supplier: Scientific Sales Inc.
Manufacturer: Thermo Scientific
Order Number: 9800-5
Lot Number: 278111
Expiration Date: 1-2014

RINSATE INFORMATION (If Applicable):

Media Type:
Equipment Used:
Equipment Type:
[] Dedicated
[] Reusable

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40mL glass vials	yes
Total Metals	HNO_3	1 250 poly bottle	yes
Dissolved Metals	HNO_3	1 250 poly bottle	yes

OBSERVATIONS / NOTES:

Signature(s):

Tetra Tech

QA SAMPLE LOG SHEET

Project Site Name: NSF Indian Head Site 43
Sample ID Number: 543FB02-20130513
Project Number: 112G00771
Sampled By: JB/CM
Sample Location: Gravel lot W of Site 43
C.O.C. Number:
QA Sample Type:

[] Trip Blank
[] Rinsate Blank
[X] Source Water Blank
[] Other Blank

SAMPLING DATA:

Date: 5-13-13
Time: 1630
Method: Direct Pour

WATER SOURCE:

[] Laboratory Prepared
[X] Tap
[] Purchased
[] Fire Hydrant
[] Other

PURCHASED WATER INFORMATION (If Applicable as Source or Rinsate Water):

Product Name:
Supplier:
Manufacturer:
Order Number:
Lot Number:
Expiration Date:

RINSATE INFORMATION (If Applicable):

Media Type:
Equipment Used:
Equipment Type:
[] Dedicated
[] Reusable

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 40mL glass vials	yes
Total Metals	HNO_3	1 250mL poly bottle	yes

OBSERVATIONS / NOTES:

Tap at gravel lot that drillers used for decon and MW installation

Signature(s):

Appendix M

Photo Log

Appendix M
Site 43 Remedial Investigation
Photo Log

Photo 1: At intersection of Gallery Road and Schuyler Road looking southeast down Schuyler Road at Building 720 blast wall and source area ditch.

Photo 2: Standing next to Building 720 blast wall looking west towards Gallery Road at source area ditch with well rehabilitation going on at S43-MW01. Water flows towards camera.

Appendix M
Site 43 Remedial Investigation
Photo Log

Photo 3: At S43-TW11 looking east down Schuyler Road towards Glennon Road, with S43-MW06 (not yet converted to flush mount) and ditch culvert in distance. Water flows away from camera.

Photo 4: On east side of Glennon Road looking west at ditch and culvert. Water flows towards camera away from source area.

Appendix M
Site 43 Remedial Investigation
Photo Log

Photo 5: At intersection of Glennon Road and Johnson Road looking north back towards drill rig at S43-MW10/TW26 and Building 720 blast wall as drillers advancing temporary well setup.

Photo 6: In between Buildings 720 and 1040 looking west at S43-SG02 (did not produce sample) with PRT probe for soil gas sampling attached to tubing deployed through drill rods.

Appendix M
Site 43 Remedial Investigation
Photo Log

Photo 7: Near intersection of Gallery Road and Schuyler Road looking southeast down Gallery Road towards Building 1041.

Photo 8: On Gallery Road looking south at drill rig while S43-MW14 is being installed.

Appendix M
Site 43 Remedial Investigation
Photo Log

Photo 9: At intersection of Strauss Avenue and Leary Road looking down Strauss Avenue towards Pump House Lane with Building 716 on the right.

Photo 10: Inside Building 716 (northern portion) looking northwest at S43-716-IND2 with duplicate sample. Building 716 used for storage.

Appendix M
Site 43 Remedial Investigation
Photo Log

Photo 11: At intersection of Strauss Avenue and Pump House Lane looking south down Strauss Avenue.

Photo 12: At intersection of Strauss Avenue and Pump House Lane looking north down Pump House Road towards Potomac River and Building 717.

Appendix M
Site 43 Remedial Investigation
Photo Log

Photo 13: Standing in southern ditch looking southeast towards Building 1755 and culvert with water flowing towards camera.

Photo 14: Standing in southern ditch looking northwest towards the Potomac River with water flowing away from the camera.

Appendix M
Site 43 Remedial Investigation
Photo Log

Photo 15: At terminus of Pump House Lane looking south back up Pump House Lane and southern ditch. Water in southern ditch flows through culvert under Pump House Lane and into the Potomac River.

Photo 16: In the northern ditch near S43-SP02. Note that water has iron precipitating out of it.

Appendix M
Site 43 Remedial Investigation
Photo Log

Photo 17: At the discharge point of the northern ditch looking southeast back upstream.

Photo 18: Near discharge point of the northern ditch looking northeast down beach along Potomac River.

Appendix M
Site 43 Remedial Investigation
Photo Log

Photo 19: At S43-TW36 showing a typical soil boring of Site 43 with the 5 to 10 foot interval soil core at the top and the 45 to 50 foot interval soil core at the bottom of the picture.

Appendix N

Chain of Custody Records

2011

Chain of Custody Records

TETRA TECH NUS, INC. | CHAIN OF CUSTODY | NUMBER 27271 | PAGE 1 OF 1

PROJECT NO:	FACILITY:	PROJECT MANAGER	PHONE NUMBER	LABORATORY NAME AND CONTACT:
112G00771	Indian Head	Rob Sok	757-466-4904	Empirical Labs
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER	PHONE NUMBER	ADDRESS
Jacob Birkett		Keith Simpson		621 MainStream Dr. Suite 270
		CARRIER/WAYBILL NUMBER		CITY, STATE
		FedEx 8686 9317 0641		Nashville TN 37228

STANDARD TAT ☒
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

CONTAINER TYPE PLASTIC (P) or GLASS (G): G G G G G P P G P G

PRESERVATIVE USED: HCl MeOH / / / HNO3 HNO3 / / / HCl NaOH ZnAcP H2SO4

	DATE YEAR 2011	TIME	SAMPLE ID 1105047	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	VOC	VOC	Explosives	Perchlorate	TAL Metals	Total Metals	Filtered Metals	Total CN	Explosives	Filtered Perchlorate	Anions	MTE	Sulfide	TOC	COMMENTS
-01	6-3	1000	S43TB01-20110603	—	—	—	QA	-	2	2														Lab prepared
-02	6-3	1120	S43SB013-0603	SB013	6	8	SO	G	6		3	1	1	1										
-03	6-3	1300	S43SB015-0810	SB015	8	10	SO	G	6		3	1	1	1										
5-04	6-3	1410	S43TW007-2327	TW007	23	27	GW	G	15	3	3				1	1	1	2	1	1	3	1	1	
7-08	6-3	1535	S43TW009-2125	TW009	21	25	GW	G	15	3					1	1	1	2	1	1	3	1	1	
9-10	6-3	1510	S43SB010-0709	SB010	7	9	SO	G	6		3	1	1	1										

	DATE	TIME		DATE	TIME
1. RELINQUISHED BY Jacob Birkett	6-3-11	1730	1. RECEIVED BY FED EX	6-3-11	1800
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY Reynaldo Talley	6-4-11	1100

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 27273 | PAGE 1 OF 1

PROJECT NO: 112G00771	FACILITY: Indian Head Site 43	PROJECT MANAGER Rob Sok	PHONE NUMBER 757-466-4904	LABORATORY NAME AND CONTACT: Empirical Laboratories Brian Richard
SAMPLERS (SIGNATURE) Jacob Birkett		FIELD OPERATIONS LEADER Keith Simpson	PHONE NUMBER 412-352-2264	ADDRESS 621 Mainstream Dr., Suite 270
		CARRIER/WAYBILL NUMBER FedEx 8686 9317 0630		CITY, STATE Nashville, TN 37228

STANDARD TAT ☒
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

CONTAINER TYPE PLASTIC (P) or GLASS (G): G G G G G P P G P
PRESERVATIVE USED: HCl MeOH / / / HNO3 HNO3 NaOH / /

	DATE YEAR 2011	TIME	SAMPLE ID 1106067	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: AG VOCs 40mL glass	Soil VOCs 40mL glass	Explosives	Perchlorate	TAL Metals, Total CN, TOC	Total Metals	Filtered Metals	Total CN	Explosives	Filtered Perchlorate	COMMENTS
-01	6-4	0830	S43TB02-20110604	—	—	—	QA	—	2	2										Lab prepared
-02	6-4	0910	S43SB009-0608	SB09	6	8	SO	G	6		3	1	1	1						
-03	6-4	1140	S43SB008-0608	SB08	6	8	SO	G	6		3	1	1	1						
-04	6-4	1526	S43SB011-0709	SB11	7	9	SO	G	6		3	1	1	1						
-05	6-4	1526	S43SB011-0709-D	SB11-D	7	9	SO	G	6		3	1	1	1						Duplicate
-06	6-4	1720	S43SB014-0709	SB14	7	9	SO	G	12		6	2	2	2						Run MS/MSD
-07 -08	6-5	1010	S43TW08 2832	TW08	28	32	GW	G	9	3				1	1	1	1	2	1	
-09	6-5	1011	S43SB016-0608	SB16	6	8	SO	G	6		3	1	1	1						
-10 -11	6-5	1345	S43RB01-20110605	—	—	—	QC	—	9	3					1	1	1	2	1	Perchlorate 0.45 micron Filtered
-12	6-5	1405	S43FB01-20110605	—	—	—	QC	—	3	3										Tapwater at Site
-13	6-5	1430	S43FB02-20110605	—	—	—	QC	—	3	3										Store bought distilled H_2O

1. RELINQUISHED BY Jacob Birkett	DATE 6-6-11	TIME 1600	1. RECEIVED BY	DATE	TIME
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY Reginald Talley 3.2°C	DATE 6.7.11	TIME 0900

COMMENTS

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TtNUS-001

11

CTO114_002

TETRA TECH NUS, INC. | CHAIN OF CUSTODY | NUMBER 27276 | PAGE 1 OF 2

PROJECT NO:	FACILITY:	PROJECT MANAGER	PHONE NUMBER	LABORATORY NAME AND CONTACT:
112G00771	Indian Head Site 3	Rob Sok	757-466-4904	Empirical Labs LLC Brian Richard
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER: Keith Simpson	PHONE NUMBER: 412 352-2264	ADDRESS: 621 Mainstream Dr. Suite 270
		CARRIER/WAYBILL NUMBER: FedEx 8689-3778-3771		CITY, STATE: Nashville, TN 37228

STANDARD TAT ☒
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

CONTAINER TYPE PLASTIC (P) or GLASS (G): G G G G G P G G P

PRESERVATIVE USED: HCl, MeOH & NaHSO4 / — / — / — / HNO3 / HNO3 / NaOH / — / —

TYPE OF ANALYSIS: VOC (Aqueous) / VOC (Soil) / Explosives (Soil) / Perchlorate (Soil) / TAL Metals, Total CN, TOC / Total Metals (Aq) / Filtered Metals (Aq) / Total CN (Aq) / Explosives (Aq) / Perchlorate (Aq-Filtered)

110658

	DATE YEAR 2011	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	VOC (Aqueous)	VOC (Soil)	Explosives (Soil)	Perchlorate (Soil)	TAL Metals, Total CN, TOC	Total Metals (Aq)	Filtered Metals (Aq)	Total CN (Aq)	Explosives (Aq)	Perchlorate (Aq-Filtered)	COMMENTS
01	6-10	0840	S43TB03-20110610	QA	—	—	QC	—	2	2										Lab prep'd -01
02	6-10	1010	S43SB017-0608	SB17	6	8	SO	G	6		3	1	1	1						-02, -17
03	6-10	1325	S43TW11-3034	TW11	30	34	GW	G	9	3					1	1	1	2	1	-03
04	6-10	1338	S43SB018-0507	SB18	5	7	SO	G	6		3	1	1	1						-04
05	6-10	1353	S43SB011-0507	SB11	5	7	SO	G	~~6~~ 3 JB		3	~~1~~ JB								-05
06	6-10	1710	S43SB009-0708	SB09	7	8	SO	G	3		3									-06
07	6-10	1710	S43SB009-0708-D	SB09	7	8	SO	G	3		3									Duplicate -07
08	6-10	1725	S43SB008-0607	SB08	6	7	SO	G	6		6									Run MS/MSD -08
09	6-11	0902	S43SB022-0708	SB22	7	8	SO	G	3		3									-09
10	6-11	0945	S43SB019-0607	SB19	6	7	SO	G	3		3									-10
11	6-11	0955	S43TW12-2630	TW12	26	30	GW	G	9	3					1	1	1	2	1	-11, -18
12	6-11	1055	S43SB012-0507	SB12	5	7	SO	G	6		3	1	1	1						-12
17	6-11	1055	S43SB012-0507-D	SB12	5	7	SO	G	6		3	1	1	1						Duplicate -13

	DATE	TIME		DATE	TIME
1. RELINQUISHED BY	6-13-11	1730	1. RECEIVED BY	6-13-11	18:00
2. RELINQUISHED BY			2. RECEIVED BY	DATE 14	
3. RELINQUISHED BY			3. RECEIVED BY		

COMMENTS

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TINUS-001

TETRA TECH NUS, INC. CHAIN OF CUSTODY | NUMBER 27277 | PAGE 2 OF 2

PROJECT NO:	FACILITY:	PROJECT MANAGER	PHONE NUMBER	LABORATORY NAME AND CONTACT:
112G00771	Indian Head Site 43	Rob Sok	757-466-4909	Empirical Labs Brian Richard
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER: Keith Simpson	PHONE NUMBER: 412-352-2264	ADDRESS: 621 Mainstream Dr. Suite 270
		CARRIER/WAYBILL NUMBER: FedEx 8689-3778-3771		CITY, STATE: Nashville, TN 37228

STANDARD TAT ☒
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

CONTAINER TYPE PLASTIC (P) or GLASS (G): G G G G G P P G P

PRESERVATIVE USED: HCl; 1 NaOH 2 Na_2SO_4; / / / HNO_3; HNO_3; NaOH; / /

TYPE OF ANALYSIS: VOC (Aqueous); VOC (Soil); Explosives (Soil); Perchlorate (Soil); TAL Metals (Total) (Soil); Total Metals (Aq); Filtered Metals (Aq); Total CN (Aq); Explosives (Aq); Perchlorate (Aq-Filtered)

	DATE YEAR	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	VOC (Aqueous)	VOC (Soil)	Explosives (Soil)	Perchlorate (Soil)	TAL Metals (Total) (Soil)	Total Metals (Aq)	Filtered Metals (Aq)	Total CN (Aq)	Explosives (Aq)	Perchlorate (Aq-Filtered)	COMMENTS
14	6-11	1305	S43TW006-2332	TW06	23	32	GW	G	9	3	4*			*	1	1	1	2	1	-14, -19
15	6-12	0930	S43SB016-0607	SB16	6	7	SO	G	3		3									-15
16	6-12	1550	S43RB02-20110612	—	—	—	QC	—	9	3					1	1	1	2	1	Rinsate Blank-16, -20

1. RELINQUISHED BY	DATE 6-13-11 +	TIME 1530	1. RECEIVED BY 4°C	DATE 6-14-11	TIME 09:00
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY	DATE	TIME

COMMENTS

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4/02R
FORM NO. TINUS-001

TETRA TECH NUS, INC.

CHAIN OF CUSTODY

NUMBER 7278

PAGE 1 OF 1

PROJECT NO:	FACILITY:	PROJECT MANAGER	PHONE NUMBER	LABORATORY NAME AND CONTACT:
112G00711	Indian Head	Rob Sok	757-466-4904	Redox Tech Attn Magaly Ramirez
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER	PHONE NUMBER	ADDRESS
Jacob Birkett		Keith Simpson	412 352 2264	200 Quade Drive
		CARRIER/WAYBILL NUMBER		CITY, STATE
		FedEx 8689 3778 3819		Cary, NC 27513

STANDARD TAT ☒
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

CONTAINER TYPE PLASTIC (P) or GLASS (G): P

PRESERVATIVE USED:

TYPE OF ANALYSIS: Perchlorate by ion chromatography

DATE YEAR 2011	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	Perchlorate by ion chromatography	COMMENTS
6-10	1415	543SB011 Outside1-1315	SB011	13	15	SO	G	1	1	
6-11	0908	543 SB022 Inside1-1315	SB022	13	15	SO	G	1	1	
6-11	0953	543 SB019 Inside2 1315	SB019	13	15	SO	G	1	1	

1. RELINQUISHED BY	DATE	TIME	1. RECEIVED BY	DATE	TIME
Jacob Birkett	4-13-11	1530	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

JUN-13-2011 18:07 From:301 632 6209 Page:5/5

TETRA TECH NUS, INC. CHAIN OF CUSTODY NUMBER 27274 PAGE 1 OF 1

PROJECT NO:	FACILITY:	PROJECT MANAGER	PHONE NUMBER	LABORATORY NAME AND CONTACT:
112G00771	Indian Head	Rob Sok	757-466-4904	Geotesting Express
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER	PHONE NUMBER	ADDRESS
[signature]		Keith Simpson	412-352-2264	125 Nagog Park
		CARRIER/WAYBILL NUMBER		CITY, STATE
		FedEx 8689 3778-3820		Acton MA 01720

STANDARD TAT ☒
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

CONTAINER TYPE PLASTIC (P) or GLASS (G): G G P

PRESERVATIVE USED

TYPE OF ANALYSIS

DATE YEAR 2011	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	Grain Size	Bulk Density Effective Porosity	Shelby Tube *	COMMENTS
6-4	1140	5435B008-0608	SB08	6	8	SO	G	3	1	2		
6-10	1610	5435B017 0517	SB17	15	17	SO	G	2	2			
6-10	1600	5435B018-3234	SB18	32	34	SO	G	2	2			
6-12	1510	5435B011-3335	SB11	33	35	SO	G	1		1		*Shelby tube Placement ~~Call Rob Sok before~~ analysis.

1. RELINQUISHED BY Jacob Burkett [signature]	DATE 6-13-11	TIME 15:30	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

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4/02R
FORM NO TtNUS-001

JUN-13-2011 18:07 From:301 632 6209 Page:4/5

TETRA TECH NUS, INC. CHAIN OF CUSTODY NUMBER 27281 PAGE 1 OF 1

PROJECT NO:	FACILITY:	PROJECT MANAGER	PHONE NUMBER	LABORATORY NAME AND CONTACT:
112G00771	NSF Indian Head	Rob Sok	757-466-4904	Empirical Labs Brian Richard
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER: Keith Simpson	PHONE NUMBER	ADDRESS: 621 Mainstream Dr.
		CARRIER/WAYBILL NUMBER: FedEx 8689-3778-3793		CITY, STATE: Nashville, TN 37228

STANDARD TAT ☒
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

CONTAINER TYPE PLASTIC (P) or GLASS (G): G P P P G P P G P G

PRESERVATIVE USED: HCL, HNO3, HNO3, NaOH, –, –, –, HCL, Zn Acetate NaOH, H2SO4

TYPE OF ANALYSIS: VOC, Total Metals, Filtered Metals, Total CN, Explosives, Filtered Perchlorate, Anions, MEE, Sulfide, Dissolved TOC

	DATE YEAR 2011	TIME	SAMPLE ID 1106198	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	VOC	Total Metals	Filtered Metals	Total CN	Explosives	Filtered Perchlorate	Anions	MEE	Sulfide	Dissolved TOC	COMMENTS
-01	6-13	1000	TBC61311-01	—	—	—	QC	—	2	2										Lab prepared
-02 -03	6-17	0918	S43MW00401	MW04	—	—	GW	G	16	3	1	1	1	2	1	1	3	1	2	
-04 -05	6-17	0918	S43MW00401-D	MW04D	—	—	GW	G	16	3	1	1	1	2	1	1	3	1	2	Duplicate
-06 -07	6-17	1040	S43MW01C03	MW01	—	—	GW	G	16	3	1	1	1	2	1	1	3	1	2	
-08 -09	6-17	1130	S43MW00601	MW06	—	—	GW	G	16	3	1	1	1	2	1	1	3	1	2	Note
-10 -11	6-17	1245	S43MW02C03	MW02	—	—	GW	G	13	3*	1°	1°	1			1	3	1	2	* TCE only ° Cobalt only
-12 -13	6-17	1357	S43MW00301	MW03	—	—	GW	G	27	9	3	3	3	6	3					RUMS MSD
-14 -15	6-17	1530	S43MW0501	MW05	—	—	GW	G	9	3	1	1	1	2	1					

1. RELINQUISHED BY	DATE	TIME	1. RECEIVED BY	DATE	TIME
Jacob Birkett	6-17-11	1700			
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY	DATE	TIME
			Reginald Talley	6.18.11	1100

COMMENTS

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4/02R
FORM NO. TtNUS-001

11

1106198 Summ Package

Air Toxics LTD.

CHAIN-OF-CUSTODY RECORD

Sample Transportation Notice
Relinquishing signature on this document indicates that sample is being shipped in compliance with all applicable local, State, Federal, national, and international laws, regulations and ordinances of any kind. Air Toxics Limited assumes no liability with respect to the collection, handling or shipping of these samples. Relinquishing signature also indicates agreement to hold harmless, defend, and indemnify Air Toxics Limited against any claim, demand, or action, of any kind, related to the collection, handling, or shipping of samples. D.O.T. Hotline (800) 467-4922

180 BLUE RAVINE ROAD, SUITE B
FOLSOM, CA 95630-4719
(916) 985-1000 FAX (916) 985-1020

Page 1 of 1

Project Manager: Rob Sok
Collected by: (Print and Sign) Jacob Birkett
Company: Tetra Tech Email:
Address: 5700 Lake Wright Dr. City: Norfolk State: VA Zip: 23185
Phone: 757-466-4904 Fax:

Project Info:
P.O. #:
Project #: 112G00771
Project Name: Indian Head Site 43

Turn Around Time:
☒ Normal
☐ Rush
specify

Lab Use Only
Pressurized by:
Date:
Pressurization Gas: N_2 He

Lab I.D.	Field Sample I.D. (Location)	Can #	Date of Collection	Time of Collection	Analyses Requested	Canister Pressure/Vacuum Initial	Final	Receipt	Final (psi)
01A	5430DA01	5705	6-11-11	1445	Modified EPA TO-15	-30+	-1		
02A	5438G0305	3731	6-11-11	1500	Mod. TO 15	-30+	-1		
03A	5435G0406	34201	6-11-11	1705	Mod. TO 15	-30+	-9		
04A	5435G0106	11880	6-11-11	1850	Mod. TO 15	-30+	-9		

Relinquished by: (signature)	Date/Time	Received by: (signature)	Date/Time
[signature]	6-13-11 1530	[signature] ATL	6/14/11 0850

Notes: Can #'s 433 and 33988 No sample

Lab Use Only	Shipper Name	Air Bill #	Temp (°C)	Condition	Custody Seals Intact?	Work Order #
	FED EX		NA	GOOD	Yes No None	1106832

Form 1293 rev.11

2012

Chain of Custody Records

Air Toxics LTD.

CHAIN-OF-CUSTODY RECORD

Sample Transportation Notice
Relinquishing signature on this document indicates that sample is being shipped in compliance with all applicable local, State, Federal, national, and international laws, regulations and ordinances of any kind. Air Toxics Limited assumes no liability with respect to the collection, handling or shipping of these samples. Relinquishing signature also indicates agreement to hold harmless, defend, and indemnify Air Toxics Limited against any claim, demand, or action, of any kind, related to the collection, handling, or shipping of samples. D.O.T. Hotline (800) 467-4922

180 BLUE RAVINE ROAD, SUITE B
FOLSOM, CA 95630-4719
(916) 985-1000 FAX (916) 985-1020

Page 1 of 1

Project Manager Rob Sok
Collected by: (Print and Sign) Robert M. Sok
Company Tetra Tech Email Rob.Sok@tetratech.com
Address 5700 Lake Wright Dr, Suite 309 City Norfolk State VA Zip 23502
Phone 757-466-4904 Fax 757-461-4148

Project Info:
P.O. #
Project # 112G00771 CTO-114
Project Name NSF IH Site 43

Turn Around Time:
☒ Normal
☐ Rush
specify

Lab Use Only
Pressurized by:
Date:
Pressurization Gas: N_2 He

Lab I.D.	Field Sample I.D. (Location)	Can #	Date of Collection	Time of Collection	Analyses Requested	Canister Pressure/Vacuum Initial	Final	Receipt	Final (psi)
01A	S43 IN001	33668	4/20/12	1200	To-15 (Site specific list)	-31	-9		
02A	S43 IN001-D	34460	4/20/12	1200		-31	-8		
03A	S43 IN002	12959	4/20/12	1204		-31	-10		
04A	S43 OUA 002	25304	4/20/12	1215		-30	-9		

Relinquished by: (signature) Date/Time	Received by: (signature) Date/Time
4/20/12	FedEx
Relinquished by: (signature) Date/Time	Received by: (signature) Date/Time: B Whittaker AIC 4/23/12 0900
Relinquished by: (signature) Date/Time	Received by: (signature) Date/Time

Notes: FedEx Airbill # 8741-9938-0990
*use Site specific To-15 List

Lab Use Only	Shipper Name	Air Bill #	Temp (°C)	Condition	Custody Seals Intact?	Work Order #
	FedEx		N/A	Good	Yes No None	1204471

Form 1293 rev.11

1204118

TETRA TECH NUS, INC.

CHAIN OF CUSTODY | NUMBER

PAGE 1 OF 2

PROJECT NO: 112G00771	SITE NAME: NSF Indian Head Site 43
PROJECT MANAGER AND PHONE NUMBER	Rob Sok 757-466-4904
FIELD OPERATIONS LEADER AND PHONE NUMBER	Jacob Birkett 757-814-9916
CARRIER/WAYBILL NUMBER	FedEx 8741-9938-1004
LABORATORY NAME AND CONTACT:	Empirical Labs Brian Richard 615-345-1115 x249
ADDRESS	621-Mainstream Drive Suite 270
CITY, STATE	Nashville, TN 37228
SAMPLERS (SIGNATURE)	

STANDARD TAT ☐
RUSH TAT ☒
☐ 24 hr. ☒ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

CONTAINER TYPE PLASTIC (P) or GLASS (G): G

PRESERVATIVE USED: HCl

TYPE OF ANALYSIS: Aqueous VOCs Quick Turn *

DATE YEAR 2012	TIME	SAMPLE ID	MATRIX	GRAB (G) COMP (C)	No. OF CONTAINERS									COMMENTS
4-20	0800	S43TB01-20120420 JB 4-20-12	GW QA	G	2	2			01					Lab prepared
4-20	1523	S43TW13-2933	GW	G	3	3*			02					*Note: sheen on purgewater
4-20	1620	S43TW14-1317	GW	G	3	3			03					
4-20	1650	S43TW14-2933	GW	G	3	3			04					
4-21	1215	S43TW20-2933	GW	G	3	3			05					
4-21	1216	S43TW20-2933-D	GW	G	3	3			06					Duplicate
4-21	1230	S43TW20-1933	GW	G	3	3			07					
4-21	1400	S43TW19-2832	GW	G	9	9			08					Run MSMS D
4-21	1600	S43TW21-1923	GW	G	3	3			09					
4-21	1625	S43TW21-2630	GW	G	3	3			10					
4-22	1115	S43TW15-1721	GW	G	3	3			11					
4-22	1123	S43TW15-2933	GW	G	3	3			12					
4-22	1330	S43TW16-2933	GW	G	3	3			13					

	DATE	TIME		DATE	TIME
1. RELINQUISHED BY	4-23-12	1730	1. RECEIVED BY FedEx		
2. RELINQUISHED BY			2. RECEIVED BY		
3. RELINQUISHED BY			3. RECEIVED BY	4/24/12	0820

COMMENTS

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FORM NO TtNUS-001

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1204118

1204118

TETRA TECH NUS, INC. CHAIN OF CUSTODY | NUMBER | PAGE 2 OF 2

PROJECT NO: 112G00771	SITE NAME: NSF Indian Head Site 43	PROJECT MANAGER AND PHONE NUMBER: Rob Sok 757-466-4904	LABORATORY NAME AND CONTACT: Empirical Labs Brian Richard
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER AND PHONE NUMBER: Jacob Birkett 757-814-9916	ADDRESS: 621 Mainstream Drive Suite 270
		CARRIER/WAYBILL NUMBER: FedEx 8741-9938-1004	CITY, STATE: Nashville, TN 37228

STANDARD TAT ☒
RUSH TAT ☒
☐ 24 hr. ☒ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

DATE YEAR 2012	TIME	SAMPLE ID	MATRIX	GRAB (G) COMP (C)	No. OF CONTAINERS	Aqueous Quick Turn VOCs	Aqueous Standard Turn VOCs	Aqueous Standard Turn Total Metals	Aqueous Standard Turn Dissolved/Filtered Metals	Aqueous Standard Turn Explosives			COMMENTS
CONTAINER TYPE PLASTIC (P) or GLASS (G)						G	G	P	P	G			
PRESERVATIVE USED						HCl	HCl	HNO_3	HNO_3	/			
4-22	1335	S43TW16-1721	GW	G	3	3						14	
4-22	1336	S43TW16-1721-D	GW	G	3	3						15	Duplicate
4-22	1515	S43TW17-2933	GW	G	3	3						16	
4-22	1532	S43TW17-1923	GW	G	3	3						17	
4-22	1415	S43RB01-20120422	QA	G	3	~~3~~ JB 4-23-12 3						18	Rinsate over TW screen
4-22	1430	S43FB01-20120422	QA	G	7	~~3~~ JB 4-23-12	3	1	1	2		19/20	Field Blank for water used for rinsate
4-22	1600	S43FB02-20120422	QA	G	7		3	1	1	2		20/21/22	Field Blank - Driller's Decon water
												6	

	DATE	TIME		DATE	TIME
1. RELINQUISHED BY	4-23-12	1730	1. RECEIVED BY FedEx		
2. RELINQUISHED BY			2. RECEIVED BY		
3. RELINQUISHED BY			3. RECEIVED BY	4/24/11	0820

COMMENTS

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FORM NO. TtNUS-001

1204118

TETRA TECH NUS, INC.

1205 004

CHAIN OF CUSTODY | NUMBER | PAGE 1 OF 1

PROJECT NO: 112G00771	SITE NAME: Site 43 NSF Indian Head	PROJECT MANAGER AND PHONE NUMBER: Rob Sok 757-466-4904	LABORATORY NAME AND CONTACT: Empirical Labs Brian Richard
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER AND PHONE NUMBER: Jacob Birkett 757-814-9916	ADDRESS: 621 Mainstream Drive Suite 270
		CARRIER/WAYBILL NUMBER: FedEx 8741-9938-1026	CITY, STATE: Nashville, TN 37228

STANDARD TAT ☒
RUSH TAT ☒
☐ 24 hr. ☒ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

CONTAINER TYPE PLASTIC (P) or GLASS (G): G
PRESERVATIVE USED: HCl

TYPE OF ANALYSIS: Aqueous VOCs Quick Turn

DATE YEAR 2012	TIME	SAMPLE ID	MATRIX	GRAB (G) COMP (C)	No. OF CONTAINERS									COMMENTS
4-27	0800	S43TB02-20120427	QA	—	2	2		—	01					Trip Blank
4-27	1242	S43TW23-3236	GW	G	3	3		—	02					
4-27	1305	S43TW23-2226	GW	G	3	3		—	03					
4-27	1512	S43TW22-2226	GW	G	3	3		—	04					
4-27	1315	S43TW23-1014	GW	G	3	3		—	05					

4-30-12

1. RELINQUISHED BY	DATE 4-30-12	TIME 1700	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 5/1/12	TIME 0830

COMMENTS

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FORM NO. TtNUS-001

10

1205004 Summ Package

1205040

TETRA TECH NUS, INC. CHAIN OF CUSTODY | NUMBER | PAGE 1 OF 3

PROJECT NO: 112G00771	SITE NAME: NSF Indian Head Site43	PROJECT MANAGER AND PHONE NUMBER: Rob Sok 757-466-4904	LABORATORY NAME AND CONTACT: Empirical Labs ~~Air Toxics LTD~~ Brian Richard JB 4-20-12
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER AND PHONE NUMBER: Jacob Birkett 757-814-9916	ADDRESS: 621 Mainstream Drive Suite 270
		CARRIER/WAYBILL NUMBER: FedEx 8741-9938-1037	CITY, STATE: Nashville, TN 37228

STANDARD TAT ☐
RUSH TAT ☒
☐ 24 hr. ☒ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

CONTAINER TYPE PLASTIC (P) or GLASS (G): G

PRESERVATIVE USED: HCL

TYPE OF ANALYSIS: TCL VOCs (48hr TAT)

DATE YEAR 2012	TIME	SAMPLE ID	MATRIX	GRAB (G) COMP (C)	No. OF CONTAINERS									COMMENTS
5/4	0940	S43TW19-2024	GW	G	3	X	-	01						
5/4	1116	S43TW22-1014				X	-	02						PID=34ppm Strong odor (?HOT)
5/4	1050	S43TW22-3337				X	-	03						
5/4	1330	S43TW24-3236				X	-	04						
5/4	1430	S43TW24-2327				X	-	05						
5/4	1545	S43TW28-2933				X	-	07	06					
5/4	1625	S43TW28-1721				X	-	22	07					
5/4	1545	S43TW28-2933D				X	-	15	22					
5/4	1700	S43TW27-2933				X	-	16	15					
5/5	1140	S43TW26-3236				X	-	17	16					
5/5	1230	S43TW26-1014				X	-	18	17					*Run MSMSD if possible
5/5	1330	S43TW25-1115				X	-	18						
5/5	1340	S43TW25-2933				X	-	19						

	DATE	TIME		DATE	TIME
1. RELINQUISHED BY: Jacob Birkett	5-7-2012	1700	1. RECEIVED BY: FedEx		
2. RELINQUISHED BY			2. RECEIVED BY		
3. RELINQUISHED BY			3. RECEIVED BY	5/8/12	0830

COMMENTS: *Can run a MSMSD on any two samples, but extra volume was not collected

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

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FORM NO. TtNUS-001

1205040

TETRA TECH NUS, INC. | CHAIN OF CUSTODY | NUMBER | PAGE 2 OF 3

PROJECT NO:	SITE NAME:	PROJECT MANAGER AND PHONE NUMBER	LABORATORY NAME AND CONTACT:
112G00771	NSF Indian Head Site 43	Robert Sok 757-466-4904	Empirical / Brian Richard
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER AND PHONE NUMBER	ADDRESS
For Rob Sok		Robert Sok 757-618-2104	621 Mainstream Drive Suite 270
		CARRIER/WAYBILL NUMBER	CITY, STATE
		FedEx 8741-9938-1037	Nashville, TN 37228

STANDARD TAT ☐
RUSH TAT ☒
☐ 24 hr. ☒ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

CONTAINER TYPE PLASTIC (P) or GLASS (G): G
PRESERVATIVE USED: HCL
TYPE OF ANALYSIS: TCL VOCs (48hr TAT)

DATE YEAR 2012	TIME	SAMPLE ID	MATRIX	GRAB (G) COMP (C)	No. OF CONTAINERS									COMMENTS
5/5	1525	S43TW18-3034	GW	G	3	3		—	23					
5/5	1658	S43TW18-1923	GW	G	3	3		—	24					
5/6	0910	S43TW32-3236	GW	G	3	3		—	20					*Run MSMSD if possible
5/6	0945	S43TW32-2226	GW	G	3	3		—	21					
5/6	0945	S43TW32-2226D	GW	G	3	3		—	25					Duplicate
5/6	1128	S43TW31-2226	GW	G	3	3		—	08					
5/6	1145	S43TW31-1014	GW	G	3	3		—	09					
5/6	1200	S43TW31-3236	GW	G	3	3		—	10					
5/6	1320	S43TW30-3236	GW	G	3	3		—	11					
5/6	1346	S43TW30-2226	GW	G	3	3		—	12					
5/6	1410	S43TW30-1317	GW	G	3	3		—	13					
5/6	1410	S43TW30-1317D	GW	G	3	3		—	26					Duplicate
5/6	1520	S43TW29-2226	GW	G	3	3		—	14					

	DATE	TIME		DATE	TIME
1. RELINQUISHED BY Jacob Birkett	5-7-12	1700	1. RECEIVED BY		
2. RELINQUISHED BY			2. RECEIVED BY		
3. RELINQUISHED BY			3. RECEIVED BY	5/8/12	0830

COMMENTS: *Can run a MSMSD on any two samples, but extra volume was not collected

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

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FORM NO. TtNUS-001

1205040

TETRA TECH NUS, INC.

CHAIN OF CUSTODY | NUMBER | PAGE 3 OF 3

PROJECT NO:	SITE NAME:	PROJECT MANAGER AND PHONE NUMBER	LABORATORY NAME AND CONTACT:
112G00771	NSF Indian Head Site 43	Rob Sok 757-466-4904	Empirical Labs Brian Richard
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER AND PHONE NUMBER	ADDRESS
for Rob Sok		Rob Sok 757-618-2104	621 Mainstream Drive Suite 270
		CARRIER/WAYBILL NUMBER	CITY, STATE
		FedEx 8741-9938-1037	Nashville, TN 37228

STANDARD TAT ☐
RUSH TAT ☒
☐ 24 hr. ☒ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

CONTAINER TYPE PLASTIC (P) or GLASS (G): G

PRESERVATIVE USED: HCl

TYPE OF ANALYSIS: TCL VOCs (48hr TAT)

DATE YEAR 2012	TIME	SAMPLE ID	MATRIX	GRAB (G) COMP (C)	No. OF CONTAINERS			COMMENTS
5-6	1436	S43RB03	QA	G	3	3	-27	Rinsate Blank
5-6	1440	S43FB03	QA	G	3	3	-28	Field Blank
5-4	1200	S43TB03	QA	G	2	2	-29	Trip Blank

Note: Vials are labeled S43EB03, but should be changed to S43RB03

5-7-12

	DATE	TIME		DATE	TIME
1. RELINQUISHED BY Jacob Birkett	5-7-12	1700	1. RECEIVED BY FedEx		
2. RELINQUISHED BY			2. RECEIVED BY		
3. RELINQUISHED BY			3. RECEIVED BY	5/8/12	0830

COMMENTS

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12

1205040 Summ Package

1205098

TETRA TECH NUS, INC. CHAIN OF CUSTODY | NUMBER № 1169 | PAGE 1 OF 2

PROJECT NO:	FACILITY:	PROJECT MANAGER	PHONE NUMBER	LABORATORY NAME AND CONTACT:
112G00771	NSF-Indian Head Site 43	Rob Sok	757-466-4904	Empirical Labs Brian Richard
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER: Jacob Birkett	PHONE NUMBER: 757-814-9916	ADDRESS: 621 Mainstream Dr. Suite 270
		CARRIER/WAYBILL NUMBER: FedEx 8741-9938-1015		CITY, STATE: Nashville, TN 37228

STANDARD TAT ☐
RUSH TAT ☒ ☐ 24 hr. ☒ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

CONTAINER TYPE PLASTIC (P) or GLASS (G): G P G
PRESERVATIVE USED: HCl HNO3 —

DATE YEAR 2012	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	Aqueous VOCs Quick Turn	Aqueous Total Metals Standard Turn	Aqueous Explosives Standard Turn	COMMENTS
5-11	0800	S43TB 04-20120511	—	—	—	QC	—	2	2			Lab prepared
5-11	0940	S43TW34-3236	TW34	32	36	GW	G	3	3			
5-11	0941	S43TW34-3236-D	TW34	32	36	GW	G	3	3			Duplicate
5-11	1000	S43TW34-2226	TW34	22	26	GW	G	9	9			Run MSMSD
5-11	1150	S43TW35-3236	TW35	32	36	GW	G	3	3			
5-11	1200	S43TW35-2226	TW35	22	26	GW	G	3	3			
5-11	1325	S43TW29-3236	TW29	32	36	GW	G	3	3			
5-11	1435	S43TWSA02-3034	TWSA02 / MW06	30	34	GW	G	3	3			Potential for elevated concentrations
5-11	1448	S43TWSA02-1418	TWSA02 / MW06	14	18	GW	G	3	3			
5-11	1632	S43TW33-3236	TW33	32	36	GW	G	3	3			
5-11	1650	S43TW33-2226	TW33	22	26	GW	G	3	3			
5-11	1409	S43TWSA01-3034	TWSA01 / MW01	30	34	GW	G	3	3			Potential for elevated concentrations
5-13	1438	S43RB03-20120513	—	—	—	QC	—	6	3	1	2	Rinsate for soils
5-13	1816	S43FB04-20120513	—	—	—	QC	—	6	3	1	2	Field Blank

15
16

	DATE	TIME		DATE	TIME
1. RELINQUISHED BY: Jacob Birkett	5-14-12	1700	1. RECEIVED BY: FedEx		
2. RELINQUISHED BY			2. RECEIVED BY		
3. RELINQUISHED BY			3. RECEIVED BY	5/15/12	0830

COMMENTS

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TtNUS-001

1205098

TETRA TECH NUS, INC.

CHAIN OF CUSTODY

NUMBER № 1170

PROJECT NO:	FACILITY:	PROJECT MANAGER	PHONE NUMBER	LABORATORY NAME AND CONTACT:
112G00771	NSF-Indian Head S.643	Rob Sok	757-466-4904	Empirical Labs Brian Richard
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER: Jacob Birkett	PHONE NUMBER: 757-814-9916	ADDRESS: 621 Mainstream Dr. Suite 270
		CARRIER/WAYBILL NUMBER: FedEx 8741-9938-1015		CITY, STATE: Nashville, TN 37228

STANDARD TAT ☒
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

CONTAINER TYPE PLASTIC (P) or GLASS (G): G G G

PRESERVATIVE USED: $NaHSO_4$ MeOH

TYPE OF ANALYSIS: VOCs, TAL Metals, Explosives

DATE YEAR 2012	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	VOCs	TAL Metals	Explosives					COMMENTS
5-13	0825	S43SB027-0001	SB027	0	1	SO	G	5	3	1	1	01				
5-13	0850	S43SB027-0708	SB027	7	8	SO	G	5	3	1	1	02				
5-13	0910	S43SB026-0001	SB026	0	1	SO	G	5	3	1	1	03				
5-13	0920	S43SB026-0506	SB026	5	6	SO	G	5	3	1	1	04				
5-13	0945	S43SB025-0001	SB025	0	1	SO	G	5	3	1	1	05				
5-13	0958	S43SB025-0607	SB025	6	7	SO	G	5	3	1	1	06				
5-13	1023	S43SB024-0001	SB024	0	1	SO	G	5	3	1	1	07				
5-13	1041	S43SB024-0607	SB024	6	7	SO	G	5	3	1	1	08				
5-13	1042	S43SB024-0607-D	SB024	6	7	SO	G	5	3	1	1	09				Duplicate
5-13	1110	S43SB023-0001	SB023	0	1	SO	G	5	3	1	1	10				
5-13	1111	S43SB023-0001-D	SB023	0	1	SO	G	5	3	1	1	11				Duplicate
5-13	1128	S43SB023-0607	SB023	6	7	SO	G	5	3	1	1	12				Elevated readings PID = 109 ppm
5-13	1203	S43SB028-0001	SB028	0	1	SO	G	5	3	1	1	13				
5-13	1215	S43SB028-0405	SB028	4	5	SO	G	15	9	3	3	14				Run MSMSD

	DATE	TIME		DATE	TIME
1. RELINQUISHED BY: Jacob Birkett	5-14-12	1700	1. RECEIVED BY: FedEx		
2. RELINQUISHED BY			2. RECEIVED BY		
3. RELINQUISHED BY			3. RECEIVED BY	5/15/12	0830

COMMENTS

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

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FORM NO. TtNUS-001

1205098

1206014

TETRA TECH NUS, INC. CHAIN OF CUSTODY | NUMBER | PAGE 1 OF 1

PROJECT NO: 112G00771	SITE NAME: NSF-Indian Head Site43	PROJECT MANAGER AND PHONE NUMBER: Rob Sok 757-466-4904	LABORATORY NAME AND CONTACT: Empirical Labs Brian Richard
SAMPLERS (SIGNATURE): [signature]		FIELD OPERATIONS LEADER AND PHONE NUMBER: Jacob Birkett 757-814-9916	ADDRESS: 621 Mainstream Dr. Suite 270
		CARRIER/WAYBILL NUMBER: FedEx 8741-9938-0980	CITY, STATE: Nashville, TN 37228

STANDARD TAT [X]
RUSH TAT [X]
[ ] 24 hr. [X] 48 hr. [ ] 72 hr. [ ] 7 day [ ] 14 day

DATE YEAR 2012	TIME	SAMPLE ID	MATRIX	GRAB (G) COMP (C)	No. OF CONTAINERS	TYPE OF ANALYSIS: Aqueous 48 TAT VOCs	Aqueous Standard TAT VOCs							COMMENTS
CONTAINER TYPE PLASTIC (P) or GLASS (G)						G	G							
PRESERVATIVE USED						HCl	HCl							
6-1	0900	S43TB05-20120601	QA	-	3	3							01	Trip Blank - Lab prepared
6-1	1124	S43TW36-3034	GW	G	3	3							02	
6-1	1129	S43TW36-2024	GW	G	9	9							03	Run MSMSD
6-1	1405	S43TW37-2024	GW	G	3	3							04	
6-1	1406	S43TW37-2024-D	GW	G	3	3							05	Duplicate
6-1	1409	S43TW37-3135	GW	G	3	3							06	
6-2	1420	S43TW38-1822	GW	G	3	3							07	
6-2	1442	S43TW38-2832	GW	G	3	3							08	
6-2	1815	S43MW09S-Grab	GW	G	3	3							09	
6-2	1830	S43MW09D-Grab	GW	G	3	3							10	
6-2	1835	S43TW39-0812	GW	G	3*	3*							11	* Only 2 vials fully filled 1 vial half full
6-3	1115	S43MW12-Grab	GW	G	3	3							12	
6-3	1130	S43RB04-20120603	QA	-	3	~~2~~ 3							13	Rinsate on TW screen
6-3	1140	S43FB05-20120603	QA	-	3	~~2~~ 3							14	Source Blank-Bathroom

1. RELINQUISHED BY: Jacob Birkett [signature]	DATE: 6-4-12	TIME: 1700	1. RECEIVED BY: FedEx	DATE	TIME
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY: Jack Deville Jr.	DATE: 6-05-12	TIME: 0815

COMMENTS

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

3/99
FORM NO. TtNUS-001

1206014 Summ Package

~~120619~~ JD 6-19-12

TETRA TECH NUS, INC.

CHAIN OF CUSTODY | NUMBER № 1173 | PAGE 1 OF 1

PROJECT NO:	FACILITY:	PROJECT MANAGER	PHONE NUMBER	LABORATORY NAME AND CONTACT:
112G00771	NSF-Indian Head Site 43	Rob Sok	757-466-4904	Empirical, Brian Richard
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER	PHONE NUMBER	ADDRESS
		Jacob Birkett	757-814-9916	621 Mainstream Dr. Suite 270
		CARRIER/WAYBILL NUMBER		CITY, STATE
		FedEx 8741-9938-0957		Nashville, TN 37228

STANDARD TAT ☐
RUSH TAT ☒
☒ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

CONTAINER TYPE PLASTIC (P) or GLASS (G): G
PRESERVATIVE USED: HCl

DATE YEAR 2012	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: Aqueous 24 Hr TAT QT VOCS								COMMENTS	
6-18	0700	S43TB06-20120618	—	—	—	QC	—	2	2								Lab prepared	01
6-18	1022	S43TW41-1822	TW41	18	22	GW	G	3	3									02
6-18	1023	S43TW41-1822-D	TW41	18	22	GW	G	3	3								Duplicate	03
6-18	1035	S43TW41-3337	TW41	33	37	GW	G	3	3	*Note: Only 2 vials filled (1 has pen sized bubble)								04
6-18	1230	S43TW42-1822	TW42	18	22	GW	G	3	3									05
6-18	1330	S43TW42-3337	TW42	33	37	GW	G	3	3									06
6-18	1425	S43TW40-3236	TW40	32	36	GW	G	3	3									07
~~6-18~~	~~1445~~	~~S43TW40-1822~~ 6-18-12	~~TW40~~	~~18~~	~~22~~	~~GW~~	~~G~~	Removed from cooler, will ship on 6-19-12										~~08~~ JD 6-19-1

6-18-12

1. RELINQUISHED BY	DATE	TIME	1. RECEIVED BY	DATE	TIME
Jacob Birkett	6-18-12	1830			
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY	DATE	TIME
			Jack Devillyn	6-19-12	0815

COMMENTS

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TINUS-001

120131

TETRA TECH NUS, INC.

CHAIN OF CUSTODY | NUMBER № 1174 | PAGE 1 OF 1

PROJECT NO:	FACILITY:	PROJECT MANAGER	PHONE NUMBER	LABORATORY NAME AND CONTACT:
112G00771	NSF-Indian Head Site 43	Rob Sok	757-466-4904	Empirical Labs, Brian Richard
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER: Jacob Birkett	PHONE NUMBER: 757-814-9916	ADDRESS: 621 Mainstream Dr. Suite 270
		CARRIER/WAYBILL NUMBER: FedEx 8741-9938-0730		CITY, STATE: Nashville, TN 37228

STANDARD TAT ☐
RUSH TAT ☒
☒ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

CONTAINER TYPE PLASTIC (P) or GLASS (G): G
PRESERVATIVE USED: HCl

DATE YEAR 2012	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: Quick Turn Aqueous VOCs 24 hour							COMMENTS
6-19	0730	S43TB07-20120619	—	—	—	QC	-	2	2					01		Lab prepared
6-19	0846	S43TW43-1519	TW43	15	19	GW	G	3	3					02		
6-19	1008	S43TW40-2226	TW40	22	26	GW	G	3	3					03		
6-19	1155	S43TW44-1317	TW44	13	17	GW	G	3	3					04		
6-19	1512	S43TW45-2024	TW45	20	24	GW	G	9	9					05		Run MSMSD
6-19	1715	S43TW49-1721	TW49	17	21	GW	G	3	3					06		Duplicate
6-19	1716	S43TW49-1721-D	TW49	17	21	GW	G	3	3					07		

6-19-12

	DATE	TIME		DATE	TIME
1. RELINQUISHED BY: Jacob Birkett	6-19-12	1830	1. RECEIVED BY		
2. RELINQUISHED BY			2. RECEIVED BY		
3. RELINQUISHED BY			3. RECEIVED BY: Jack Deville Jr.	6-20-12	0815

COMMENTS

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TtNUS-001

120641

TETRA TECH NUS, INC. CHAIN OF CUSTODY | NUMBER № 1175 | PAGE 1 OF 1

PROJECT NO: 112G00771	FACILITY: NSF-Indian Head Site43	PROJECT MANAGER Rob Sok	PHONE NUMBER 757-466-4904
LABORATORY NAME AND CONTACT: Empirical Labs, Brian Richard			
SAMPLERS (SIGNATURE)	FIELD OPERATIONS LEADER Jacob Birkett	PHONE NUMBER 757-814-9916	ADDRESS 621 Mainstream Dr. Suite 270
	CARRIER/WAYBILL NUMBER FedEx AirBill # 8741-9938-1243		CITY, STATE Nashville, TN 37228

STANDARD TAT ☐
RUSH TAT ☒
☒ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

CONTAINER TYPE PLASTIC (P) or GLASS (G): G
PRESERVATIVE USED: HCl
TYPE OF ANALYSIS: Aqueous 24 TAT VOCs

DATE YEAR 2012	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								COMMENTS
6-20	0730	543TB08-20120620	—	—	—	QC	—	2	2						01	Lab prepared
6-20	0851	543TW50-1822	TW50	18	22	GW	G	3	3						02	
6-20	1242	543TW48-4044	TW48	40	44	GW	G	3	3						03	
6-20	1723	543SW01-20120620	SW01	—	—	SW	G	3	3						04	Seep sample near TW44 ditch near culvert

6-20-12

1. RELINQUISHED BY Jacob Birkett	DATE 6-20-12	TIME 1800	1. RECEIVED BY	DATE	TIME
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY jack doughty	DATE 6-21-12	TIME 0820

COMMENTS

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TtNUS-001

1RU6151

TETRA TECH NUS, INC. CHAIN OF CUSTODY | NUMBER № 1176 | PAGE 1 OF 1

PROJECT NO:	FACILITY:	PROJECT MANAGER	PHONE NUMBER	LABORATORY NAME AND CONTACT:
112G00771	NSF-Indian Head Site 43	Rob Sok	757-466-4904	Empirical Labs Brian Richard
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER	PHONE NUMBER	ADDRESS
		Jacob Birkett	757-814-9916	621 Mainstream Dr. Suite 270
		CARRIER/WAYBILL NUMBER		CITY, STATE
		FedEx Airbill # 8741-9938-1232		Nashville, TN 37228

STANDARD TAT ☐
RUSH TAT ☒
☒ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

CONTAINER TYPE PLASTIC (P) or GLASS (G)

PRESERVATIVE USED

TYPE OF ANALYSIS: VOCs 24 hour TAT; VOCs Regular TAT

DATE YEAR 2012	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	VOCs 24 hour TAT	VOCs Regular TAT							COMMENTS
6-21	0730	S43TB09-20120621	—	—	—	QC	-	2	2					01			Lab prepared
6-21	0738	S43TW47-1014	TW47	10	14	GW	G	3	3					02			
6-21	1035	S43TW45-3741	TW45	37	41	GW	G	3	3					03			Very Muddy
6-21	1201	S43TW51-1721	TW51	17	21	GW	G	3	3					04			
6-21	1551	S43TW52-1014	TW52	10	14	GW	G	3	3					05			
6-21	1630	S43SP02-01	SP02	—	—	SW	G	3	3					06			Seep sample
6-22	0942	S43TW53-2428	TW53	24	28	GW	G	3	3					07			
6-22	0943	S43TW53-2428-D	TW53	24	28	GW	G	3	3					08			Duplicate
6-22	0945	S43TW53-1317	TW53	13	17	GW	G	3	3					09			
6-22	1015	S43RB05-20120622	—	—	—	QC	G	3	~~3~~ 3					10			Rinsate on TW screen
6-22	1048	S43TW54-1721	TW54	17	21	GW	G	3	3					11			
6-22	1150	S43TW56-1620	TW56	16	20	GW	G	3	3					12			
6-22	1220	S43TW55-1822	TW55	18	22	GW	G	3	3					13			
6-22	1235	S43FB06-20120622	—	—	—	QC	G	3	~~2~~ 3					14			Source Blank

	DATE	TIME		DATE	TIME
1. RELINQUISHED BY Jacob Birkett	6-22-12	1430	1. RECEIVED BY FedEx		
2. RELINQUISHED BY			2. RECEIVED BY		
3. RELINQUISHED BY			3. RECEIVED BY jack deville jr	6-23-12	0810

COMMENTS

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TtNUS-001

1207073

TETRA TECH NUS, INC.

CHAIN OF CUSTODY | NUMBER

PAGE 1 OF 1

PROJECT NO: 112G00771	SITE NAME: NSF-Indian Head Site 43	PROJECT MANAGER AND PHONE NUMBER: Rob Sok 757-466-4904	LABORATORY NAME AND CONTACT: Empirical Laboratories Brian Richard
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER AND PHONE NUMBER: Jacob Birkett 757-814-9916	ADDRESS: 621 Mainstream Drive Suite 270
		CARRIER/WAYBILL NUMBER: FedEx 8741-9938-1254	CITY, STATE: Nashville, TN 37228

STANDARD TAT ☐
RUSH TAT ☒
☒ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

DATE YEAR 2012	TIME	SAMPLE ID	MATRIX	GRAB (G) COMP (C)	No. OF CONTAINERS	TYPE OF ANALYSIS: Quick turn (48 hr) Aqueous VOCs								COMMENTS
CONTAINER TYPE PLASTIC (P) or GLASS (G)						G								
PRESERVATIVE USED						HCl								
7-9	0700	543TB10-20120709	QA	G	2	2					01			Lab prepared
7-12	1545	543TW57-1923	GW	G	3	3					02			
7-13	0720	543TW57-2933	GW	G	3	3					03			

7-13-12

1. RELINQUISHED BY: Jacob Birkett	DATE: 7-13-12	TIME: 1830	1. RECEIVED BY	DATE	TIME
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY: Jack Deville Jr.	DATE: 7-14-12	TIME: 0830

COMMENTS

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3/99
FORM NO. TINUS-001

1207073 Summ Package 10

1207112

TETRA TECH NUS, INC. CHAIN OF CUSTODY | NUMBER | PAGE 1 OF 1

PROJECT NO:	SITE NAME:	PROJECT MANAGER AND PHONE NUMBER	LABORATORY NAME AND CONTACT:
112G00771	Site 43 NSF-Indian Head	Rob Sok 757-466-4907	Empirical Laboratories, LLC Brian Richard
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER AND PHONE NUMBER: Jacob Birkett 757-814-9916	ADDRESS: 621 Mainstream Dr. Suite 270
		CARRIER/WAYBILL NUMBER: FedEx 8741-9938-0762	CITY, STATE: Nashville, TN 37228

STANDARD TAT ☒
RUSH TAT ☐ ☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

DATE YEAR 2012	TIME	SAMPLE ID	MATRIX	GRAB (G) COMP (C)	No. OF CONTAINERS	VOCs	TAL Metals (Total)	TAL Dissolved Metals (Filtered)	Explosives incl. Nitroglycerin Nitroguanidine				COMMENTS
CONTAINER TYPE PLASTIC (P) or GLASS (G)						G	P	P	P				
PRESERVATIVE USED						HCl	HNO_3	HNO_3	—				
7-18	1400	S43TB11-20120718	QA	—	2	2						01	Lab prepared
7-18	1505	S43MW26-01	GW	G	7	3	1	1	2		02/03	02	JD 7-21-12
7-19	1044	S43MW20-01	GW	G	7	3	1	1	2		04/05	03	
7-19	1214	S43MW22-01	GW	G	7	3	1	1	2		06/07	04	
7-20	0917	S43MW24-01	GW	G	7	3	1	1	2		08/09	05	
7-20	1053	S43MW25-01	GW	G	7	3	1	1	2		10/11	06	
7-20	1210	S43MW23-01	GW	G	7	3	1	1	2		12/13	07	

7-20-12

1. RELINQUISHED BY: Jacob Birkett	DATE 7-20-12	TIME 1500	1. RECEIVED BY	DATE	TIME
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY: Jack Dardle	DATE 7-21-12	TIME 835

COMMENTS

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FORM NO. TtNUS-001

TETRA TECH NUS, INC. CHAIN OF CUSTODY | NUMBER 1207126 | PAGE 1 OF 5

PROJECT NO:	SITE NAME:	PROJECT MANAGER AND PHONE NUMBER	LABORATORY NAME AND CONTACT:
112G00771	NSF-Indian Head Site 43	Rob Sak 757-466-4904	Empirical Laboratories Brian Richard
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER AND PHONE NUMBER: Jacob Birkett	ADDRESS: 621 Mainstream Dr. Suite 270
		CARRIER/WAYBILL NUMBER: FedEx 8741-9938-1162	CITY, STATE: Nashville, TN 37228

STANDARD TAT ☒
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

CONTAINER TYPE PLASTIC (P) or GLASS (G): G G P P G P P

PRESERVATIVE USED: HCl – HNO3 HNO3 HCl HNO3 HNO3

TYPE OF ANALYSIS

DATE YEAR 2012	TIME	SAMPLE ID	MATRIX	GRAB (G) COMP (C)	No. OF CONTAINERS	VOCs	Explosives	Total Metals	Dissolved Filtered Metals	TCE	Total Cobalt ~~Dissolved~~ 7-23-12	Filtered ~~Metals~~ 7-23-12 Dissolved Cobalt	COMMENTS
7-21	0900	S43TB12-20120721	QA	–	2	2					– 01		Lab prepared
7-21	0948	S43MW1101	GW	G	18	9	6	3			– 02		Run MSMSD
7-21	0948	S43MW1101-F	GW	G	3				3		– 03		Run MSMSD (Filtered)
7-21	1005	S43MW19S01	GW	G	6	3	2	1			– 04		
7-21	1005	S43MW19S01-F	GW	G	1				1		– 05		Filtered
7-21	1005	S43MW19S01-D	GW	G	6	3	2	1			– 06		Duplicate
7-21	1005	S43MW19S01-DF	GW	G	1				1		– 07		Duplicate Filtered
7-21	1135	S43MW17D01	GW	G	6	3	2	1			– 08		
7-21	1135	S43MW17D01-F	GW	G	1				1		– 09		Filtered
7-21	1140	S43MW19D01	GW	G	6	3	2	1			– 10		
7-21	1140	S43MW19D01-F	GW	G	1				1		– 11		Filtered
7-21	1237	S43MW17S01	GW	G	6	3	2	1			– 12		
7-21	1237	S43MW17S01-F	GW	G	1				1		– 13		Filtered

	DATE	TIME		DATE	TIME
1. RELINQUISHED BY Jacob Birkett	7-23-12	0900	1. RECEIVED BY FedEx		
2. RELINQUISHED BY			2. RECEIVED BY		
3. RELINQUISHED BY			3. RECEIVED BY	7/24/12	0820

COMMENTS

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FORM NO. TtNUS-001

11

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TETRA TECH NUS, INC. | CHAIN OF CUSTODY | NUMBER 1C4 + 1C6 | PAGE 2 OF 5

PROJECT NO: 112G00771	SITE NAME: NSF-Indian Head Site 43	PROJECT MANAGER AND PHONE NUMBER: Rob Sok 757-466-4904	LABORATORY NAME AND CONTACT: Empirical Laboratories Brian Richard
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER AND PHONE NUMBER: Jacob Birkett 757-814-9916	ADDRESS: 621 Mainstream Dr Suite 270
		CARRIER/WAYBILL NUMBER: FedEx 8741-9938-1162	CITY, STATE: Nashville, TN 37228

STANDARD TAT ☒
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

DATE YEAR 2012	TIME	SAMPLE ID	MATRIX	GRAB (G) COMP (C)	No. OF CONTAINERS	VOC	Explosives	Total Metals	Filtered Dissolved Metals	TCE	Total Cobalt	Filtered Dissolved Cobalt	Ignite/Corr	TCLP Metals	COMMENTS
CONTAINER TYPE PLASTIC (P) or GLASS (G)						G	G	P	P	G	P	P	P	P	
PRESERVATIVE USED						HCl	/	HNO3	HNO3	HCl	HNO3	HNO3	/	HNO3	
7-21	1310	S43MW1801	GW	G	6	3	2	1							-14
7-21	1310	S43MW1801-F	GW	G	1				1						Filtered -15
7-21	1457	S43AQIDW01-20120721	GW	C	5	3							1	1	IDW -16
7-21	1515	S43AQIDW02-20120721	GW	C	5	3							1	1	IDW -17
7-21	1735	S43MW0801	GW	G	6	3	2	1							-18
7-21	1735	S43MW0801-F	GW	G	1				1						Filtered -19
7-21	1803	S43MW0602	GW	G	6	3	2	1							-20
7-21	1803	S43MW0602-F	GW	G	1				1						Filtered -21
7-21	1805	S43MW2101	GW	G	6	3	2	1							-22
7-21	1805	S43MW2101-F	GW	G	1				1						Filtered -23
7-22	0955	S43MW1401	GW	G	4	BAA 7-23-12				3	1				-24
7-22	0955	S43MW1401-F	GW	G	1							1			Filtered -25
7-22	1010	S43MW0901	GW	G	6	3	2	1							-26

	DATE	TIME		DATE	TIME
1. RELINQUISHED BY	7-23-12	0900	1. RECEIVED BY FedEx		
2. RELINQUISHED BY			2. RECEIVED BY		
3. RELINQUISHED BY			3. RECEIVED BY	7/24/12	0820

COMMENTS

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3/99
FORM NO. TtNUS-001

1207126

EMPIRICAL LABORATORIES, LLC - CHAIN OF CUSTODY RECORD

SHIP TO: 621 Mainstream Drive, Suite 270 ♦ Nashville, TN 37228 ♦ 615-345-1115 ♦ (fax) 615-846-5426

17028

13

Send Results to:
Name Tetra Tech
Company
Address 5700 Lake Wright Dr, Ste 309
City Norfolk
State, Zip VA 23502
Phone
Fax
E-mail

Project No./Name:

Send Invoice to:
Name
Company See
Address
City
State, Zip Contract
Phone
Fax
E-mail

Sampler's (Signature):

Analysis Requirements:

Lab Use Only:

VOA Headspace	Y	N	NA
Field Filtered	Y	N	NA
Correct Containers	Y	N	NA
Discrepancies	Y	N	NA
Cust. Seals Intact	Y	N	NA
Containers Intact	Y	N	NA

Airbill #:

CAR #:

Lab Use Only Lab #	Date/Time Sampled	Sample Description	Sample Matrix	VOCs	Explosives	Total Metals	Filtered Metals (Dissolved)	TCE	Total Cobalt	Filtered Dissolved Cobalt	Comments	No. of Bottles	Lab Use Only Containers/Pres.
-27 -26	7.22.12 1010	S43MW09S01-F	GW				1				Filtered	1	
-28 -27	7.22.12 1025	S43MW0502	GW	3	2	1						6	
-29 -28	7.22.12 1025	S43MW0502-F	GW				1				Filtered	1	
-30 -29	7.22.12 1100	S43MW1301	GW					3	1			4	
-31 -30	7.22.12 1100	S43MW1301-F	GW							1	Filtered	1	
-32 -31	7.22.12 1132	S43MW09D01	GW	3	2	1						6	
-33 -32	7.22.12 1132	S43MW09D01-F	GW				1				Filtered	1	
-34 -33	7.22.12 1150	S43MW0204	GW					3	1			4	
-35 -34	7.22.12 1150	S43MW0204-F	GW							1	Filtered	1	
-36 -35	7.22.12 1150	S43MW0204-D	GW					3	1		Duplicate	4	
-37 -36	7.22.12 1150	S43MW0204-DF	GW							1	Filtered	1	
	7.22.12 1155	S43MW0302	GW	3	2	1						6	

Sample Kit Prep'd by: (Signature)	Date/Time	Received By: (Signature)
	7.23.12 0940	FedEx
Relinquished by: (Signature)	Date/Time	Received By: (Signature)
Relinquished by: (Signature)	Date/Time	Received By: (Signature)
Received for Laboratory By: (Signature)	Date/Time 7/24/12 0820	*Temperature* 19

REMARKS:

Details:
Page 3 of 5
Cooler No. ___ of ___
Date Shipped 7.23-12
Shipped By GB EW
Turnaround Std

Distribution: Original and yellow copies accompany sample shipment to laboratory; Pink retained by samplers.

1207126 Summ Package

EMPIRICAL LABORATORIES, LLC - CHAIN OF CUSTODY RECORD

1207127 SHIP TO: 621 Mainstream Drive, Suite 270 ♦ Nashville, TN 37228 ♦ 615-345-1115 ♦ (fax) 615-846-5426

17025

12

Send Results to:

Name
Company See Previous
Address
City
State, Zip
Phone
Fax
E-mail

Send Invoice to:

Name
Company
Address
City
State, Zip
Phone
Fax
E-mail

Project No./Name:

Sampler's (Signature):

Analysis Requirements:

Lab Use Only:

VOA Headspace	Y	N	NA
Field Filtered	Y	N	NA
Correct Containers	Y	N	NA
Discrepancies	Y	N	NA
Cust. Seals Intact	Y	N	NA
Containers Intact	Y	N	NA

Airbill #:

CAR #:

Lab Use Only Lab #	Date/Time Sampled	Sample Description	Sample Matrix	VOCs	Explosives	Total Metals	Filtered Dissolved Metals	TCE	Total Cobalt	Filtered Dissolved Cobalt	Comments	No. of Bottles	Lab Use Only Containers/Pres.
-02	7-22-12 1155	S43MW0302-F	GW				1				Filtered	1	
-03	7-22-12 1300	S43MW1601	GW					3	1			4	
-04	7-22-12 1300	S43MW1601-F	GW							1	Filtered	1	
-05	7-22-12 1310	S43MW1001	GW	3	2	1						6	
-06	7-22-12 1310	S43MW1001-F	GW				1				Filtered	1	
-07	7-22-12 1345	S43MW1201	GW	3	2	1						6	
-08	7-22-12 1345	S43MW1201-F	GW				1				Filtered	1	
-09	7-22-12 1355	S43MW1501	GW					3	1			4	
-10	7-22-12 1355	S43MW1501-F	GW							1	Filtered	1	
-11	7-22-12 1430	S43MW0104	GW	3	2	1						6	
-12	7-22-12 1430	S43MW0104-F	GW				1				Filtered	1	
-13	7-22-12 143[illegible]	S43MW0104-D	GW	3	2	1					Duplicate	6	

	Date/Time	Received By: (Signature)
Sample Kit Prep'd by: (Signature)	7-23-12 0900	FedEx
Relinquished by: (Signature)		
Relinquished by: (Signature)		
Received for Laboratory by: (Signature)	7/24/12 0820	Temperature 19

REMARKS:

Details:

Page 4 of 5

Cooler No. ____ of ____

Date Shipped 7-23-12

Shipped By FB EW

Turnaround Std

Distribution: Original and yellow copies accompany sample shipment to laboratory; Pink retained by samplers.

1207127 Summ Package

1207127

EMPIRICAL LABORATORIES, LLC - CHAIN OF CUSTODY RECORD

17026

SHIP TO: 621 Mainstream Drive, Suite 270 ♦ Nashville, TN 37228 ♦ 615-345-1115 ♦ (fax) 615-846-5426

Send Results to:

Name
Company See previous Pages
Address
City
State, Zip
Phone
Fax
E-mail

Project No./Name:

Send Invoice to:

Name
Company
Address
City
State, Zip
Phone
Fax
E-mail

Sampler's (Signature):

Analysis Requirements:

Lab Use Only:

VOA Headspace	Y	N	NA
Field Filtered	Y	N	NA
Correct Containers	Y	N	NA
Discrepancies	Y	N	NA
Cust. Seals Intact	Y	N	NA
Containers Intact	Y	N	NA

Airbill #:

CAR #:

Lab Use Only Lab #	Date/Time Sampled	Sample Description	Sample Matrix	VOCs	Explosives	Total Metals	Dissolved Metals	Ignite/Corrosive	TCLP Metals (Aqueous)	TCLP Metals (Soils), VOCs, Ign/Corr							Comments	No. of Bottles	Lab Use Only Containers/Pres.
-14	7-22-12 1431	543MW0104-DF	GW				1										Duplicate Filtered	1	
-15	7-22-12 1510	543MW0402	GW	9	6	3											Run MSMSD	18	
-16	7-22-12 1510	543MW0402-F	GW				3										Run MSMSD Filtered	3	
~~-17~~ -17	7-22-12 1608	543MW0701	GW	3	2	1												6	
-18	7-22-12 1608	543MW0701-F	GW				1										Filtered	1	
-19	7-22-12 1640	543FB07-20120722	QA	3	2	1											Field Blank	6	
-20	7-22-12 1640	543FB07-20120722	QA				1										Field Blank Filtere	1	
-21	7-22-12 1800	543AQIDW03-20120722	GW	3				1	1								IDW	5	
-22	7-21-12 1535	543SOIDW01-20120721	SO							4							IDW	4	
-23	7-21-12 1545	543SOIDW02-20120721	SO							4							IDW		

	Date/Time	Received By: (Signature)
Sample Kit Prep'd by: (Signature)	7-23-12 0900	FedEx
Relinquished by: (Signature)	Date/Time	Received By: (Signature)
Relinquished by: (Signature)	Date/Time	Received By: (Signature)
Received for Laboratory by: (Signature)	Date/Time 7/24/12 0820	*Temperature* 1.9

REMARKS:

Details:

Page 5 of 5

Cooler No. ___ of ___

Date Shipped 7-23-12

Shipped By JB EW

Turnaround Std

Distribution: Original and yellow copies accompany sample shipment to laboratory; Pink retained by samplers.

1207127 Summ Package

13

1207125

EMPIRICAL LABORATORIES, LLC - CHAIN OF CUSTODY RECORD

SHIP TO: 621 Mainstream Drive, Suite 270 ♦ Nashville, TN 37228 ♦ 615-345-1115 ♦ (fax) 615-846-5426

17027

9

Send Results to:	Send Invoice to:	Analysis Requirements:	Lab Use Only:
Name	Name See	VOCs	VOA Headspace Y N NA
Company Tetra Tech	Company Contract		Field Filtered Y N NA
Address 5700 Lake Wright Dr. Ste 309	Address		Correct Containers Y N NA
City Norfolk	City		Discrepancies Y N NA
State, Zip VA 23502	State, Zip		Cust. Seals Intact Y N NA
Phone	Phone		Containers Intact Y N NA
Fax	Fax		Airbill #:
E-mail	E-mail		CAR #:
Project No./Name:	Sampler's (Signature):		

Lab Use Only Lab #	Date/Time Sampled	Sample Description	Sample Matrix	VOCs	Comments	No. of Bottles	Lab Use Only Containers/Pres.
-01	7-22-12 0955	5431041 VOC	GW	3		3	

Sample Kit Prep'd by: (Signature)	Date/Time	Received By: (Signature)
	7-23-12 0900	FedEx
Relinquished by: (Signature)	Date/Time	Received By: (Signature)
Relinquished by: (Signature)	Date/Time	Received By: (Signature)
Received for Laboratory by: (Signature)	Date/Time 7/24/12 0820	Temperature 19

REMARKS:

Details:

Page 1 of 1

Cooler No. ____ of ____

Date Shipped 7-23-12

Shipped By FEW

Turnaround Std

Distribution: Original and yellow copies accompany sample shipment to laboratory; Pink retained by samplers.

1207125 Summ Package

2013

Chain of Custody Records

Air Toxics LTD.

CHAIN-OF-CUSTODY RECORD

Sample Transportation Notice
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180 BLUE RAVINE ROAD, SUITE B
FOLSOM, CA 95630-4719
(916) 985-1000 FAX (916) 985-1020

Project Manager: Rob Sok
Collected by: (Print and Sign) Charles Mayer
Company: Tetra Tech Email: Rob.Sok@tetratech.com
Address: 5700 Lake Wright Dr. Suite 309 City: Norfolk State: VA Zip: 23502
Phone: 757-466-4904 Fax:

Project Info:
P.O. #:
Project #: 112G00771 CTO 114
Project Name: NSF Indian Head S.643

Turn Around Time:
☒ Normal
☐ Rush
specify

Lab Use Only
Pressurized by:
Date:
Pressurization Gas: N_2 He

Lab I.D.	Field Sample I.D. (Location)	Can #	Date of Collection	Time of Collection	Analyses Requested	Canister Pressure/Vacuum Initial	Final	Receipt	Final (psi)
01A	543SG08-0708	1580	5-6-13	1608	Modified TO-15 H/Lo (SH)	-30	-7		
02A	543SG07-1011	3727	5-6-13	1710	↓	-30	-3		
03A	543SG05-0708	34439	5-6-13	1810	↓	-29	-7.5		
04A	543SGDup01	9417	5-6-13	1230	↓	-30	-8.5		
05A	543SG06-0708	34384	5-7-13	0917	↓	-30	-3		

Relinquished by: (signature)	Date/Time	Received by: (signature)	Date/Time
Jacob Birkett	5-7-13 1850	FedEx	
Relinquished by: (signature)	Date/Time	Received by: (signature)	Date/Time
		Kathy Decker ATL	05/08/13 1022
Relinquished by: (signature)	Date/Time	Received by: (signature)	Date/Time

Notes:

Lab Use Only	Shipper Name	Air Bill #	Temp (°C)	Condition	Custody Seals Intact?	Work Order #
	FedEx	8634-8642-7776	NA	good	Yes (circled) No None	1305145

Form 1293 rev.11

1305111

EMPIRICAL LABORATORIES, LLC - CHAIN OF CUSTODY RECORD

SHIP TO: 621 Mainstream Drive, Suite 270 ♦ Nashville, TN 37228 ♦ 615-345-1115 ♦ (fax) 615-846-5426

16640

10

Send Results to:	Send Invoice to:	Analysis Requirements:	Lab Use Only:
Name Rob Sok	Name See Contract	VOCs, Total Metals	VOA Headspace Y N NA
Company Tetra Tech	Company		Field Filtered Y N NA
Address 5700 Lake Wright Dr. Ste 300	Address		Correct Containers Y N NA
City Norfolk	City		Discrepancies Y N NA
State, Zip VA 23502	State, Zip		Cust. Seals Intact Y N NA
Phone 757-466-4904	Phone		Containers Intact Y N NA
Fax	Fax		Airbill #: 8634 8642 7684
E-mail Rob.Sok@tetratech.com	E-mail		CAR #:
Project No./Name:	Sampler's (Signature):		

Lab Use Only Lab #	Date/Time Sampled	Sample Description	Sample Matrix	VOCs	Total Metals	Comments	No. of Bottles	Lab Use Only Containers/Pres.
-01	5-8-13 1300	S43TB02-20130508	QC	2		Trip Blank	2	
-02	5-8-13 1305	S43MW18D02	GW	3	1		4	
-03	5-8-13 1445	S43MW19S02	GW	3	1		4	
-04	5-8-13 1510	S43MW24D02	GW	3	1		4	
-05	5-8-13 1612	S43MW25D02	GW	3	1		4	
-06	5-8-13 1640	S43MW19D02	GW	3	1		4	
-07	5-8-13 1813	S43MW00105	GW	3	1		4	
-08	5-8-13 1800	S43MW02102	GW	3	1		4	
-09	5-8-13 1600	S43Dup01-20130508	GW	3	1	Duplicate	4	

5-8-13

Sample Kit Prep'd by: (Signature)	Date/Time	Received By: (Signature)
Jacob Birkett	5-8-13 1700	FedEx
Relinquished by: (Signature)	Date/Time	Received By: (Signature)
Relinquished by: (Signature)	Date/Time	Received By: (Signature)
Received for Laboratory by: (Signature)	Date/Time 5/9/13 0830	Temperature 1.3 INT

REMARKS:

Details:

Page 1 of 1

Cooler No. 1 of 1

Date Shipped ~~5-8-13~~ 5-9-13

Shipped By J.Birkett

Turnaround Standard

Distribution: Original and yellow copies accompany sample shipment to laboratory; Pink retained by samplers.

1305111 Summ Package

EMPIRICAL LABORATORIES, LLC - CHAIN OF CUSTODY RECORD

1305126 SHIP TO: 621 Mainstream Drive, Suite 270 ♦ Nashville, TN 37228 ♦ 615-345-1115 ♦ (fax) 615-846-5426 16631

Send Results to:
Name Rob Sok
Company Tetra Tech
Address 5700 Lake Wright Dr. Ste 300
City Norfolk
State, Zip VA 23502
Phone 757-466-4904
Fax
E-mail Rob.Sok@tetratech.com

Send Invoice to:
See Contract

Project No./Name:

Sampler's (Signature):

Analysis Requirements: VOCs; Total Metals; Dissolved Metals*

Lab Use Only:

VOA Headspace	Y	N	NA
Field Filtered	Y	N	NA
Correct Containers	Y	N	NA
Discrepancies	Y	N	NA
Cust. Seals Intact	Y	N	NA
Containers Intact	Y	N	NA

Airbill #:
CAR #:

Lab Use Only Lab #	Date/Time Sampled	Sample Description	Sample Matrix	VOCs	Total Metals	Dissolved Metals*	Comments	No. of Bottles	Lab Use Only Containers/Pres.
01	5-9-13 1015	S43TB03-20130509	QC	2			Trip Blank	2	
02	5-9-13 1137	S43MW01102	GW	3	1			4	
03	5-9-13 1205	S43MW02302	GW	9	3		Run MSMSD	12	
04	5-9-13 1237	S43MW017S02	GW	3	1			4	
05	5-9-13 1337	S43MW017D02	GW	3	1			4	
06	5-9-13 1355	S43MW02202	GW	3	1			4	
07/08	5-9-13 1525	S43MW02002	GW	3	1	1		5	
09	5-9-13 1540	S43MW00802	GW	3	1			4	
10	5-9-13 1760	S43MW02602	GW	3	1			4	
11/12	5-9-13 1620	S43FB01-20130509	QC	3	1	1	Field Blank	5	
13/14	5-9-13 1807	S43MW00603	GW	3	1	1		5	
15	5-9-13 1815	S43MW00303	GW	3	1			4	

	Date/Time	Received By: (Signature)
Sample Kit Prep'd by: (Signature) Jacob Birkett	5-10-13 1300	
Relinquished by: (Signature)	Date/Time	Received By: (Signature)
Relinquished by: (Signature)	Date/Time	Received By: (Signature)
Received for Laboratory By: (Signature)	Date/Time 5/10/13	Temperature 3.4 INT

REMARKS:
*For Filtered/Dissolved Metals use a "-F" designator at end of Sample ID to designate Filtered

Details:
Page 1 of 3
Cooler No. ___ of ___
Date Shipped 5-10-13
Shipped By J. Birkett
Turnaround Standard

Distribution: Original and yellow copies accompany sample shipment to laboratory; Pink retained by samplers.

1305126 Summ Package 10

EMPIRICAL LABORATORIES, LLC - CHAIN OF CUSTODY RECORD

1305126

SHIP TO: 621 Mainstream Drive, Suite 270 ♦ Nashville, TN 37228 ♦ 615-345-1115 ♦ (fax) 615-846-5426

16632

11

Send Results to:	Send Invoice to:
Name Rob Sok	Name See Contract
Company TetraTech	Company
Address 5700 Lake Wright Dr. Ste 300	Address
City Norfolk	City
State, Zip VA 23502	State, Zip
Phone 757-466-4904	Phone
Fax	Fax
E-mail Rob.Sok@tetratech.com	E-mail
Project No./Name:	Sampler's (Signature):

Analysis Requirements: Aqueous | Soils

Lab Use Only:

VOA Headspace	Y	N	NA
Field Filtered	Y	N	NA
Correct Containers	Y	N	NA
Discrepancies	Y	N	NA
Cust. Seals Intact	Y	N	NA
Containers Intact	Y	N	NA

Airbill #:

CAR #:

Lab Use Only Lab #	Date/Time Sampled	Sample Description	Sample Matrix	VOCs	Total Metals	Dissolved Metals*	VOCs	Total Metals	Comments	No. of Bottles	Lab Use Only Containers/Pres.
16/17	5-9-13 1912	S43MW01002-F/S 5-9-13	GW	3	1	1				5	
18/19	5-9-13 1940	S43MW00503	GW	3	1	1				5	
20	5-9-13 1340	S43MW017D02-D	GW	3	1					4	
21	5-10-13 0900	S43SW02	SW	3	1					4	
22	5-10-13 0910	S43SD02	SD				3	1		4	
23	5-10-13 0915	S43SW01	SW	3	1					4	
24	5-10-13 0917	S43SW01-D	SW	3	1				Duplicate	4	
25	5-10-13 0925	S43SD01	SD				3	1		4	
26	5-10-13 0927	S43SD01-D	SD				3	1		4	
27	5-10-13 1000	S43CL01	SW	3	1					4	
28	5-10-13 1010	S43SP0102	GW	3	1					4	
29	5-10-13 1020	S43SW04	SW	9	3				Run MSMSD	12	

Sample Kit Prep'd by: (Signature)	Date/Time	Received By: (Signature)
Jacob Birkett	5-10-13 1300	
Relinquished by: (Signature)	Date/Time	Received By: (Signature)
Relinquished by: (Signature)	Date/Time	Received By: (Signature)
Received for Laboratory by: (Signature)	Date/Time 5/14/13 0830	*Temperature* 3.4 INIT

REMARKS:

* See first page

Details:

Page 2 of 3

Cooler No. ____ of ____

Date Shipped 5-10-13

Shipped By JB

Turnaround Standard

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1305126 Summ Package

EMPIRICAL LABORATORIES, LLC - CHAIN OF CUSTODY RECORD

16635

1305126

SHIP TO: 621 Mainstream Drive, Suite 270 ♦ Nashville, TN 37228 ♦ 615-345-1115 ♦ (fax) 615-846-5426

Send Results to:

Name Rob Sok
Company Tetra Tech
Address 5700 Lake Wright Dr. St 309
City Norfolk
State, Zip VA 23502
Phone 757-466-4904
Fax
E-mail Rob.Sok@tetratech.com

Send Invoice to:

Name See
Company Contract
Address
City
State, Zip
Phone
Fax
E-mail

Project No./Name:

Sampler's (Signature):

Analysis Requirements:

Lab Use Only:

VOA Headspace	Y	N	NA
Field Filtered	Y	N	NA
Correct Containers	Y	N	NA
Discrepancies	Y	N	NA
Cust. Seals Intact	Y	N	NA
Containers Intact	Y	N	NA

Airbill #:

CAR #:

Lab Use Only Lab #	Date/Time Sampled	Sample Description	Sample Matrix	Aqueous VOCs	Aqueous Total Metals	Soils VOCs	Soils Metals	Comments	No. of Bottles	Lab Use Only Containers/Pres.
30	5-10-13 1030	S435D04	SD			9	3	Run MSMSD	12	
31	5-10-13 1110	S435P0202	GW	3	1				4	
32	5-10-13 1125	S43BKGSD02	SD			3	1		4	
33	5-10-13 1135	S43BKGSD01	SD			3	1		4	
34	5-10-13 1200	S43OF01	SW	3	1				4	

JBB 5-10-13

Sample Kit Prep'd by: (Signature)	Date/Time	Received By: (Signature)
Jacob Bickett	5-10-13 1300	FedEx
Relinquished by: (Signature)	Date/Time	Received By: (Signature)
Relinquished by: (Signature)	Date/Time	Received By: (Signature)
Received for Laboratory by: (Signature)	Date/Time 5/13 0850	Temperature 3.4 INT

REMARKS:

Details:

Page 3 of 3

Cooler No. ___ of ___

Date Shipped 5-10-13

Shipped By JB

Turnaround Standard

Distribution: Original and yellow copies accompany sample shipment to laboratory; Pink retained by samplers.

1305126 Summ Package

12

1305159

EMPIRICAL LABORATORIES, LLC - CHAIN OF CUSTODY RECORD

SHIP TO: 621 Mainstream Drive, Suite 270 ♦ Nashville, TN 37228 ♦ 615-345-1115 ♦ (fax) 615-846-5426

16633

10

Send Results to:
Name Rob Sok
Company Tetra Tech
Address 5700 Lake Wright Dr. S139
City Norfolk
State, Zip VA 23502
Phone 757-466-4904
Fax
E-mail Rob.Sok@tetratech.com

Send Invoice to:
Name See
Company
Address
City
State, Zip
Phone
Fax N/A
E-mail

Project No./Name:

Sampler's (Signature):

Analysis Requirements: VOCs; Total Metals; Dissolved Metals*

Lab Use Only:

VOA Headspace	Y	N	NA
Field Filtered	Y	N	NA
Correct Containers	Y	N	NA
Discrepancies	Y	N	NA
Cust. Seals Intact	Y	N	NA
Containers Intact	Y	N	NA

Airbill #: 8634-8642-7662

CAR #:

Lab Use Only Lab #	Date/Time Sampled	Sample Description	Sample Matrix	VOCs	Total Metals	Dissolved Metals*	Comments	No. of Bottles	Lab Use Only Containers/Pres.
01	5-13-13 1020	S43TB04-20130513	QC	2			Trip Blank	2	
02	5-13-13 1147	S43MW02901	GW	3	1			4	
03	5-13-13 1205	S43MW009S02	GW	3	1			4	
04	5-13-13 1210	S43MW009S02-D	GW	3	1		Duplicate	4	
05	5-13-13 1319	S43MW02801	GW	3	1			4	
06/07	5-13-13 1335	S43MW009D02	GW	3	1	1		5	
08	5-13-13 1447	S43MW02701	GW	9	3		Run MSMSD	12	
09	5-13-13 ~~1447~~ 1600	S43MW03001	GW	3	1			4	
10	5-13-13 ~~1605~~ 5-13-13	S43MW03001-D	GW	3	1		Duplicate	4	
11	5-13-13 1630	S43FB02-20130513	GW	3	1		Spigot at gravel lot Source Water Blank	4	
12	5-13-13 1802	S43MW00702	GW	3	1			4	
13	5-13-13 1810	S43MW00403	GW	3	1			4	

Sample Kit Prep'd by: (Signature)	Date/Time	Received By: (Signature)
Jacob Birkett	5-14-13 1900	FedEx
Relinquished by: (Signature)	Date/Time	Received By: (Signature)
Relinquished by: (Signature)	Date/Time	Received By: (Signature)
Received for Laboratory by: (Signature)	Date/Time ~~5/15/13 3.0~~	Temperature ~~3.0~~ 5/15/13 3.1 INT

REMARKS:
* For Dissolved/Filtered samples add a "-F" designator to end of parent sample ID

Details:
Page 1 of 2
Cooler No. 1 of 1
Date Shipped 5-14-13
Shipped By
Turnaround Standard

Distribution: Original and yellow copies accompany sample shipment to laboratory; Pink retained by samplers.

0830

1305159 Summ Package

EMPIRICAL LABORATORIES, LLC - CHAIN OF CUSTODY RECORD

B05159 SHIP TO: 621 Mainstream Drive, Suite 270 ♦ Nashville, TN 37228 ♦ 615-345-1115 ♦ (fax) 615-846-5426

16636

Send Results to:
Name Rob Sok
Company Tetra Tech
Address 5700 Lake Wright Dr. S1309
City Norfolk
State, Zip VA 23502
Phone 757-466-4904
Fax
E-mail Rob.Sok@tetratech.com

Send Invoice to:
Name See Contract
Company
Address
City
State, Zip
Phone
Fax
E-mail

Project No./Name:

Sampler's (Signature):

Analysis Requirements: VOCs; Total Metals; Dissolved Metals*

Lab Use Only:

VOA Headspace	Y	N	NA
Field Filtered	Y	N	NA
Correct Containers	Y	N	NA
Discrepancies	Y	N	NA
Cust. Seals Intact	Y	N	NA
Containers Intact	Y	N	NA

Airbill #: 8634-8642-7662

CAR #:

Lab Use Only Lab #	Date/Time Sampled	Sample Description	Sample Matrix	VOCs	Total Metals	Dissolved Metals*	Comments	No. of Bottles	Lab Use Only Containers/Pres.
14	5-14-13 1210	S43PZ004	GW	3	1			4	
15	5-14-13 1210	S43PZ001	GW	3	1			4	
16	5-14-13 1350	S43PZ003	GW	3	1			4	
17/18	5-14-13 1522	S43PZ002	GW	3	1	1		5	
19	5-14-13 1755	S43MW01202	GW	3	1			4	
	5/15/13								

5-14-13

Sample Kit Prep'd by: (Signature)	Date/Time	Received By: (Signature)
Jacob Birkett	5-14-13 1900	FedEx
Relinquished by: (Signature)	Date/Time	Received By: (Signature)
Relinquished by: (Signature)	Date/Time	Received By: (Signature)
Received for Laboratory by: (Signature)	Date/Time	Temperature
	5/15/13 0830	3.1 MT

REMARKS:
*For Dissolved/Filtered samples add a "-F" designator to end of parent Sample ID

Details:
Page 2 of 2
Cooler No. 1 of 1
Date Shipped 5-14-13
Shipped By
Turnaround Standard

Distribution: Original and yellow copies accompany sample shipment to laboratory; Pink retained by samplers.

1305159 Summ Package

1305160

EMPIRICAL LABORATORIES, LLC - CHAIN OF CUSTODY RECORD

SHIP TO: 621 Mainstream Drive, Suite 270 ♦ Nashville, TN 37228 ♦ 615-345-1115 ♦ (fax) 615-846-5426

16638

Send Results to:

Name Rob Sok
Company Tetra Tech
Address 5700 Lake Wright Dr. S1309
City Norfolk
State, Zip VA 23502
Phone 757-466-4904
Fax
E-mail Rob.Sok@tetratech.com

Send Invoice to:

Name See Contract
Company
Address
City
State, Zip
Phone
Fax
E-mail

Project No./Name:

Sampler's (Signature):

Analysis Requirements:

Lab Use Only:

VOA Headspace	Y	N	NA
Field Filtered	Y	N	NA
Correct Containers	Y	N	NA
Discrepancies	Y	N	NA
Cust. Seals Intact	Y	N	NA
Containers Intact	Y	N	NA

Airbill #:

CAR #:

Lab Use Only Lab #	Date/Time Sampled	Sample Description	Sample Matrix	TCLP VOCs	TCLP Metals, Corrosivity, Ignitability	Comments	No. of Bottles	Lab Use Only Containers/Pres.
-01	5-14-13 0930	S43SOIDW01-20130514	SO	1	1	IDW Solid Sample	2	
-02	5-14-13 0940	S43SOIDW02-20130514	SO	1	1	IDW Soil Sample	2	

5-14-13

Sample Kit Prep'd by: (Signature)	Date/Time 1915 5-14-13	Received By: (Signature) FedEx
Relinquished by: (Signature)	Date/Time	Received By: (Signature)
Relinquished by: (Signature)	Date/Time	Received By: (Signature)
Received for Laboratory by: (Signature)	Date/Time 5/15/13 0830	Temperature 3.1 INT

REMARKS:

Details:

Page 1 of 1

Cooler No. 1 of 1

Date Shipped 5-14-13

Shipped By

Turnaround Standard

Distribution: Original and yellow copies accompany sample shipment to laboratory; Pink retained by samplers.

1305219

EMPIRICAL LABORATORIES, LLC - CHAIN OF CUSTODY RECORD

SHIP TO: 621 Mainstream Drive, Suite 270 ♦ Nashville, TN 37228 ♦ 615-345-1115 ♦ (fax) 615-846-5426

15637

10

Send Results to:	Send Invoice to:	Analysis Requirements:	Lab Use Only:
Name Rob. Sok	Name See Contract		VOA Headspace Y N NA
Company Tetra Tech	Company		Field Filtered Y N NA
Address 5700 Lake Wright Dr. S1309	Address		Correct Containers Y N NA
City Norfolk	City		Discrepancies Y N NA
State, Zip VA 23502	State, Zip		Cust. Seals Intact Y N NA
Phone 757-466-4904	Phone		Containers Intact Y N NA
Fax	Fax		Airbill #: 8744 8572 4710
E-mail Rob.Sok@tetratech.com	E-mail		CAR #:
Project No./Name:	Sampler's (Signature):		

Lab Use Only Lab #	Date/Time Sampled	Sample Description	Sample Matrix	VOCs	Total Metals	TCLP VOCs	TCLP Metals	Corrosivity, Ignitability	Comments	No. of Bottles	Lab Use Only Containers/Pres.
01	5-19-13 0840	S43TB05-20130519	QA	3							
02	5-19-13 0937	S43MW01302	GW	3	1						
03	5-19-13 0945	S43MW01402	GW	3	1						
04	5-19-13 1037	S43MW00205	GW	3	1						
05	5-19-13 1055	S43MW01502	GW	3	1						
06	5-19-13 1135	S43MW01602	GW	3	1						
	5-19-13 1330	S43AQIDW01-20130519	GW			3	1	1	IDW sample Do not validate		
	5-19-13 1345	S43AQIDW02-20130519	GW			3	1	1	IDW sample Do not validate		

JBB 5-20-13

Sample Kit Prep'd by: (Signature)	Date/Time	Received By: (Signature)
Jacob Birkett	5-20-13 1200	FedEx
Relinquished by: (Signature)	Date/Time	Received By: (Signature)
Relinquished by: (Signature)	Date/Time	Received By: (Signature)
Received for Laboratory by: (Signature)	Date/Time 5/21/13 0820	Temperature 2.4 IR

REMARKS:

For the two IDW samples put on a Seperate SDG

Details:

Page 1 of 1

Cooler No. 1 of 1

Date Shipped 5-20-13

Shipped By JB

Turnaround Standard

Distribution: Original and yellow copies accompany sample shipment to laboratory; Pink retained by samplers.

1305219 Summ Package

Air Toxics LTD.

CHAIN-OF-CUSTODY RECORD

Sample Transportation Notice
Relinquishing signature on this document indicates that sample is being shipped in compliance with all applicable local, State, Federal, national, and international laws, regulations and ordinances of any kind. Air Toxics Limited assumes no liability with respect to the collection, handling or shipping of these samples. Relinquishing signature also indicates agreement to hold harmless, defend, and indemnify Air Toxics Limited against any claim, demand, or action, of any kind, related to the collection, handling, or shipping of samples. D.O.T. Hotline (800) 467-4922

180 BLUE RAVINE ROAD, SUITE B
FOLSOM, CA 95630-4719
(916) 985-1000 FAX (916) 985-1020

Project Manager: Rob Sok
Collected by: (Print and Sign) Jacob Birkett
Company: Tetra Tech Email: Rob.Sok@tetratech.com
Address: 5700 Lake Wright Dr. Suite 309 City: Norfolk State: VA Zip: 23502
Phone: 757.466.4904 Fax:

Project Info:
P.O. #:
Project #: 112G00771 CTO-114
Project Name: NSF-Indian Head Site43

Turn Around Time:
☒ Normal
☐ Rush
specify

Lab Use Only
Pressurized by:
Date:
Pressurization Gas: N_2 He

Lab I.D.	Field Sample I.D. (Location)	Can #	Date of Collection	Time of Collection	Analyses Requested	Canister Pressure/Vacuum Initial	Final	Receipt	Final (psi)
01AB	S43-716-IND01	23928	7-25-13	0935	TO-15	-31	-10		
02AB	S43-716-IND02	14875	7-25-13	1010	TO-15	-30.5	-3		
03AB	S43-716-Dup01	12695	7-25-13	1200	TO-15	-29.5	-8		
04AB	S43-716-ODA01	4220	7-25-13	0930	TO-15	-30.5	-10		

Relinquished by: (signature)	Date/Time	Received by: (signature)	Date/Time
[signature]	7	[signature]	7/26/13 1015
Relinquished by: (signature)	Date/Time	Received by: (signature)	Date/Time
Relinquished by: (signature)	Date/Time	Received by: (signature)	Date/Time

Notes:
FedEx Airbill 8992-5262-6599

Lab Use Only	Shipper Name	Air Bill #	Temp (°C)	Condition	Custody Seals Intact?	Work Order #
	FedEx		NA	Good	Yes No None	1307513

Form 1293 rev.11

Appendix O

Validation Letters and Tables

2011

Validation Letters and Tables

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**R. SOK**	**DATE:**	**AUGUST 26, 2011**
FROM:	**ANN COGNETTI**	**COPIES:**	**DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION- VOC / OVG / EXP**
NSF INDIAN HEAD, CTO 114, FULL REVIEW
SAMPLE DELIVERY GROUP (SDG) - CTO114_001

SAMPLES: 4/Aqueous/VOC/OVG/EXP

S43TB01-20110603	S43TW007-2327	S43TW007-2327-D
S43TW009-2125		

3/Soil/VOC/EXP

S43SB010-0709	S43SB013-0603	S43SB015-0810

Overview

The sample set for NSF INDIAN HEAD CTO 114, SDG CTO114_001 consists of three (3) aqueous environmental samples, three (3) soil environmental samples and a trip blank. All samples were analyzed for volatile organic compounds (VOCs). The aqueous environmental samples were analyzed for organic volatile gases (OVG). All of the environmental samples were analyzed for explosives (EXP). The field duplicate pair contained within this SDG is S43TW007-2327/ S43TW007-2327-D.

The samples were collected by Tetra Tech on June 3, 2011 and analyzed by Empirical Laboratories. All analyses were conducted in accordance with the SW846 Method 8260B for VOCs, 8330B for explosives, 6850 for perchlorate, RSK-175 for OVG and IAAP for nitroguanidine.

The data contained in this SDG were validated with regard to the following parameters: data completeness, system performance, holding times, GC/MS tuning, initial / continuing calibrations, laboratory method blank results, surrogate spike recoveries, internal standard recoveries, laboratory control sample results, matrix spike/matrix spike duplicate results, compound identification, compound quantitation, field duplicate pair precision and detection limits.

Areas of concern are listed below; documentation supporting these findings is presented in Appendix C. Qualified analytical results are presented in Appendix A. Results as reported by the laboratory are presented in Appendix B.

Major

- The continuing calibration of instrument MS-VOA6 on June 10, 2011@ 10:59 and June 11, 2011@ 11:24 had relative response factors (RRFs) for acetone less than the 0.05 quality control limit. The nondetected acetone results were qualified as rejected (UR) in the affected soil samples. The positive acetone result in sample S43SB015-0810 was qualified as estimated (J).

- The initial volatile calibration and continuing calibration of instrument MS-VOA4 on June 2 and 15, 2011, 1,4-dioxane had RRFs less than the 0.05 quality control limit. The nondetected 1,4-dioxane results were qualified as (UR) due to this noncompliance. This noncompliance affects all aqueous samples analyzed for VOC.

- The target analyte 1,4-dioxane was not calibrated in instrument MS-VOA6 affecting the soil samples. The laboratory did a library search based upon retention time for the presence/absence of 1,4-dioxane. 1,4-Dioxane was not included in the blank spike. The nondetected 1,4-dioxane results in the soil samples were qualified as rejected (UR).

Minor

- Contaminants were detected in the volatile laboratory blanks associated with batch 1F11002 analyzed on June 11, 2011 @ 13:25 on instrument MS-VOA6.

Contaminant	Maximum Concentration (ug/kg)	Action Level (ug/kg)
Methylene chloride	3.87	38.7

  An action level of 10X the maximum concentration of methylene chloride was established in order to evaluate samples for blank contamination. Sample aliquot, dilution factors and percent solids, if applicable, were taken into account when applying the action level. Positive results less than the action level in the affected samples were qualified as (B).

- The continuing calibration %D for acetone was greater than the 20% quality control limit but was less than 50% on June 10, 2011 @ 7:09 on instrument MS-VOA4. The positive acetone result in the affected aqueous sample S43TW009-2125 was qualified as estimated (J). No action was taken on the nondetected acetone results in the affected aqueous samples.

- The continuing calibration %D for bromomethane was greater than 50% on June 10, 2011 @ 10:59 on instrument MS-VOA6. The nondetected bromomethane results in the affected soil samples S43SB013-0603 and S43SB015-0810 were qualified as estimated (UJ).

- The volatile continuing calibration %Ds for bromomethane and 4-methyl-2-pentanone were greater than the 20% quality control limit but less than 50% on June 11, 2011@ 11:24 on instrument MS-VOA6. The positive 4-methyl-2-pentanone result in diluted sample S43SB015-0810 was qualified as estimated (J). No action was taken on the nondetected bromomethane and 4-methyl-2-pentanone results in the affected soil samples S43-SB010-0709 and the diluted sample S43SB015-0810.

- Due to a high concentration of acetone in sample S43SB015-0810, acetone could not be quantified in the original analysis. Sample S43SB015-0810 was diluted 1000X in the VOC fraction in order to obtain a concentration of 2-butanone, acetone and 4-methyl-2-pentanone within instrument calibration range. The 2-butanone result in the diluted sample was a nondetect. The laboratory did not reanalyze the sample at another dilution. The 2-butanone result was taken from the initial analysis and qualified as estimated (J) due to exceeding the instrument calibration range. The positive acetone and 4-methyl-2-pentanone results were taken from the diluted sample.

- The closing continuing calibration percent differences (%Ds) for methane and ethane exceeded the quality control limit on June 17, 2011 @ 22:16. The positive and nondetected methane and ethane results in the affected samples were qualified as estimated (J) and (UJ), respectively.

- The laboratory control sample (LCS) associated with batch 1F17007 had percent recoveries (%Rs) for methane and ethane greater than the upper quality control limit. The positive methane and ethane results were qualified as estimated (J) in the affected samples.

- The percent recovery (%R) of surrogate 1-chloro-3-nitrobenzene exceeded quality control limits on column 1 in aqueous samples S43TW007-2327, S43TW007-2327-D and S43TW009-2125. The positive results taken from column 1 were qualified as estimated (J) due to conflicting directional bias.

- The relative percent difference (RPD) between columns was greater than 40% quality control limit in the following samples. The laboratory reported the lower positive result. The positive results were qualified as estimated (J).

Sample	Analyte	%RPD	Qualification
S43TW007-2327	3-nitrotoluene	122	J
	4-amino-2,6-dinitrotoluene	62	J
	RDX	174	J
S43TW007-2327-D	3-nitrotoluene	137	J
	4-amino-2,6-dinitrotoluene	63	J
	4-nitrotoluene	120	J
	RDX	171	J
S43TW009-2125	2-nitrotoluene	175	J

Notes

Chloroform was detected in the trip blank.

Contaminant	Maximum Concentration (ug/L)	Action level (ug/L)
Chloroform	0.134	0.67

An action level of 5X the maximum concentration of chloroform was established in order to evaluate samples for blank contamination. Sample aliquot and dilutions were taken into account upon applying the action level. No action was warranted on the nondetected chloroform results in the affected samples.

The volatile continuing calibration %D for several analytes exceeded the 20% quality control limit but less than 50% on instrument MS-VOA6 on June 10, 2011 @ 10:59. The analytes were chloroethane, 1,1-dichloroethane, trans-1,2-dichlroethene, 4-methyl-2-pentanone and methyl tert-butyl ether. No action was taken on the nondetected results of the aforementioned analytes in the affected samples S43SB013-0603 and S43SB015-0810.

The volatile continuing calibration %Ds for several analytes were greater than 20% but less than 50% on June 10, 2011 @ 7:09 on instrument MS-VOA4. The analytes were 2-butanone, chloroethane, chloromethane, 1,2-dibromo-3-chloropropane, dichlorodifluoromethane and methyl acetate. No action was taken on the nondetected results in the affected aqueous samples.

The LCS associated with batch 1F10001 had a %R of chloromethane greater than the upper quality control limit. No action was taken on the nondetected chloromethane results in the affected aqueous samples.

The laboratory control sample duplicate (LCSD) associated with batch 1F10023 had several analytes with %Rs greater than the upper quality control limit. The analytes were bromodichloromethane, bromomethane, carbon tetrachloride, chloroform, dichlorodifluoromethane, 1,1-dichloroethane, 1,2-dichloroethane, 1,1,1-trichloroethane and trichloroethene. The LCS %Rs of these analytes and the

relative percent differences (RPDs) were within quality control limits. No action was taken on the nondetected results of the aforementioned analytes in the affected soil samples.

The continuing calibration verification %Ds for 2,4,6-trinitrotoluene exceeded the 20% quality control limits on column 1 on June 9, 2011 @ 12:27, June 10, 2011 @ 18:21 and June 11, 2011 @ 4:07. No action was taken on the nondetected 2,4,6-trinitrotoluene results in the affected aqueous samples. The %Ds on column #2 for 2,4,6-trinitrotoluene were within quality control limits.

The continuing calibration %D for 4-amino-2,6-dinitrotoluene exceeded the 20% quality control limit on column 1 on June 10, 2011 @ 22:16. No action was taken on the positive 4-amino-2,6-dinitrotoluene results in the affected aqueous samples because the positive results were taken from the second column.

The continuing calibration %Ds for 1,3,5-trinitrobenzene, 1,3-dinitrobenzene, nitrobenzene and the already mentioned 2,4,6-trinitrotoluene exceeded quality control limits on June 11, 2011 @4:07. No action was taken on the nondetected 1,3,5-trinitrobenzene, 1,3-dinitrobenzene and nitrobenzene results in the affected aqueous samples.

The continuing calibration %D for 4-amino-2,6-dinitrotoluene exceeded quality control limits on July 11, 2011 @ 4:11 on column 2. No action was taken on the nondetected 4-amino-2,6-dinitrotoluene results in the affected soil samples.

The LCS/LCSD %Rs of nitroglycerin exceeded the upper quality control limit in batch 1F07016 affecting the aqueous samples. No action was taken on the nondetected nitroglycerin results in the affected aqueous samples.

The %R of nitroguandine in LCSs associated with batches 1F15938 and 1F16734 exceeded the upper quality control limits. No action was taken on the nondetected nitroguandine results in the affected samples.

The matrix spike/matrix spike duplicate (MS/MSD) %R of nitroguandine in spiked sample S43TW007-2327 exceeded quality control limits. No action was taken on the nondetected nitroguandine result in spiked sample S43TW007-2327.

The laboratory had to be contacted to correct the form 1s for nitroguandine in several samples. The same results were populated in all of the fields. The laboratory raised the reporting limits due to matrix interference in the samples. The nondetected nitroguandine results were reported to the limit of quantitation.

Sample S43TW007-2327-D was not listed on the chain of custody. The project manager was contacted. Sample S43TW007-2327-D is a field duplicate and should be analyzed in the same fractions as its field duplicate pair.

Nondetected results were reported to the limit of detection (LOD).

Executive Summary

Laboratory Performance: Initial and continuing calibrations RRFs of acetone and 1,4-dioxane were less than the quality control limit resulting in the rejection of nondetected results and qualification of positive acetone results. 1,4-Dioxane soil results were qualified as rejected due to no initial calibration of the instrument for this analyte. Continuing calibration percent differences exceeded quality control limits in the VOC and OVG fractions. The percent recoveries of methane and ethane exceeded quality control limits. The EXP surrogate recovery exceeded quality control limits.

Other Factors Affecting Data Quality: Methylene chloride was detected in a laboratory method blank. The positive 2-butanone result in sample S43SB015-0810 which exceeded instrument calibration range in the original analysis was used for validation purposes.

The data for these analyses were reviewed with reference to Region III modifications to U.S. EPA National Functional Guidelines for Organic Data Review (9/94) and the Department of Defense (DoD) document entitled "Quality Systems Manual (QSM) for Environmental Laboratories (April 2009). The text of this report has been formulated to address only those problem areas affecting data quality.

Ann Cognetti

Tetra Tech NUS
Ann Cognetti
Chemist/Data Validator

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

Appendix A

Qualified Analytical Results

Data Validation Qualifier Codes:

A = Lab Blank Contamination
B = Field Blank Contamination
C = Calibration Noncompliance (e.g. % RSDs, %Ds, ICVs, CCVs, RRFs, etc.)
C01 = GC/MS Tuning Noncompliance
D = MS/MSD Recovery Noncompliance
E = LCS/LCSD Recovery Noncompliance
F = Lab Duplicate Imprecision
G = Field Duplicate Imprecision
H = Holding Time Exceedance
I = ICP Serial Dilution Noncompliance
J = GFAA PDS - GFAA MSA's $r < 0.995$
K = ICP Interference - includes ICS % R Noncompliance
L = Instrument Calibration Range Exceedance
M = Sample Preservation Noncompliance
N = Internal Standard Noncompliance
N01 = Internal Standard Recovery Noncompliance Dioxins
N02 = Recovery Standard Noncompliance Dioxins
N03 = Clean-up Standard Noncompliance Dioxins
O = Poor Instrument Performance (e.g. base-line drifting)
P = Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q = Other problems (can be any number of issues; e.g. poor chromatography,interferences, etc.)
R = Surrogates Recovery Noncompliance
S = Pesticide/PCB Resolution
T = % Breakdown Noncompliance for DDT and Endrin
U = % Difference between columns/detectors >25% for positive results determined via GC/HPLC
V = Non-linear calibrations; correlation coefficient $r < 0.995$
W = EMPC result
X = Signal to noise response drop
Y = Percent solids <30%
Z = Uncertainty at 2 sigma deviation is greater than sample activity

PROJ_NO: 00771	NSAMPLE	S43SB010-0709			S43SB013-0603			S43SB015-0810			S43SB015-0810RE1		
SDG: CTO114_001	LAB_ID	1106047-08			1106047-02			1106047-03			1106047-03RE1		
FRACTION: OV	SAMP_DATE	6/3/2011			6/3/2011			6/3/2011			6/3/2011		
MEDIA: SOIL	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/KG			UG/KG			UG/KG			UG/KG		
	PCT_SOLIDS	81.7			84.1			85.0			85.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		2.81	U		2.3	U		2.44	U				
1,1,2,2-TETRACHLOROETHANE		2.81	U		2.3	U		2.44	U				
1,1,2-TRICHLOROETHANE		2.81	U		2.3	U		2.44	U				
1,1,2-TRICHLOROTRIFLUOROETHANE		5.62	U		4.6	U		4.87	U				
1,1-DICHLOROETHANE		2.81	U		2.3	U		2.44	U				
1,1-DICHLOROETHENE		2.81	U		2.3	U		2.44	U				
1,2,3-TRICHLOROBENZENE		2.81	U		2.3	U		2.44	U				
1,2,4-TRICHLOROBENZENE		2.81	U		2.3	U		2.44	U				
1,2-DIBROMO-3-CHLOROPROPANE		5.62	U		4.6	U		4.87	U				
1,2-DIBROMOETHANE		2.81	U		2.3	U		2.44	U				
1,2-DICHLOROBENZENE		2.81	U		2.3	U		2.44	U				
1,2-DICHLOROETHANE		2.81	U		2.3	U		2.44	U				
1,2-DICHLOROPROPANE		2.81	U		2.3	U		2.44	U				
1,3-DICHLOROPROPANE		2.81	U		2.3	U		2.44	U				
1,4-DICHLOROBENZENE		2.81	U		2.3	U		2.44	U				
1,4-DIOXANE		112	UR	C	92	UR	C	97.4	UR	C			
2-BUTANONE		5.62	U		4.6	U		564	J	L			
2-HEXANONE		2.81	U		2.3	U		16					
4-METHYL-2-PENTANONE		2.81	U		2.3	U					5190	J	C
ACETONE		11.2	UR	C	9.2	UR	C				157000	J	C
BENZENE		2.81	U		2.3	U		2.44	U				
BROMODICHLOROMETHANE		2.81	U		2.3	U		2.44	U				
BROMOFORM		2.81	U		2.3	U		2.44	U				
BROMOMETHANE		5.62	U		4.6	UJ	C	4.87	UJ	C			
CARBON DISULFIDE		2.81	U		2.3	U		2.44	U				
CARBON TETRACHLORIDE		2.81	U		2.3	U		2.44	U				
CHLOROBENZENE		2.81	U		2.3	U		2.44	U				
CHLORODIBROMOMETHANE		2.81	U		2.3	U		2.44	U				
CHLOROETHANE		5.62	U		4.6	U		4.87	U				
CHLOROFORM		2.81	U		2.3	U		2.44	U				
CHLOROMETHANE		5.62	U		4.6	U		4.87	U				
CIS-1,2-DICHLOROETHENE		2.81	U		2.3	U		2.44	U				
CYCLOHEXANE		2.81	U		2.3	U		2.44	U				
DICHLORODIFLUOROMETHANE		5.62	U		4.6	U		4.87	U				
ETHYLBENZENE		2.81	U		2.3	U		2.44	U				

PROJ_NO: 00771	NSAMPLE	S43SB010-0709			S43SB013-0603			S43SB015-0810			S43SB015-0810RE1		
SDG: CTO114_001	LAB_ID	1106047-08			1106047-02			1106047-03			1106047-03RE1		
FRACTION: OV	SAMP_DATE	6/3/2011			6/3/2011			6/3/2011			6/3/2011		
MEDIA: SOIL	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/KG			UG/KG			UG/KG			UG/KG		
	PCT_SOLIDS	81.7			84.1			85.0			85.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		2.81	U		2.3	U		2.44	U				
METHYL ACETATE		5.62	U		4.6	U		4.87	U				
METHYL TERT-BUTYL ETHER		2.81	U		2.3	U		2.44	U				
METHYLENE CHLORIDE		9.47	B	A	6.81	J	P	8.6	J	P			
STYRENE		2.81	U		2.3	U		2.44	U				
TETRACHLOROETHENE		1.65	J	P	2.3	U		2.44	U				
TOLUENE		2.81	U		1.29	J	P	2.44	U				
TOTAL XYLENES		8.43	U		6.9	U		7.31	U				
TRANS-1,2-DICHLOROETHENE		2.81	U		2.3	U		2.44	U				
TRICHLOROETHENE		2.81	U		2.3	U		2.44	U				
TRICHLOROFLUOROMETHANE		5.62	U		4.6	U		4.87	U				
VINYL CHLORIDE		2.81	U		2.3	U		2.44	U				

PROJ_NO: 00771	NSAMPLE	S43TB01-20110603			S43TW007-2327			S43TW007-2327-D			S43TW009-2125		
SDG: CTO114_001	LAB_ID	1106047-01			1106047-04			1106047-09			1106047-06		
FRACTION: OV	SAMP_DATE	6/3/2011			6/3/2011			6/3/2011			6/3/2011		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF							S43TW007-2327					
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		0.5	U		5	U		5	U		2.5	U	
1,1,2,2-TETRACHLOROETHANE		0.5	U		5	U		5	U		2.5	U	
1,1,2-TRICHLOROETHANE		0.5	U		5	U		5	U		2.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		1	U		10	U		10	U		5	U	
1,1-DICHLOROETHANE		0.5	U		5	U		5	U		2.5	U	
1,1-DICHLOROETHENE		0.5	U		4.5	J	P	4.75	J	P	2.5	U	
1,2,3-TRICHLOROBENZENE		0.5	U		5	U		5	U		2.5	U	
1,2,4-TRICHLOROBENZENE		0.5	U		5	U		5	U		2.5	U	
1,2-DIBROMO-3-CHLOROPROPANE		1	U		10	U		10	U		5	U	
1,2-DIBROMOETHANE		0.5	U		5	U		5	U		2.5	U	
1,2-DICHLOROBENZENE		0.5	U		5	U		5	U		2.5	U	
1,2-DICHLOROETHANE		0.5	U		5	U		5	U		2.5	U	
1,2-DICHLOROPROPANE		0.5	U		5	U		5	U		2.5	U	
1,3-DICHLOROPROPANE		0.5	U		5	U		5	U		2.5	U	
1,4-DICHLOROBENZENE		0.5	U		5	U		5	U		2.5	U	
1,4-DIOXANE		10	UR	C	100	UR	C	100	UR	C	10	UR	C
2-BUTANONE		5	U		50	U		50	U		25	U	
2-HEXANONE		2.5	U		25	U		25	U		12.5	U	
4-METHYL-2-PENTANONE		2.5	U		25	U		25	U		12.5	U	
ACETONE		5	U		50	U		50	U		55.6	J	C
BENZENE		0.5	U		5	U		5	U		2.5	U	
BROMODICHLOROMETHANE		0.5	U		5	U		5	U		2.5	U	
BROMOFORM		0.5	U		5	U		5	U		2.5	U	
BROMOMETHANE		1	U		10	U		10	U		5	U	
CARBON DISULFIDE		0.5	U		5	U		5	U		2.5	U	
CARBON TETRACHLORIDE		0.5	U		5	U		5	U		2.5	U	
CHLOROBENZENE		0.5	U		5	U		5	U		2.5	U	
CHLORODIBROMOMETHANE		0.5	U		5	U		5	U		2.5	U	
CHLOROETHANE		1	U		10	U		10	U		5	U	
CHLOROFORM		0.134	J	P	5	U		5	U		2.5	U	
CHLOROMETHANE		0.5	U		5	U		5	U		2.5	U	
CIS-1,2-DICHLOROETHENE		0.5	U		56.5			61.3			2.61	J	P
CYCLOHEXANE		0.5	U		5	U		5	U		2.5	U	
DICHLORODIFLUOROMETHANE		1	U		10	U		10	U		5	U	
ETHYLBENZENE		0.5	U		5	U		5	U		2.5	U	

PROJ_NO: 00771	NSAMPLE	S43TB01-20110603			S43TW007-2327			S43TW007-2327-D			S43TW009-2125		
SDG: CTO114_001	LAB_ID	1106047-01			1106047-04			1106047-09			1106047-06		
FRACTION: OV	SAMP_DATE	6/3/2011			6/3/2011			6/3/2011			6/3/2011		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF							S43TW007-2327					
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		0.5	U		5	U		5	U		2.5	U	
METHYL ACETATE		1	U		10	U		10	U		5	U	
METHYL TERT-BUTYL ETHER		0.5	U		5	U		5	U		2.5	U	
METHYLENE CHLORIDE		1	U		7.7	J	P	9.74	J	P	4.84	J	P
STYRENE		0.5	U		5	U		5	U		2.5	U	
TETRACHLOROETHENE		0.5	U		5	U		5	U		2.5	U	
TOLUENE		0.5	U		5	U		5	U		2.5	U	
TOTAL XYLENES		1.5	U		15	U		15	U		7.5	U	
TRANS-1,2-DICHLOROETHENE		0.5	U		5	U		5	U		2.5	U	
TRICHLOROETHENE		0.5	U		923			1010			563		
TRICHLOROFLUOROMETHANE		1	U		10	U		10	U		5	U	
VINYL CHLORIDE		0.5	U		26.2			25.8			2.5	U	

PROJ_NO: 00771 SDG: CTO114_001 FRACTION: OVG MEDIA: WATER	NSAMPLE	S43TW007-2327			S43TW007-2327-D			S43TW009-2125		
	LAB_ID	1106047-04			1106047-09			1106047-06		
	SAMP_DATE	6/3/2011			6/3/2011			6/3/2011		
	QC_TYPE	NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0		
	DUP_OF									
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ETHANE		10.3	J	CE	11.5	J	CE	2	UJ	C
ETHENE		8.89			10.3			2	U	
METHANE		196	J	CE	235	J	CE	46.4	J	CE

PROJ_NO: 00771	NSAMPLE	S43RB01-20110605			S43TW08 2832		
SDG: CTO114_002	LAB_ID	1106067-10			1106067-07		
FRACTION: EXP	SAMP_DATE	6/5/2011			6/5/2011		
MEDIA: WATER	QC_TYPE	NM			NM		
	UNITS	UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0		
	DUP_OF						
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,3,5-TRINITROBENZENE		0.151	U		0.154	U	
1,3-DINITROBENZENE		0.151	U		0.154	U	
2,4,6-TRINITROTOLUENE		0.151	U		0.154	U	
2,4-DINITROTOLUENE		0.151	U		0.154	U	
2,6-DINITROTOLUENE		0.151	U		0.154	U	
2-AMINO-4,6-DINITROTOLUENE		0.151	U		0.154	U	
2-NITROTOLUENE		0.151	U		0.154	U	
3-NITROTOLUENE		0.151	U		0.156	J	PQU
4-AMINO-2,6-DINITROTOLUENE		0.151	U		0.154	U	
4-NITROTOLUENE		0.151	U		0.146	J	PQU
HMX		0.151	U		0.154	U	
NITROBENZENE		0.151	U		0.154	U	
NITROGLYCERIN		0.377	U		0.385	U	
NITROGUANIDINE		5	UJ	C	5	UJ	C
RDX		0.151	U		0.49	J	QU
TETRYL		0.151	U		0.154	U	

PROJ_NO: 00771 SDG: CTO114_001 FRACTION: EXP MEDIA: SOIL	NSAMPLE	S43SB010-0709			S43SB013-0603			S43SB015-0810		
	LAB_ID	1106047-08			1106047-02			1106047-03		
	SAMP_DATE	6/3/2011			6/3/2011			6/3/2011		
	QC_TYPE	NM			NM			NM		
	UNITS	MG/KG			MG/KG			MG/KG		
	PCT_SOLIDS	81.7			84.1			85.0		
	DUP_OF									
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,3,5-TRINITROBENZENE		0.0396	U		0.0367	U		0.0381	U	
1,3-DINITROBENZENE		0.0396	U		0.0367	U		0.0381	U	
2,4,6-TRINITROTOLUENE		0.0396	U		0.0367	U		0.0381	U	
2,4-DINITROTOLUENE		0.0396	U		0.0367	U		0.0381	U	
2,6-DINITROTOLUENE		0.0396	U		0.0367	U		0.0381	U	
2-AMINO-4,6-DINITROTOLUENE		0.0396	U		0.0367	U		0.0381	U	
2-NITROTOLUENE		0.0396	U		0.0367	U		0.0381	U	
3-NITROTOLUENE		0.0396	U		0.0367	U		0.0381	U	
4-AMINO-2,6-DINITROTOLUENE		0.0396	U		0.0367	U		0.0381	U	
4-NITROTOLUENE		0.0396	U		0.0367	U		0.0381	U	
HMX		0.0396	U		0.0367	U		0.0381	U	
NITROBENZENE		0.0396	U		0.0367	U		0.0381	U	
NITROGLYCERIN		0.198	U		0.183	U		0.19	U	
NITROGUANIDINE		0.345	U		0.435	U		0.417	U	
RDX		0.0396	U		0.0367	U		0.0381	U	
TETRYL		0.0396	U		0.0367	U		0.0381	U	

PROJ_NO: 00771	NSAMPLE	S43SB010-0709			S43SB013-0603			S43SB015-0810		
SDG: CTO114_001	LAB_ID	1106047-08			1106047-02			1106047-03		
FRACTION: MISC	SAMP_DATE	6/3/2011			6/3/2011			6/3/2011		
MEDIA: SOIL	QC_TYPE	NM			NM			NM		
	UNITS	UG/KG			UG/KG			UG/KG		
	PCT_SOLIDS	81.7			84.1			85.0		
	DUP_OF									
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
PERCHLORATE		2.45	U		2.38	U		2.35	U	

PROJ_NO: 00771	NSAMPLE	S43TW007-2327			S43TW007-2327-D			S43TW009-2125		
SDG: CTO114_001	LAB_ID	1106047-04			1106047-09			1106047-06		
FRACTION: MISC	SAMP_DATE	6/3/2011			6/3/2011			6/3/2011		
MEDIA: WATER	QC_TYPE	NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0		
	DUP_OF									
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
PERCHLORATE		0.2	U		0.2	U		0.2	U	

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**R. SOK**	**DATE:**	**September 1, 2011**
FROM:	**MEGAN CARSON**	**COPIES:**	**DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION –SELECT TOTAL AND FILTERED METALS, ALKALINITY, CHLORIDE, CYANIDE, NITRATE-N, NITRITE-N, SULFATE, SULFIDE, AND TOTAL ORGANIC CARBON**
NSF INDIAN HEAD, CTO 114
SAMPLE DELIVERY GROUP (SDG) – CTO114-001

SAMPLES: 3/Soil/
S43SB010-0709 S43SB013-0603
S43SB015-0810

3/Water/
S43TW007-2327 S43TW007-2327-D
S43TW009-2125

Overview

The sample set for NSF Indian Head, SDG CTO114-001 consists of three (3) soil environmental samples and three (3) aqueous environmental. This SDG contained one field duplicate pair S43TW007-2327/S43TW007-2327-D.

All samples were analyzed for total select metals, cyanide, and total organic carbon. Water samples were also analyzed for alkalinity, chloride, nitrate-N, nitrite-N, sulfate, and sulfide. Samples S43TW007-2327, S43TW007-2327-D, and S43TW009-2125 were also analyzed for filtered select metals. The samples were collected by Tetra Tech NUS, Inc. on June 3, 2011 and analyzed by Analytical Laboratory Services Inc. under Naval Facilities Engineering Service Center (NFESC) Quality Assurance / Quality Control (QA/QC) criteria. Metals analyses were conducted using SW846 method 6010C. Mercury analyses were conducted using SW846 methods 7471A and 7470. Chloride, nitrate, nitrite, and sulfate analyses were conducted using EPA 300. Cyanide analyses were conducted using method SM9012A. Sulfide analyses were conducted using method SM4500. TOC analyses were conducted using the Lloyd Kahn method. Alkalinity analyses were conducted using method SM 2320B.

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 / matrix spike duplicate results, field duplicate pair, laboratory duplicate precision, laboratory control sample (LCS) results, ICP serial dilution results, detection limits and analyte quantitation.

Areas of concern with respect to data quality are listed below.

Major Problems:

- None.

Minor Problems:

- The CRDL standard analyzed on 6/10/11 had a percent recovery < 90% for antimony and arsenic and a percent recovery >110% for selenium. Samples S43SB010-0709, S43SB013-0603, and S43SB015-0810 were affected. Selenium results were not qualified as sample results were non-detected. Positive results <2X CRDL and non-detected antimony and arsenic results were qualified as biased low (L and UL, respectively) or estimated (J) due to conflicting directional bias.

- The CRDL standard analyzed on 6/15/11 had a percent recovery >110% for aluminum and iron and a percent recovery <90% for arsenic and selenium. Samples S43TW007-2327 (total), S43TW009-2125 (total), S43TW009-2125 (filtered), and S43TW007-2327-D (total) were affected. Positive less than 2X CRDL and non-detected arsenic, aluminum, and selenium results were qualified as biased low (L and UL, respectively) or estimated (J) due to conflicting directional bias. Iron results were not qualified as sample results were greater than 2X CRDL.

- The CRDL standard analyzed on 7/11/11 had a percent recovery >110% for arsenic, antimony and cadmium and a percent recovery <90% for nickel. Samples S43TW007-2327(filtered) and S43TW007-2327-D (filtered) were affected. Arsenic results were qualified as either biased high (K) or estimated (J) due to conflicting directional bias. The nickel result for sample S43TW007-2327-D was qualified as estimated (J) due to conflicting directional bias. No validation action was warranted for antimony and cadmium as sample results were either >2X CRDL or non-detected.

- The field duplicate pair S43TW007-2327/S43TW007-2327-D had a relative percent difference or percent difference greater than the quality control limits for aluminum, barium, chromium, cobalt, copper, lead, nickel, vanadium, and zinc. Filtered samples S43TW007-2327, S43TW007-2327-D, and S43TW009-2125 were affected. Positive results were qualified as estimated and non-detected results were qualified as estimated (UJ).

- The field duplicate pair S43TW007-2327/S43TW007-2327-D had a percent difference greater than the quality control limits for TOC. Samples S43TW007-2327, S43TW007-2327-D, and S43TW009-2125 were affected. Positive results were qualified as estimated (J).

- Positive results < LOQ but > MDL were qualified as estimated (J).

Notes

The following contaminant was detected in the laboratory calibration blank at the following maximum concentration:

Analyte	Maximum Concentration	Action Level
TOC	0.344 mg/L	1.72 mg/L

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. Only water samples were affected. No validation action was warranted as sample results were greater than the blank action limit.

The CRDL standard analyzed on 6/4/11 had a percent recovery <90% for chloride. Samples S43TW009-2125, S43TW007-2327 and S43TW007-2327-D were affected. No validation action was warranted for chloride as sample results were either >2X CRDL or non-detected.
All soil and dissolved water samples were analyzed at a 2X dilution for metals (except mercury) analyses.

Total water samples were analyzed at a 5X dilution for metals (except mercury)

Sample S43TW007-2327-D was not listed on the chain of custody but was included in the SDG

Executive Summary

Laboratory Performance: CRDL standard non-compliances resulted in the qualification of sample results.

Other Factors Affecting Data Quality: Field duplicate pair non-compliances for aluminum, barium, chromium, cobalt, copper, lead, nickel, vanadium, zinc, and TOC resulted in the qualification of sample results.

The data for these analyses were reviewed with reference to Region III modifications to the "National Functional Guidelines for Inorganic Data Validation", April 1993, and the Department of Defense (DoD) document entitled "Quality Systems Manual (QSM) for Environmental Laboratories "(April, 2009).

The text of this report has been formulated to address only those problem areas affecting data quality.

Megan Carson

Tetra Tech NUS
Megan Carson
Chemist/Data Validator

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

APPENDIX A

QUALIFIED ANALYTICAL RESULTS

Data Validation Qualifier Codes:

A	=	Lab Blank Contamination
B	=	Field Blank Contamination
C	=	Calibration Noncompliance (e.g. % RSDs, %Ds, ICVs, CCVs, RRFs, etc.)
C01	=	GC/MS Tuning Noncompliance
D	=	MS/MSD Recovery Noncompliance
E	=	LCS/LCSD Recovery Noncompliance
F	=	Lab Duplicate Imprecision
G	=	Field Duplicate Imprecision
H	=	Holding Time Exceedance
I	=	ICP Serial Dilution Noncompliance
J	=	GFAA PDS - GFAA MSA's $r < 0.995$
K	=	ICP Interference - includes ICS % R Noncompliance
L	=	Instrument Calibration Range Exceedance
M	=	Sample Preservation Noncompliance
N	=	Internal Standard Noncompliance
N01	=	Internal Standard Recovery Noncompliance Dioxins
N02	=	Recovery Standard Noncompliance Dioxins
N03	=	Clean-up Standard Noncompliance Dioxins
O	=	Poor Instrument Performance (e.g. base-line drifting)
P	=	Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q	=	Other problems (can be any number of issues; e.g. poor chromatography,interferences, etc.)
R	=	Surrogates Recovery Noncompliance
S	=	Pesticide/PCB Resolution
T	=	% Breakdown Noncompliance for DDT and Endrin
U	=	% Difference between columns/detectors >25% for positive results determined via GC/HPLC
V	=	Non-linear calibrations; correlation coefficient $r < 0.995$
W	=	EMPC result
X	=	Signal to noise response drop
Y	=	Percent solids <30%
Z	=	Uncertainty at 2 sigma deviation is greater than sample activity

PROJ_NO: 00771	NSAMPLE	S43TW007-2327			S43TW007-2327-D			S43TW009-2125		
SDG: CTO114_001	LAB_ID	1106047-04			1106047-09			1106047-06		
FRACTION: M	SAMP_DATE	6/3/2011			6/3/2011			6/3/2011		
MEDIA: WATER	QC_TYPE	NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0		
	DUP_OF				S43TW007-2327					
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM		23700			24300			13900		
ANTIMONY		10	U		10	U		10	U	
ARSENIC		11.7	J	CP	11.8	J	CP	13.8	L	C
BARIUM		295			301			208		
BERYLLIUM		2.53	J	P	2.54	J	P	1.99	J	P
CADMIUM		2.5	U		2.5	U		2.5	U	
CHROMIUM		53.2			53.6			78.5		
COBALT		28.3			29.6			11.4	J	P
COPPER		93.5			98.2			87		
IRON		58200			58300			61300		
LEAD		48.1			48.7			43.4		
MANGANESE		610			618			485		
MERCURY		0.261			0.25			0.0857	J	P
NICKEL		23.1			23.8			15	L	K
SELENIUM		6.25	UL	C	6.25	UL	C	6.25	UL	C
SILVER		2.5	U		2.5	U		2.5	U	
THALLIUM		5	U		5	U		5	U	
VANADIUM		80.2			82.2			64.8		
ZINC		99.3			104			42		

PROJ_NO: 00771	NSAMPLE	S43TW007-2327			S43TW007-2327-D			S43TW009-2125		
SDG: CTO114_001	LAB_ID	1106047-05			1106047-10			1106047-07		
FRACTION: MF	SAMP_DATE	6/3/2011			6/3/2011			6/3/2011		
MEDIA: WATER	QC_TYPE	NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0		
	DUP_OF				S43TW007-2327					
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM		11400	J	G	2740	J	G	42.2	J	CGP
ANTIMONY		4	U		4	U		4	U	
ARSENIC		7.17	K	C	2.86	J	CP	7.59	L	C
BARIUM		173	J	G	106	J	G	108	J	G
BERYLLIUM		1.11	J	P	1	U		1	U	
CADMIUM		1	U		1	U		1	U	
CHROMIUM		23.8	J	G	5.59	J	G	2	UJ	G
COBALT		14.7	J	G	7.12	J	G	2.5	J	GP
COPPER		38.9	J	G	9.23	J	G	4	UJ	G
IRON		48200			39900			47200		
LEAD		18.7	J	G	4.78	J	G	1.5	UJ	G
MANGANESE		550			472			475		
MERCURY		0.0825	J	P	0.2	U		0.2	U	
NICKEL		12.7	J	G	5.2	J	CG	8.06	J	G
SELENIUM		2.5	U		2.5	U		2.5	UL	C
SILVER		1	U		1	U		1	U	
THALLIUM		2	U		2	U		2	U	
VANADIUM		38	J	G	9.44	J	G	5	UJ	G
ZINC		42.5	J	G	12.2	J	G	17.4	J	G

PROJ_NO: 00771 SDG: CTO114_001 FRACTION: M MEDIA: SOIL	NSAMPLE	S43SB010-0709			S43SB013-0603			S43SB015-0810		
	LAB_ID	1106047-08			1106047-02			1106047-03		
	SAMP_DATE	6/3/2011			6/3/2011			6/3/2011		
	QC_TYPE	NM			NM			NM		
	UNITS	MG/KG			MG/KG			MG/KG		
	PCT_SOLIDS	81.7			84.1			85.0		
	DUP_OF									
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM		5970			2180			10600		
ANTIMONY		0.956	UL	C	0.928	UL	C	0.932	UL	C
ARSENIC		0.925	J	CP	0.834	J	CP	2.14	L	C
BARIUM		30.8			19			148		
BERYLLIUM		0.455	J	P	0.295	J	P	0.844		
CADMIUM		0.239	U		0.232	U		0.233	U	
CHROMIUM		10			18.5			13.1		
COBALT		2.54			1.47			4.17		
COPPER		10			7.38			12.9		
IRON		8670			4010			8630		
LEAD		5.99			5.02			11.4		
MANGANESE		11.5			23			10.3		
MERCURY		0.0418	U		0.0368	U		0.0364	U	
NICKEL		5.92			5.26			10.1		
SELENIUM		0.597	U		0.58	U		0.583	U	
SILVER		0.239	U		0.232	U		0.233	U	
THALLIUM		0.478	U		0.464	U		0.466	U	
VANADIUM		12.7			7.53			20.1		
ZINC		16.9			9.98			26.3		

PROJ_NO: 00771	NSAMPLE	S43TW007-2327						S43TW007-2327-D					
SDG: CTO114_001	LAB_ID	1106047-04						1106047-09					
FRACTION: MISC	SAMP_DATE	6/3/2011						6/3/2011					
MEDIA: WATER	QC_TYPE	NM						NM					
	UNITS	MG/L			UG/L			MG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF							S43TW007-2327			S43TW007-2327		
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALKALINITY		27.4						41					
CHLORIDE		41.7						41					
CYANIDE		0.01	U					0.01	U				
NITRATE-N		0.043	J	P				0.1	U				
NITRITE-N		0.1	U					0.1	U				
PERCHLORATE					0.2	U					0.2	U	
SULFATE		11.8						11.2					
SULFIDE		1.82	U					1.85	U				
TOTAL ORGANIC CARBON		1.86	J	G				4.33	J	G			

PROJ_NO: 00771	NSAMPLE	S43TW009-2125					
SDG: CTO114_001	LAB_ID	1106047-06					
FRACTION: MISC	SAMP_DATE	6/3/2011					
MEDIA: WATER	QC_TYPE	NM					
	UNITS	MG/L			UG/L		
	PCT_SOLIDS	0.0			0.0		
	DUP_OF						
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALKALINITY		41.8					
CHLORIDE		54					
CYANIDE		0.01	U				
NITRATE-N		0.1	U				
NITRITE-N		0.1	U				
PERCHLORATE					0.2	U	
SULFATE		0.926	J	P			
SULFIDE		2	U				
TOTAL ORGANIC CARBON		3.86	J	G			

PROJ_NO: 00771	NSAMPLE	S43SB010-0709						S43SB013-0603					
SDG: CTO114_001	LAB_ID	1106047-08						1106047-02					
FRACTION: MISC	SAMP_DATE	6/3/2011						6/3/2011					
MEDIA: SOIL	QC_TYPE	NM						NM					
	UNITS	MG/KG			UG/KG			MG/KG			UG/KG		
	PCT_SOLIDS	81.7			81.7			84.1			84.1		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
CYANIDE		0.266	U					0.268	U				
PERCHLORATE					2.45	U					2.38	U	
TOTAL ORGANIC CARBON		702	J	P				1100	J	P			

PROJ_NO: 00771	NSAMPLE	S43SB015-0810					
SDG: CTO114_001	LAB_ID	1106047-03					
FRACTION: MISC	SAMP_DATE	6/3/2011					
MEDIA: SOIL	QC_TYPE	NM					
	UNITS	MG/KG			UG/KG		
	PCT_SOLIDS	85.0			85.0		
	DUP_OF						
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD
CYANIDE		0.272	U				
PERCHLORATE					2.35	U	
TOTAL ORGANIC CARBON		828	J	P			

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**R. SOK**	**DATE:**	**AUGUST 9, 2011**
FROM:	**MICHELLE L. ALLEN**	**COPIES:**	**DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION – TOTAL AND DISSOLVED METALS/CN/TOC/ PERCHLORATE**

NSF INDIAN HEAD, CTO 114
SDG CTO114_002

SAMPLES: 6/Soil/METALS/CN/TOC/PERCHLORATE

S43SB008-0608	S43SB009-0608	S43SB011-0709
S43SB011-0709-D	S43SB014-0709	S43SB016-0608

2/Aqueous/TOTAL AND DISSOLVED METALS/CN/PERCHLORATE

S43TW08 2832	S43RB01-20110605

Overview

The sample set for NSF Indian Head, CTO 114, SDG CTO114_002 consisted of six (6) soil environmental samples, one (1) aqueous environmental sample, and one (1) rinsate blank. All eight (8) samples were analyzed for select metals, cyanide and perchlorate. The six (6) soil samples were analyzed for Total Organic Carbon (TOC). The two (2) aqueous samples were analyzed for dissolved metals. One field duplicate pair was included in the sample delivery group (SDG): S43SB011-0709/S43SB011-0709-D.

The samples were collected by Tetra Tech on June 4 and 5, 2011 and analyzed by Empirical Laboratories. All analyses were conducted in accordance with SW-846 Methods 6010C, 7470A, 7471A, 9012A, 6850 and Lloyd Kahn analytical and reporting protocols.

The data contained in this SDG were validated with regard to the following parameters: data completeness, holding times, calibration data, ICP/MS tune, laboratory method/preparation blanks, Interference Check Sample (ICS) results, Matrix Spike/Matrix Spike Duplicate (MS/MSD) results, field duplicate precision, Laboratory Control Sample (LCS) results, laboratory duplicate results, ICP serial dilution results, detection limits and analyte quantitation. Areas of concern are listed below.

Major

No major issues were identified.

Minor

- The low concentration calibration verifications performed on instrument LCMS1 on 06/24/11 @ 16:33 and on 6/25/11 @ 07:29 exceeded the laboratory's 30% quality control limit for the perchlorate analysis. All samples were affected. The positive and non-detected results were qualified as estimated, (J) and (UJ), respectively, due to conflicting directional bias.

- The Contract Required Detection Limit (CRDL) Percent Recovery (%R) for selenium was less than the 90% quality control limit. All soil samples were affected. The non-detected results reported for selenium were qualified as biased low, (UL). The positive results less than 2X CRDL

reported for selenium were qualified as estimated, (J), as a result of conflicting noncompliances.

- The CRDL %Rs for arsenic and selenium were less than the 90% quality control limit affecting the total and dissolved aqueous samples. The non-detected results reported for arsenic and selenium were qualified as biased low, (UL). The positive results less than 2X CRDL reported for arsenic were qualified as estimated, (J), as a result of conflicting noncompliances.

- The CRDL %R for iron was greater than 110% quality control limit affecting the total and dissolved aqueous samples. The positive results less than 2X CRDL for iron were qualified as biased high, (K).

- The Matrix Spike/Matrix Spike Duplicate (MS/MSD) samples had Percent Recoveries (%Rs) less than 10% for the analyte, antimony. The laboratory took corrective action and performed a post digestion spike which yielded an acceptable %R. All the soil samples were affected. The non-detected results reported for antimony in these samples were qualified as biased low, (UL).

- The MS/MSD %Rs for manganese were above the upper quality control limit. In addition, the MSD %Rs for chromium, vanadium, and zinc were above the upper quality control limit. The post digestion spike yielded acceptable %Rs for these analytes. All soil samples were affected. Only positive results were reported for these analytes in the affected samples and the positive results were qualified as biased high, (K), with the exception of the vanadium results. All vanadium results were qualified as estimated, (J), due to conflicting directional bias.

- The Matrix Spike/Matrix Spike Duplicate (MS/MSD) samples had Percent Recoveries (%Rs) less than 10% for the analyte, antimony. The laboratory took corrective action and performed a post digestion spike which yielded an acceptable %R. All the soil samples were affected. The non-detected results reported for antimony in these samples were qualified as rejected, (UR).

- The MS/MSD %Rs for perchlorate were above the upper quality control limit. All soil samples were affected. The positive results reported for perchlorate in samples, S43SB008-0608, S43SB011-0709, and S43SB011-0709-D, were qualified as estimated, (J), due to conflicting directional bias. No action was taken for the affected non-detected results.

- The Relative Percent Differences (RPDs) for arsenic, barium and vanadium were greater than the 50% quality control limit in the field duplicate pair, S43SB011-0709/S43SB011-0709-D. The positive results reported for these analytes were qualified as estimated, (J).

- Positive results reported below the Level of Quantitation (LOQ) but above the Detection Limit (DL) were qualified as estimated, (J).

Notes

The interfering analyte, aluminum, was present in all soil samples at concentrations comparable to the concentration of aluminum in the Interference Check Sample (ICS) solution analyzed on 06/17/11. Cadmium, copper, manganese, and/or zinc were present in the ICS solution at a concentration that exceeded the absolute value of the DL. No validation action was warranted as no interference effects were present.

The interfering analyte, iron, was present in all soil samples at concentrations comparable to the concentration of iron in the Interference Check Sample (ICS) solution analyzed on 06/17/11. Cadmium, copper, manganese, and/or zinc were present in the ICS solution at a concentration that exceeded the

absolute value of the DL. No validation action was warranted as no interference effects were present.

The CRDL %R for cadmium was greater than the 110% quality control limit affecting the soil samples. No validation actions were warranted as all sample results were non-detects.

The CRDL %R for lead was less than the 90% quality control limit. All soil samples were affected. No validation actions were necessary because all sample results were greater than 2X CRDL.

The CRDL %R for aluminum was greater than the 110% quality control limit affecting the total and dissolved aqueous samples. No validation action was warranted as all sample results were either non-detects for were greater than 2X CRDL.

Perchlorate was detected in the duplicate sample, S43SB011-0709-D, but not in the environmental sample, S43SB011-0709. No action was necessary in the field duplicate pair because the difference between the positive and non-detected result was less than 4X the LOQ.

The laboratory stated that LOQ was raised for silver and/or thallium in the soil samples due to interference.

The sample below was analyzed at the following dilution:

Sample	Analyte	Dilution
S43TW08 2832	All Metals except Mercury	5X

Non-detected results were reported to the Limit of Detection (LOD).

Executive Summary

Laboratory Performance: Two low concentration calibration verifications exceeded the quality control limit in the perchlorate fraction, affecting all samples. Several CRDL %Rs were outside the 90 - 110% quality control limits.

Other Factors Affecting Data Quality: The MS/MSD %Rs for antimony were below 10% resulting in the qualification of the soil sample results. High MS/MSD %Rs were noted for chromium, manganese, vanadium, zinc, and perchlorate. Field duplicate imprecision was noted for arsenic, barium and vanadium. Positive results reported below the LOQ but above the DL were estimated.

The data for these analyses were reviewed with reference to Region III modifications to the "National Functional Guidelines for Inorganic Data Validation" (April 1993), and the Department of Defense (DoD) document entitled "Quality Systems Manual (QSM) for Environmental Laboratories" (April 2009).

Tetra Tech NUS
Michelle L. Allen
Chemist/Data Validator

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

Appendix A

Qualified Analytical Results

Data Validation Qualifier Codes:

A = Lab Blank Contamination
B = Field Blank Contamination
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D = MS/MSD Recovery Noncompliance
E = LCS/LCSD Recovery Noncompliance
F = Lab Duplicate Imprecision
G = Field Duplicate Imprecision
H = Holding Time Exceedance
I = ICP Serial Dilution Noncompliance
J = GFAA PDS - GFAA MSA's $r < 0.995$ / ICP PDS Recovery Noncompliance
K = ICP Interference - includes ICS % R Noncompliance
L = Instrument Calibration Range Exceedance
M = Sample Preservation Noncompliance
N = Internal Standard Noncompliance
N01 = Internal Standard Recovery Noncompliance Dioxins
N02 = Recovery Standard Noncompliance Dioxins
N03 = Clean-up Standard Noncompliance Dioxins
O = Poor Instrument Performance (e.g. base-line drifting)
P = Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q = Other problems (can encompass a number of issues; e.g. chromatography,interferences, etc.)
R = Surrogates Recovery Noncompliance
S = Pesticide/PCB Resolution
T = % Breakdown Noncompliance for DDT and Endrin
U = % Difference between columns/detectors >25% for positive results determined via GC/HPLC
V = Non-linear calibrations; correlation coefficient $r < 0.995$
W = EMPC result
X = Signal to noise response drop
Y = Percent solids <30%
Z = Uncertainty at 2 sigma deviation is greater than sample activity

PROJ_NO: 00771	NSAMPLE	S43SB008-0608			S43SB009-0608			S43SB011-0709			S43SB011-0709-D		
SDG: CTO114_002	LAB_ID	1106067-03			1106067-02			1106067-04			1106067-05		
FRACTION: M	SAMP_DATE	6/4/2011			6/4/2011			6/4/2011			6/4/2011		
MEDIA: SOIL	QC_TYPE	NM			NM			NM			NM		
	UNITS	MG/KG			MG/KG			MG/KG			MG/KG		
	PCT_SOLIDS	86.5			83.9			82.7			83.4		
	DUP_OF										S43SB011-0709		
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM		5890			8690			8040			7100		
ANTIMONY		0.469	UL	D	0.472	UL	D	0.474	UL	D	0.461	UL	D
ARSENIC		1.53	J	G	3.01	J	G	2.25	J	G	5.24	J	G
BARIUM		28.2	J	G	51.1	J	G	39.6	J	G	16.7	J	G
BERYLLIUM		0.361			0.777			0.557			0.613		
CADMIUM		0.117	U		0.118	U		0.119	U		0.115	U	
CHROMIUM		8.03	K	D	15.8	K	D	13.3	K	D	14.5	K	D
COBALT		3.36			5.28			6.12			5.13		
COPPER		4.8			14			8.13			11.6		
IRON		9430			14500			9380			15500		
LEAD		5.34			11.6			9.23			9.19		
MANGANESE		23.3	K	D	16.9	K	D	28.6	K	D	30	K	D
MERCURY		0.0128	J	P	0.0347	U		0.0292	U		0.0383	U	
NICKEL		6.02			10.3			10.4			9.5		
SELENIUM		0.293	UL	C	0.343	J	P	0.223	J	P	0.258	J	P
SILVER		0.117	U		0.118	U		0.119	U		0.115	U	
THALLIUM		0.235	U		0.472	U		0.474	U		0.461	U	
VANADIUM		11.3	J	DG	27.1	J	DG	16.4	J	DG	29.9	J	DG
ZINC		18.8	K	D	35.7	K	D	27.8	K	D	31.4	K	D

PROJ_NO: 00771	NSAMPLE	S43SB014-0709			S43SB016-0608		
SDG: CTO114_002	LAB_ID	1106067-06			1106067-09		
FRACTION: M	SAMP_DATE	6/4/2011			6/5/2011		
MEDIA: SOIL	QC_TYPE	NM			NM		
	UNITS	MG/KG			MG/KG		
	PCT_SOLIDS	85.9			85.1		
	DUP_OF						
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM		12300			9680		
ANTIMONY		0.448	UL	D	0.454	UL	D
ARSENIC		2.48	J	G	1.19	J	G
BARIUM		115	J	G	55.4	J	G
BERYLLIUM		0.855			0.675		
CADMIUM		0.112	U		0.113	U	
CHROMIUM		15.7	K	D	14.2	K	D
COBALT		5.45			5.29		
COPPER		15.3			10.4		
IRON		10600			8290		
LEAD		13.3			9.87		
MANGANESE		17	K	D	9.75	K	D
MERCURY		0.0133	J	P	0.0388	U	
NICKEL		11.8			9.09		
SELENIUM		0.28	UL	C	0.284	UL	C
SILVER		0.112	U		0.113	U	
THALLIUM		0.392	U		0.454	U	
VANADIUM		20.3	J	DG	12.6	J	DG
ZINC		46.6	K	D	36.2	K	D

PROJ_NO: 00771	NSAMPLE	S43RB01-20110605			S43TW08 2832		
SDG: CTO114_002	LAB_ID	1106067-10			1106067-07		
FRACTION: M	SAMP_DATE	6/5/2011			6/5/2011		
MEDIA: WATER	QC_TYPE	NM			NM		
	UNITS	UG/L			UG/L		
	PCT_SOLIDS						
	DUP_OF						
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM		25	U		21500		
ANTIMONY		2	U		10	U	
ARSENIC		1.5	UL	C	28.8		
BARIUM		2.5	U		316		
BERYLLIUM		0.5	U		4.11	J	P
CADMIUM		0.5	U		2.5	U	
CHROMIUM		1	U		75.7		
COBALT		2.5	U		132		
COPPER		2	U		91.8		
IRON		37.2	K	C	58500		
LEAD		0.75	U		41.9		
MANGANESE		1.5	U		678		
MERCURY		0.2	U		0.36		
NICKEL		1.5	U		112		
SELENIUM		1.25	UL	C	6.25	UL	C
SILVER		0.5	U		2.5	U	
THALLIUM		1	U		5	U	
VANADIUM		2.5	U		104		
ZINC		2.5	U		312		

PROJ_NO: 00771	NSAMPLE	S43RB01-20110605			S43TW08 2832		
SDG: CTO114_002	LAB_ID	1106067-11			1106067-08		
FRACTION: MF	SAMP_DATE	6/5/2011			6/5/2011		
MEDIA: WATER	QC_TYPE	NM			NM		
	UNITS	UG/L			UG/L		
	PCT_SOLIDS						
	DUP_OF						
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM		25	U		2150		
ANTIMONY		2	U		10	U	
ARSENIC		1.5	UL	C	5.84	J	CP
BARIUM		2.5	U		93.7		
BERYLLIUM		0.5	U		2.5	U	
CADMIUM		0.5	U		2.5	U	
CHROMIUM		1	U		9.44	J	P
COBALT		2.5	U		17.8		
COPPER		2	U		9.53	J	P
IRON		15	U		32500		
LEAD		0.75	U		3.72	J	P
MANGANESE		1.5	U		491		
MERCURY		0.2	U		0.2	U	
NICKEL		1.5	U		17.9		
SELENIUM		1.25	UL	C	6.25	UL	C
SILVER		0.5	U		2.5	U	
THALLIUM		1	U		5	U	
VANADIUM		2.5	U		11.9	J	P
ZINC		2.5	U		33.1		

PROJ_NO: 00771	NSAMPLE	S43SB008-0608						S43SB009-0608					
SDG: CTO114_002	LAB_ID	1106067-03						1106067-02					
FRACTION: MISC	SAMP_DATE	6/4/2011						6/4/2011					
MEDIA: SOIL	QC_TYPE	NM						NM					
	UNITS	MG/KG			UG/KG			MG/KG			UG/KG		
	PCT_SOLIDS	86.5			86.5			83.9			83.9		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
CYANIDE		0.292	U					0.266	U				
PERCHLORATE					3.86	J	CDP				2.38	UJ	C
TOTAL ORGANIC CARBON		1180	J	P				1660					

PROJ_NO: 00771	NSAMPLE	S43SB011-0709						S43SB011-0709-D					
SDG: CTO114_002	LAB_ID	1106067-04						1106067-05					
FRACTION: MISC	SAMP_DATE	6/4/2011						6/4/2011					
MEDIA: SOIL	QC_TYPE	NM						NM					
	UNITS	MG/KG			UG/KG			MG/KG			UG/KG		
	PCT_SOLIDS	82.7			82.7			83.4			83.4		
	DUP_OF							S43SB011-0709			S43SB011-0709		
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
CYANIDE		0.285	U					0.291	U				
PERCHLORATE					2.42	UJ	C				4.84	J	CDP
TOTAL ORGANIC CARBON		1210	J	P				900	J	P			

PROJ_NO: 00771	NSAMPLE	S43SB014-0709						S43SB016-0608					
SDG: CTO114_002	LAB_ID	1106067-06						1106067-09					
FRACTION: MISC	SAMP_DATE	6/4/2011						6/5/2011					
MEDIA: SOIL	QC_TYPE	NM						NM					
	UNITS	MG/KG			UG/KG			MG/KG			UG/KG		
	PCT_SOLIDS	85.9			85.9			85.1			85.1		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
CYANIDE		0.294	U					0.265	U				
PERCHLORATE					1.08	J	CDP				2.35	UJ	C
TOTAL ORGANIC CARBON		1030	J	P				1020	J	P			

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**R. SOK**	**DATE:**	**August 31, 2011**
FROM:	**MEGAN CARSON**	**COPIES:**	**DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION –SELECT METALS, CYANIDE AND TOTAL ORGANIC CARBON**
NSF INDIAN HEAD, CTO 114
SAMPLE DELIVERY GROUP (SDG) – CTO114-003

SAMPLES:

4/Soil/

S43SB012-0507	S43SB012-0507-D
S43SB017-0608	S43SB018-0507

4/Water/

S43RB02-20110612	S43TW006-2832
S43TW11-3034	S43TW12-2630

Overview

The sample set for NSF Indian Head, SDG CTO114-003 consists of four (4) soil environmental samples and four (4) aqueous samples. This SDG contained one field duplicate pair: S43SB012-0507/S43SB012-0507-D.

All samples were analyzed for select metals and cyanide. Soil results were also analyzed for total organic carbon (TOC). The samples were collected by Tetra Tech NUS, Inc. on June 10th, 11th, and 12th, 2011 and analyzed by Empirical Laboratories, LLC under Naval Facilities Engineering Service Center (NFESC) Quality Assurance / Quality Control (QA/QC) criteria. Metals analyses were conducted using SW846 method 6010C. Mercury analyses were conducted using SW846 methods 7471A and 7470. Cyanide analyses were conducted using method SM9012A. TOC analyses were conducted using method SW9060.

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, ICP/MS tune, laboratory method/preparation blanks, interference check sample (ICS) results, matrix spike / matrix spike duplicate results, field duplicate precision, laboratory duplicate precision, laboratory control sample (LCS) results, ICP serial dilution results, ICP/MS internal standard recoveries, detection limits and analyte quantitation.

Areas of concern with respect to data quality are listed below.

Major Problems:

- None.

Minor Problems:

- The continuing calibrations analyzed on 7/5/11 at 18:05 and 18:55 had percent recoveries > 110% for iron. All water samples were affected. Iron results were qualified as biased high (K).

- The CRDL standard analyzed on 7/5/11 had a percent recovery >110% for aluminum and percent recoveries <90% for lead and thallium. All water samples were affected. Aluminum results <2X CRDL were qualified as biased high (K). Positive lead results were qualified as biased low (L) and non-detected results were qualified as biased low (UL). Non-detected thallium results were qualified as biased low (UL).

- The interfering analyte aluminum was present in all soil samples at concentrations comparable to the concentrations of aluminum in the interference check sample (ICS) solution. Several analytes namely, antimony, chromium, cobalt, copper lead, manganese, nickel, selenium, silver, thallium, and zinc were present in the ICS solution at a concentration that exceeded the instrument detection limit (IDL). Interference effects exist for selenium and silver in the affected samples. Non-detected silver and selenium results were qualified as biased low (UL).

- The interfering analyte iron was present in sample S43SB012-0507, S43SB012-0507-D, S43SB017-0608, and S43SB018-0507 at concentrations comparable to the concentrations of iron in the interference check sample (ICS) solution. Several analytes namely, antimony, chromium, cobalt, copper lead, manganese, nickel, selenium, silver, thallium, and zinc were present in the ICS solution at a concentration that exceeded the instrument detection limit (IDL). Interference effects exist for selenium and silver in the affected samples. All non-detected silver and selenium results were qualified as biased low (UL).

- Field duplicate pair S43SB012-0507/S43SB012-0507-D had RPD>50% for manganese. All soil samples were affected. Positive results were qualified as estimated (J).

- Positive results < LOQ but > DL were qualified as estimated (J).

Notes

The continuing calibration analyzed on 7/7/11 at 19:14 had a percent recovery >110% for selenium. All soil samples were affected. No validation action was warranted as sample results were non-detected.

The following contaminants were detected in the laboratory calibration blank at the following maximum concentration:

Analyte	Maximum Concentration	Action Level
Iron	71.4 ug/L	17.85 mg/kg
Aluminum	68.1 ug/L	17.02 mg/kg

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. All soil samples were affected. No validation action was warranted.

The continuing calibration analyzed on 6/24/11 at 15:22 had a percent recovery > 110% for cyanide. All samples were affected. No validation action was taken because sample results were non-detected.

The matrix spike and matrix spike duplicate had a relative percent difference >20% for cyanide. No validation action was required.

Samples S43TW11-3034 and S43TW12-2630 were analyzed at a 2X for mercury.

Executive Summary

Laboratory Performance: Continuing calibration non-compliances resulted in the qualification of sample results. CRDL standard non-compliances resulted in the qualification of sample results. Interferent standard non-compliances resulted in the qualification of sample results.

Other Factors Affecting Data Quality: Field duplicate non-compliances for manganese resulted in the qualification of sample results.

The data for these analyses were reviewed with reference to Region III modifications to the "National Functional Guidelines for Inorganic Data Validation", April 1993, and the Department of Defense (DoD) document entitled "Quality Systems Manual (QSM) for Environmental Laboratories "(April, 2009).

The text of this report has been formulated to address only those problem areas affecting data quality.

Megan Carson

Tetra Tech NUS
Megan Carson
Chemist/Data Validator

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

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

APPENDIX A

QUALIFIED ANALYTICAL RESULTS

Data Validation Qualifier Codes:

A	=	Lab Blank Contamination
B	=	Field Blank Contamination
C	=	Calibration Noncompliance (e.g. % RSDs, %Ds, ICVs, CCVs, RRFs, etc.)
C01	=	GC/MS Tuning Noncompliance
D	=	MS/MSD Recovery Noncompliance
E	=	LCS/LCSD Recovery Noncompliance
F	=	Lab Duplicate Imprecision
G	=	Field Duplicate Imprecision
H	=	Holding Time Exceedance
I	=	ICP Serial Dilution Noncompliance
J	=	GFAA PDS - GFAA MSA's $r < 0.995$
K	=	ICP Interference - includes ICS % R Noncompliance
L	=	Instrument Calibration Range Exceedance
M	=	Sample Preservation Noncompliance
N	=	Internal Standard Noncompliance
N01	=	Internal Standard Recovery Noncompliance Dioxins
N02	=	Recovery Standard Noncompliance Dioxins
N03	=	Clean-up Standard Noncompliance Dioxins
O	=	Poor Instrument Performance (e.g. base-line drifting)
P	=	Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q	=	Other problems (can be any number of issues; e.g. poor chromatography,interferences, etc.)
R	=	Surrogates Recovery Noncompliance
S	=	Pesticide/PCB Resolution
T	=	% Breakdown Noncompliance for DDT and Endrin
U	=	% Difference between columns/detectors >25% for positive results determined via GC/HPLC
V	=	Non-linear calibrations; correlation coefficient $r < 0.995$
W	=	EMPC result
X	=	Signal to noise response drop
Y	=	Percent solids <30%
Z	=	Uncertainty at 2 sigma deviation is greater than sample activity

PROJ_NO: 00771 SDG: CTO114_003 FRACTION: M MEDIA: SOIL	NSAMPLE	S43SB012-0507			S43SB012-0507-D			S43SB017-0608			S43SB018-0507		
	LAB_ID	1106158-12			1106158-13			1106158-02			1106158-04		
	SAMP_DATE	6/11/2011			6/11/2011			6/10/2011			6/10/2011		
	QC_TYPE	NM			NM			NM			NM		
	UNITS	MG/KG			MG/KG			MG/KG			MG/KG		
	PCT_SOLIDS	84.9			85.9			85.5			84.8		
	DUP_OF				S43SB012-0507								
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM		10500			8440			7220			7260		
ANTIMONY		0.569	U		0.585	U		0.596	U		0.575	U	
ARSENIC		2.91			2.92			1.28			0.895		
BARIUM		221			165			33.2			25.6		
BERYLLIUM		0.713			0.666			0.545			0.605		
CADMIUM		0.284	U		0.292	U		0.298	U		0.288	U	
CHROMIUM		16.2			13.4			12.7			11.9		
COBALT		6.16			5.32			5.04			4.71		
COPPER		12.1			10.2			6.77			9.81		
IRON		9620			9590			9110			10500		
LEAD		10.7			9.36			8.21			8.1		
MANGANESE		30.9	J	G	18.1	J	G	16.5	J	G	15.4	J	G
MERCURY		0.0376	U		0.036	U		0.0351	U		0.0365	U	
NICKEL		11.2			9.88			8.38			8.97		
SELENIUM		0.569	UL	K	0.585	UL	K	0.596	UL	K	0.575	UL	K
SILVER		0.569	UL	K	0.585	UL	K	0.596	UL	K	0.575	UL	K
THALLIUM		0.455	U		0.468	U		0.477	U		0.46	U	
VANADIUM		18.3			18			17.8			16.7		
ZINC		35.2			33.8			23.1			22.7		

PROJ_NO: 00771	NSAMPLE	S43RB02-20110612			S43TW006-2832			S43TW11-3034			S43TW12-2630		
SDG: CTO114_003	LAB_ID	1106158-16			1106158-14			1106158-03			1106158-11		
FRACTION: M	SAMP_DATE	6/12/2011			6/11/2011			6/10/2011			6/11/2011		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM		125			21900			27100			20500		
ANTIMONY		2.5	U		2.5	U		5	U		5	U	
ARSENIC		2.5	U		12.9			43.5			39.2		
BARIUM		1.31	J	P	234			267			243		
BERYLLIUM		1.25	U		2.38			1.98	J	P	1.76	J	P
CADMIUM		1.25	U		1.25	U		2.5	U		2.5	U	
CHROMIUM		0.916	J	P	141			126			239		
COBALT		3.12	U		29.5			32.3			29.6		
COPPER		23.6			99.2			93.7			163		
IRON		234	K	C	52800	K	C	58200	K	C	68500	K	C
LEAD		1.26	L	C	42.6			38.7			32		
MANGANESE		2.82	J	P	811			418			507		
MERCURY		0.2	U		0.125	J	P	0.236			0.206		
NICKEL		0.796	J	P	34			64.9			85.6		
SELENIUM		2.5	U		2.5	U		6.49			2.92		
SILVER		2.5	U		2.5	U		5	U		5	U	
THALLIUM		2	UL	C	2	UL	C	4	UL	C	4	UL	C
VANADIUM		3.12	U		101			91			78.6		
ZINC		12			66			103			129		

PROJ_NO: 00771 SDG: CTO114_003 FRACTION: MF MEDIA: WATER	NSAMPLE	S43RB02-20110612			S43TW006-2832			S43TW11-3034			S43TW12-2630		
	LAB_ID	1106158-20			1106158-19			1106158-17			1106158-18		
	SAMP_DATE	6/12/2011			6/11/2011			6/10/2011			6/11/2011		
	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM		52.2	K	C	3150			373			1340		
ANTIMONY		2.5	U		2.5	U		2.5	U		2.5	U	
ARSENIC		2.5	U		2.97			3.74			4.53		
BARIUM		10	U		93.4			92.2			90.9		
BERYLLIUM		1.25	U		0.386	J	P	1.25	U		1.25	U	
CADMIUM		1.25	U		1.25	U		1.25	U		1.25	U	
CHROMIUM		0.545	J	P	16.3			1.83	J	P	15.3		
COBALT		3.12	U		14.2			3.12	U		2.2	J	P
COPPER		2.5	U		11.9			2.5	U		9.95		
IRON		115	K	C	28300	K	C	23700	K	C	24200	K	C
LEAD		0.75	UL	C	5.6			0.75	UL	C	1.12	L	C
MANGANESE		1.71	J	P	566			270			274		
MERCURY		0.2	U		0.2	U		0.2	U		0.2	U	
NICKEL		2.5	U		8.43			4.4			10.2		
SELENIUM		2.5	U		2.5	U		2.5	U		2.5	U	
SILVER		2.5	U		2.5	U		2.5	U		2.5	U	
THALLIUM		2	UL	C	2	UL	C	2	UL	C	2	UL	C
VANADIUM		3.12	U		14.9			1.54	J	P	5.39		
ZINC		5	U		10.9			2.72	J	P	11.4		

PROJ_NO: 00771	NSAMPLE	S43SB012-0507						S43SB012-0507-D					
SDG: CTO114_003	LAB_ID	1106158-12						1106158-13					
FRACTION: MISC	SAMP_DATE	6/11/2011						6/11/2011					
MEDIA: SOIL	QC_TYPE	NM						NM					
	UNITS	MG/KG			UG/KG			MG/KG			UG/KG		
	PCT_SOLIDS	84.9			84.9			85.9			85.9		
	DUP_OF							S43SB012-0507			S43SB012-0507		
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
CYANIDE		0.883	U					0.873	U				
PERCHLORATE					2.36	UJ	C				2.33	U	
TOTAL ORGANIC CARBON		1260	J	P				1690					

PROJ_NO: 00771	NSAMPLE	S43SB017-0608						S43SB018-0507					
SDG: CTO114_003	LAB_ID	1106158-02						1106158-04					
FRACTION: MISC	SAMP_DATE	6/10/2011						6/10/2011					
MEDIA: SOIL	QC_TYPE	NM						NM					
	UNITS	MG/KG			UG/KG			MG/KG			UG/KG		
	PCT_SOLIDS	85.5			85.5			84.8			84.8		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
CYANIDE		0.877	U					0.884	U				
PERCHLORATE					2.34	UJ	C				2.36	UJ	C
TOTAL ORGANIC CARBON		588	J	P				1130	J	P			

PROJ_NO: 00771	NSAMPLE	S43RB02-20110612						S43TW006-2832					
SDG: CTO114_003	LAB_ID	1106158-16						1106158-14					
FRACTION: MISC	SAMP_DATE	6/12/2011						6/11/2011					
MEDIA: WATER	QC_TYPE	NM						NM					
	UNITS	MG/L			UG/L			MG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
CYANIDE		0.02	U					0.02	U				
PERCHLORATE					0.2	U					0.2	U	

PROJ_NO: 00771	NSAMPLE	S43TW11-3034						S43TW12-2630					
SDG: CTO114_003	LAB_ID	1106158-03						1106158-11					
FRACTION: MISC	SAMP_DATE	6/10/2011						6/11/2011					
MEDIA: WATER	QC_TYPE	NM						NM					
	UNITS	MG/L			UG/L			MG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
CYANIDE		0.02	U					0.02	U				
PERCHLORATE					0.2	U					0.2	U	

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**R. SOK**	**DATE:**	**SEPTEMBER 7, 2011**
FROM:	**J. KALINYAK**	**COPIES:**	**DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – VOC / EXPLOSIVES**
NSF INDIAN HEAD, CTO 114
SAMPLE DELIVERY GROUP CTO114_002

SAMPLES: 6 / Soil / Explosives

S43SB008-0608	S43SB009-0608	S43SB011-0709
S43SB011-0709-D	S43SB014-0709	S43SB016-0608

2 / Aqueous / Explosives

S43RB01-20110605	S43TW08 2832

5 / Aqueous / VOC

S43FB01-20110605	S43FB02-20110605	S43RB01-20110605
S43TB02-20110604	S43TW08 2832	

OVERVIEW

The sample set for NSF Indian Head CTO 114 SDG CTO114_002 consisted of six (6) soil environmental samples and five (5) aqueous samples including one (1) rinse blank QC sample, one (1) aqueous trip blank QC sample, and two (2) aqueous field blank QC samples. The samples were analyzed as listed above for explosives and volatile organic compounds (VOC) in this sample delivery group (SDG). One (1) field duplicate pair was contained within this SDG: S43SB011-0709-D / S43SB011-0709.

The samples were collected by TetraTech NUS on June 4 and 5, 2011 and analyzed by Empirical Laboratory LLC. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using EPA SW-846 Method 8260B and 8330B analysis and reporting protocols.

The data contained in this SDG were validated with regard to the following parameters: data completeness, hold times, GC/MS tuning, initial/continuing calibrations, laboratory method blank results, surrogate spike recoveries, blank spike results, matrix spike/matrix spike duplicate results, internal standard recoveries, field duplicate results, chromatographic resolution, compound identification, compound quantitation, and detection limits. Areas of concern are listed below.

MAJOR

- The relative response factor (RRF) was less than the 0.05 quality control limit for 1,4-dioxane for the initial calibration on instrument MS-VOA4 on 06/02/11 and for the continuing calibration verification (CCV) performed on 06/15/11 @ 22:53. All samples were affected. The non-detected results reported for 1,4-dioxane were qualified rejected, (UR).

MINOR

- Positive results reported below the quantitation limit but above the method detection limit were qualified as estimated, (J).

- The VOC CCV percent difference (%D) was greater than the 20% and less than 50% quality control limit for acetone, 2-butanone, chloroethane, 1,2-dibromo-3-chloropropane, dichlorodifluoromethane, methyl acetate, and 4-methyl-2-pentanone for instrument MS-VOA4 on 06/15/11 @ 22:27 affecting samples S43RB01-20110605 and S43TW08 2832. The positive acetone result for sample S43TW08 2832 was qualified estimated, (J). The remaining aforementioned analytes results for samples S43RB01-20110605 and S43TW08 2832 were non-detected and were not qualified.

- The explosive CCV %Ds were greater than the 20% quality control limit for 2,4,6-trinitrotoluene and 4-amino-2,6-dinitrotoluene on instrument HPLC1 on 07/10/11 @ 01:08. The explosive CCV %D was greater than the quality control limit for 4-amino-2,6-dinitrotoluene on instrument HPLC2 on 07/11/11 @ 04:11. Additionally, the explosive CCV %Ds were greater than the 20% quality control limit for 2,4,6-trinitrotoluene, 4-amino-2,6-dinitrotoluene, nitroglycerin, and tetryl on instrument HPLC2 on 07/11/11 @ 11:32 The affected samples were S43SB008-0608, S43SB009-0608, S43SB011-0709, S43SB011-0709-D, S43SB014-0709, and S43SB016-0608. As the %Ds were not compliant for the analytes 2,4,6-trinitrotoluene and 4-amino-2,6-dinitrotoluene on both columns, the non-detected results for 2,4,6-trinitrotoluene and 4-amino-2,6-dinitrotoluene for all soil samples were qualified estimated, (UJ). The non-detected sample results for nitroglycerin and tetryl were not qualified as the alternate analytical column %Ds were within the quality control limits.

- The matrix spike/matrix spike duplicate (MS/MSD) %Rs were less than the quality control limit for 2-nitrotoluene for spiked sample S43SB014-0709. The non-detected result for 2-nitrotoluene for the sample was qualified estimated, (UJ).

- The explosive analysis relative percent differences (RPD) between the two analytical columns for the positive explosive results were greater than 40% for all sample positive explosives results. The positive explosives results for all samples were qualified estimated, (J). The positive explosives results for the samples were qualified estimated, (J). The C-18 (primary) column results were reported except when the RPD between the analytical columns was greater than 100%, in which case the lower of the two results from the columns was reported. The table below lists the samples and analytes qualified as well as the results for both analytical columns (the results reported are in bold).

Sample	Analyte	C-18	Ultra II Aromax	RPD
S43TW08 2832	3-nitrotoluene	2.24 µg/l	**0.156 µg/l**	174%
	4-nitrotoluene	**0.146 µg/l**	0.893 µg/l	144%
	RDX	**0.490 µg/l**	4.28 µg/l	159%
S43SB009-0608	1,3-dinitrobenzene	0.168 mg/kg	**0.0375 mg/kg**	127%
S43SB011-0709	4-nitrotoluene	**0.0640 mg/kg**	0.0292 mg/kg	75%
S43SB014-0709	4-nitrotoluene	0.0848 mg/kg	**0.0234 mg/kg**	113%
S43SB016-0608	1,3-dinitrobenzene	0.135 mg/kg	**0.0320 mg/kg**	124%
	4-nitrotoluene	0.0793 mg/kg	**0.0239 mg/kg**	107%

- The laboratory indicated a matrix interference for some sample positive explosive results for samples S43TW08 2832, S43SB009-0608, S43SB014-0709, and S43SB016-0608. These sample positive explosive results were qualified estimated, (J), due to the matrix interference.

- The nitroguanidine results for all soil samples had significant matrix interference effects indicated in the raw data for all of the samples. The laboratory performed a MS and MSD on soil sample S43B017-0608 from another SDG which had a similar matrix interference and recovered the spikes with %Rs within the quality control limits. The laboratory used this spike date to raise the detection limit, the limit of detection, and the limit of quantitation for the samples as a result of the interference. As a result of this interference and the method used by the laboratory to raise the LOD, all non-detected nitroguanidine soil sample results were qualified estimated, (UJ). A comparison of the chromatograms for the soil samples, the LCS, the CCV, the method blanks, and the MS/MSD are included in the data validation package.

NOTES

The VOC CCV %D was greater than the 20% and less than 50% quality control limit for acetone, 2-butanone, chloroethane, chloromethane, 1,2-dibromo-3-chloropropane, dichlorodifluoromethane, methyl acetate, and 4-methyl-2-pentanone for instrument MS-VOA4 on 06/11/11 @ 12:36 affecting samples S43FB01-20110605, S43FB02-20110605, and S43TB02-20110604. No action was taken as all results for the aforementioned analytes were non-detected.

The VOC CCV percent difference (%D) was greater than the 20% and less than 50% quality control limit for 1,4-dioxane for instrument MS-VOA4 on 06/15/11 @ 22:53 affecting samples S43RB01-20110605 and S43TW08 2832. The 1,4-dioxane non-detected sample results were not affected as they were previously rejected for RRF quality control limit non-compliances.

The initial VOC analysis of samples S43FB01-20110605, S43FB02-20110605, and S43TB02-20110604 on 06/11/11 did not include an analysis for 1,4-dioxane. The samples were re-analyzed on 06/16/11 for VOCs including 1,4-dioxane. Only the VOC 1,4-dioxane results from the 06/16/11 sample analyses were reported for the aforementioned samples.

The explosive CCV %Ds was greater than the 20% for 2,4,6-trinitrotoluene quality control limits for instrument HPLC1 on 06/09/11 @ 12:27, 06/10/11 @ 18:21 affecting the method blank and the LCS/LCSD. No samples were affected and no sample validation action was necessary.

The explosive CCV %D was greater than the 20% quality control limit for 4-amino-2,6-dinitrotoluene on instrument HPLC1 on 06/10/11 @ 22:16. Additionally, the CCV %Ds for 1,3,5-trinitrobenzene, 1,3-dinitrobenzene, 2,4,6-trinitrotoluene, and nitrobenzene were greater than the 20% quality control limits on instrument HPLC1 on 06/11/11 @ 04:07. The affected samples were S43RB01-20110605 and S43TW08 2832. No validation action was taken as the samples had non-detected results for the aforementioned explosive analytes and the alternate column CCV %Ds for the analytes were within the quality control limits.

The laboratory explosives surrogate standard recovery and retention time summary forms were missing the retention times for the surrogate 1-chloro-3-nitrobenzene on column 2 for a number of samples, blanks, CCVs, etc. making it appear that there were quality control limit retention time exceedances. The data validation chemist provided the correct retention times from the raw data for the samples to verify that the sample surrogate standard retention times were within the quality control limits.

The LCS/LCSD %Rs were greater than the quality control limit for nitroglycerin in batch 1F07016 affecting the aqueous samples S43RB01-20110605 and S43TW08 2832. No action was taken as the aforementioned samples had non-detected nitroglycerin results.

The LCS %Rs were greater than the quality control limit for nitroguanidine for the LCSs associated with batches 1F15938 and 1F16734 affecting all the aqueous and soil samples. No action was taken as all samples had non-detected results for nitroguanidine.

The MS/MSD %Rs for nitroguanidine were less than the quality control limit at 0% for both the MS and the MSD for spiked sample S43B014-0709. No action was taken as the sample was not spiked at a high enough concentration to be detected by the analysis.

The explosives positive sample results were reported from the two analytical columns inconsistently for different SDGs by the laboratory. The laboratory was contacted on this issue and the response is included in the data package. The laboratory policy is to report the primary analytical column positive explosives results unless there is an RPD between analytical columns greater than 100%, in which case the lower of the two column results was reported. The data validation chemist reviewed this SDG sample data for this policy, and in the case of this SDG, no changes were necessary for positive explosive results.

As was stated earlier in the validation report, there were significant laboratory analytical difficulties associated with the nitroguanidine analyses.

Non-detected results were reported to the limit of detection (LOD).

Soil samples were air dried for the explosives analysis. Therefore, the percent solids results presented in the 'Appendix A - Qualified Analytical Results' are 100% for the explosive fractions.

EXECUTIVE SUMMARY

Laboratory Performance Issues: VOC sample 1,4-dioxane non-detected results were rejected due to RRF quality control limit non-compliances. All soil sample non-detected nitroguanidine results and some sample positive explosive results were qualified due to matrix sample analytical interferences. The sample S43TW08 2832 acetone result was qualified for a CCV %D quality control limit non-compliance. Explosive results were qualified for CCV %D quality control limit non-compliances. The non-detected result for 2-nitrotoluene for the sample S43SB014-0709 was qualified due to a MS/MSD %R quality control limit non-compliance.

Other Factors Affecting Data Quality: Positive results reported below the quantitation limit but above the method detection limit were qualified as estimated (J). Sample positive explosive results were qualified for RPD quality control limit non-compliances.

The data for these analyses were reviewed with reference to the Region III modifications to U.S. EPA National Functional Guidelines for Organic Data Validation (Sept. 1994), USEPA SW-846 Methods 8260B and 8330B, and the Department of Defense (DoD) document entitled "Quality Systems Manual (QSM) for Environmental Laboratories" (April 2009).

Tetra Tech NUS
Joseph Kalinyak
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

APPENDIX A
QUALIFIED ANALYTICAL RESULTS

DATA QUALIFICATION CODE (QUAL CODE)

A = Lab Blank Contamination
B = Field Blank Contamination
C = Calibration Noncompliance (e.g. % RSDs, %Ds, ICVs, CCVs, RRFs, etc.)
C01 = GC/MS Tuning Noncompliance
D = MS/MSD Recovery Noncompliance
E = LCS/LCSD Recovery Noncompliance
F = Lab Duplicate Imprecision
G = Field Duplicate Imprecision
H = Holding Time Exceedance
I = ICP Serial Dilution Noncompliance
J = GFAA PDS - GFAA MSA's r < 0.995 / ICP PDS Recovery Noncompliance
K = ICP Interference - includes ICS % R Noncompliance
L = Instrument Calibration Range Exceedance
M = Sample Preservation Noncompliance
N = Internal Standard Noncompliance
N01 = Internal Standard Recovery Noncompliance Dioxins
N02 = Recovery Standard Noncompliance Dioxins
N03 = Clean-up Standard Noncompliance Dioxins
O = Poor Instrument Performance (e.g. base-line drifting)
P = Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q = Other problems (can encompass a number of issues; e.g. chromatography,interferences, etc.)
R = Surrogates Recovery Noncompliance
S = Pesticide/PCB Resolution
T = % Breakdown Noncompliance for DDT and Endrin
U = % Difference between columns/detectors >25% for positive results determined via GC/HPLC
V = Non-linear calibrations; correlation coefficient r < 0.995
W = EMPC result
X = Signal to noise response drop
Y = Percent solids <30%
Z = Uncertainty at 2 sigma deviation is greater than sample activity

PROJ_NO: 00771	NSAMPLE	S43FB01-20110605			S43FB02-20110605			S43RB01-20110605			S43TB02-20110604		
SDG: CTO114_002	LAB_ID	1106067-12			1106067-13			1106067-10			1106067-01		
FRACTION: OV	SAMP_DATE	6/5/2011			6/5/2011			6/5/2011			6/4/2011		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2,2-TETRACHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		1	U		1	U		0.5	U		1	U	
1,1-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2,3-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2,4-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE		1	U		1	U		0.5	U		1	U	
1,2-DIBROMOETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,3-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,4-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,4-DIOXANE		10	UR	C	10	UR	C	10	UR	C	10	UR	C
2-BUTANONE		5	U		5	U		5	U		5	U	
2-HEXANONE		2.5	U		2.5	U		2.5	U		2.5	U	
4-METHYL-2-PENTANONE		2.5	U		2.5	U		2.5	U		2.5	U	
ACETONE		5	U		5	U		5	U		5	U	
BENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
BROMODICHLOROMETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
BROMOFORM		0.648	J	P	0.5	U		0.5	U		0.5	U	
BROMOMETHANE		1	U		1	U		1	U		1	U	
CARBON DISULFIDE		0.5	U		0.5	U		0.5	U		0.5	U	
CARBON TETRACHLORIDE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLORODIBROMOMETHANE		0.385	J	P	0.5	U		0.5	U		0.5	U	
CHLOROETHANE		1	U		1	U		1	U		1	U	
CHLOROFORM		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROMETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
CIS-1,2-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
CYCLOHEXANE		0.5	U		0.5	U		0.5	U		0.5	U	
DICHLORODIFLUOROMETHANE		1	U		1	U		1	U		1	U	
ETHYLBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	

PROJ_NO: 00771 SDG: CTO114_002 FRACTION: OV MEDIA: WATER	NSAMPLE	S43FB01-20110605			S43FB02-20110605			S43RB01-20110605			S43TB02-20110604		
	LAB_ID	1106067-12			1106067-13			1106067-10			1106067-01		
	SAMP_DATE	6/5/2011			6/5/2011			6/5/2011			6/4/2011		
	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
METHYL ACETATE		1	U		1	U		1	U		1	U	
METHYL TERT-BUTYL ETHER		0.5	U		0.5	U		0.5	U		0.5	U	
METHYLENE CHLORIDE		1	U		1	U		1	U		1	U	
STYRENE		0.5	U		0.5	U		0.5	U		0.5	U	
TETRACHLOROETHENE		0.5	U		0.5	U		0.5	U		0.127	J	P
TOLUENE		0.5	U		0.5	U		0.5	U		0.5	U	
TOTAL XYLENES		1.5	U		1.5	U		1	U		1.5	U	
TRANS-1,2-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
TRICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
TRICHLOROFLUOROMETHANE		1	U		1	U		1	U		1	U	
VINYL CHLORIDE		0.5	U		0.5	U		0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43TW08 2832		
SDG: CTO114_002	LAB_ID	1106067-07		
FRACTION: OV	SAMP_DATE	6/5/2011		
MEDIA: WATER	QC_TYPE	NM		
	UNITS	UG/L		
	PCT_SOLIDS	0.0		
	DUP_OF			
PARAMETER		RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		0.5	U	
1,1,2,2-TETRACHLOROETHANE		0.5	U	
1,1,2-TRICHLOROETHANE		0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		0.5	U	
1,1-DICHLOROETHANE		0.5	U	
1,1-DICHLOROETHENE		0.364	J	P
1,2,3-TRICHLOROBENZENE		0.5	U	
1,2,4-TRICHLOROBENZENE		0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE		0.5	U	
1,2-DIBROMOETHANE		0.5	U	
1,2-DICHLOROBENZENE		0.5	U	
1,2-DICHLOROETHANE		0.5	U	
1,2-DICHLOROPROPANE		0.5	U	
1,3-DICHLOROPROPANE		0.5	U	
1,4-DICHLOROBENZENE		0.5	U	
1,4-DIOXANE		10	UR	C
2-BUTANONE		5	U	
2-HEXANONE		2.5	U	
4-METHYL-2-PENTANONE		2.5	U	
ACETONE		10.6	J	C
BENZENE		0.5	U	
BROMODICHLOROMETHANE		0.5	U	
BROMOFORM		0.5	U	
BROMOMETHANE		1	U	
CARBON DISULFIDE		0.5	U	
CARBON TETRACHLORIDE		0.5	U	
CHLOROBENZENE		0.5	U	
CHLORODIBROMOMETHANE		0.5	U	
CHLOROETHANE		1	U	
CHLOROFORM		0.5	U	
CHLOROMETHANE		0.5	U	
CIS-1,2-DICHLOROETHENE		21.8		
CYCLOHEXANE		0.5	U	
DICHLORODIFLUOROMETHANE		1	U	
ETHYLBENZENE		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43TW08 2832
SDG: CTO114_002	LAB_ID	1106067-07
FRACTION: OV	SAMP_DATE	6/5/2011
MEDIA: WATER	QC_TYPE	NM
	UNITS	UG/L
	PCT_SOLIDS	0.0
	DUP_OF	

PARAMETER	RESULT	VQL	QLCD
ISOPROPYLBENZENE	0.5	U	
METHYL ACETATE	1	U	
METHYL TERT-BUTYL ETHER	0.5	U	
METHYLENE CHLORIDE	0.748	J	P
STYRENE	0.5	U	
TETRACHLOROETHENE	0.5	U	
TOLUENE	0.5	U	
TOTAL XYLENES	1	U	
TRANS-1,2-DICHLOROETHENE	0.5	U	
TRICHLOROETHENE	41.9		
TRICHLOROFLUOROMETHANE	1	U	
VINYL CHLORIDE	16.2		

PROJ_NO: 00771 SDG: CTO114_002 FRACTION: EXP MEDIA: WATER	NSAMPLE	S43RB01-20110605			S43TW08 2832		
	LAB_ID	1106067-10			1106067-07		
	SAMP_DATE	6/5/2011			6/5/2011		
	QC_TYPE	NM			NM		
	UNITS	UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0		
	DUP_OF						
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,3,5-TRINITROBENZENE		0.151	U		0.154	U	
1,3-DINITROBENZENE		0.151	U		0.154	U	
2,4,6-TRINITROTOLUENE		0.151	U		0.154	U	
2,4-DINITROTOLUENE		0.151	U		0.154	U	
2,6-DINITROTOLUENE		0.151	U		0.154	U	
2-AMINO-4,6-DINITROTOLUENE		0.151	U		0.154	U	
2-NITROTOLUENE		0.151	U		0.154	U	
3-NITROTOLUENE		0.151	U		0.156	J	PQU
4-AMINO-2,6-DINITROTOLUENE		0.151	U		0.154	U	
4-NITROTOLUENE		0.151	U		0.146	J	PQU
HMX		0.151	U		0.154	U	
NITROBENZENE		0.151	U		0.154	U	
NITROGLYCERIN		0.377	U		0.385	U	
NITROGUANIDINE		5	UJ	C	5	UJ	C
RDX		0.151	U		0.49	J	QU
TETRYL		0.151	U		0.154	U	

PROJ_NO: 00771	NSAMPLE	S43SB008-0608			S43SB009-0608			S43SB011-0709			S43SB011-0709-D		
SDG: CTO114_002	LAB_ID	1106067-03			1106067-02			1106067-04			1106067-05		
FRACTION: EXP	SAMP_DATE	6/4/2011			6/4/2011			6/4/2011			6/4/2011		
MEDIA: SOIL	QC_TYPE	NM			NM			NM			NM		
	UNITS	MG/KG			MG/KG			MG/KG			MG/KG		
	PCT_SOLIDS	100.0			100.0			100.0			100.0		
	DUP_OF										S43SB011-0709		
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,3,5-TRINITROBENZENE		0.0392	U		0.0385	U		0.0396	U		0.0367	U	
1,3-DINITROBENZENE		0.0392	U		0.0375	J	PQU	0.0396	U		0.0367	U	
2,4,6-TRINITROTOLUENE		0.0392	UJ	C	0.0385	UJ	C	0.0396	UJ	C	0.0367	UJ	C
2,4-DINITROTOLUENE		0.0392	U		0.0385	U		0.0396	U		0.0367	U	
2,6-DINITROTOLUENE		0.0392	U		0.0385	U		0.0396	U		0.0367	U	
2-AMINO-4,6-DINITROTOLUENE		0.0392	U		0.0385	U		0.0396	U		0.0367	U	
2-NITROTOLUENE		0.0392	U		0.0385	U		0.0396	U		0.0367	U	
3-NITROTOLUENE		0.0392	U		0.0385	U		0.0396	U		0.0367	U	
4-AMINO-2,6-DINITROTOLUENE		0.0392	UJ	C	0.0385	UJ	C	0.0396	UJ	C	0.0367	UJ	C
4-NITROTOLUENE		0.0392	U		0.0385	U		0.064	J	PU	0.0367	U	
HMX		0.0392	U		0.0385	U		0.0396	U		0.0367	U	
NITROBENZENE		0.0392	U		0.0385	U		0.0396	U		0.0367	U	
NITROGLYCERIN		0.196	U		0.192	U		0.198	U		0.183	U	
NITROGUANIDINE		0.37	UJ	Q	0.455	UJ	Q	0.455	UJ	Q	0.37	UJ	Q
RDX		0.0392	U		0.0385	U		0.0396	U		0.0367	U	
TETRYL		0.0392	U		0.0385	U		0.0396	U		0.0367	U	

PROJ_NO: 00771 SDG: CTO114_002 FRACTION: EXP MEDIA: SOIL	NSAMPLE	S43SB014-0709			S43SB016-0608		
	LAB_ID	1106067-06			1106067-09		
	SAMP_DATE	6/4/2011			6/5/2011		
	QC_TYPE	NM			NM		
	UNITS	MG/KG			MG/KG		
	PCT_SOLIDS	100.0			100.0		
	DUP_OF						
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,3,5-TRINITROBENZENE		0.0377	U		0.0392	U	
1,3-DINITROBENZENE		0.0377	U		0.032	J	PQU
2,4,6-TRINITROTOLUENE		0.0377	UJ	C	0.0392	UJ	C
2,4-DINITROTOLUENE		0.0377	U		0.0392	U	
2,6-DINITROTOLUENE		0.0377	U		0.0392	U	
2-AMINO-4,6-DINITROTOLUENE		0.0377	U		0.0392	U	
2-NITROTOLUENE		0.0377	UJ	D	0.0392	U	
3-NITROTOLUENE		0.0377	U		0.0392	U	
4-AMINO-2,6-DINITROTOLUENE		0.0377	UJ	C	0.0392	UJ	C
4-NITROTOLUENE		0.0234	J	PQU	0.0239	J	PQU
HMX		0.0377	U		0.0392	U	
NITROBENZENE		0.0377	U		0.0392	U	
NITROGLYCERIN		0.189	U		0.196	U	
NITROGUANIDINE		0.385	UJ	Q	0.37	UJ	Q
RDX		0.0377	U		0.0392	U	
TETRYL		0.0377	U		0.0392	U	

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**R. SOK**	**DATE:**	**SEPTEMBER 7, 2011**
FROM:	**J. KALINYAK**	**COPIES:**	**DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – VOC / EXPLOSIVES / PERCHLORATE**
NSF INDIAN HEAD, CTO 114
SAMPLE DELIVERY GROUP CTO114_003

SAMPLES: 5 / Aqueous / VOC

S43RB02-20110612	S43TB03-20110610	S43TW006-2832
S43TW11-3034	S43TW12-2630	

11 / Soil / VOC

S43SB008-0607	S43SB009-0708	S43SB009-0708-D
S43SB011-0507	S43SB012-0507	S43SB012-0507-D
S43SB016-0607	S43SB017-0608	S43SB018-0507
S43SB019-0607	S43SB022-0708	

4 / Aqueous / Explosives / Perchlorate

S43RB02-20110612	S43TW006-2832	S43TW11-3034
S43TW12-2630		

4 / Soil / Explosives / Perchlorate

S43SB012-0507	S43SB012-0507-D	S43SB017-0608
S43SB018-0507		

OVERVIEW

The sample set for NSF Indian Head CTO 114 SDG CTO114_003 consisted of eleven (11) soil environmental samples and five (5) aqueous samples, including one (1) aqueous rinse blank QC sample, and one (1) aqueous trip blank QC sample. The samples were analyzed as listed above for explosives (including nitroguanidine), perchlorate, and volatile organic compounds (VOC). Two (2) field duplicate sample pairs were contained in this sample delivery group (SDG): S43SB009-0708-D / S43SB009-0708 and S43SB012-0507-D / S43SB012-0507.

The samples were collected by TetraTech NUS on June 10, 11, and 12, 2011 and analyzed by Empirical Laboratory LLC. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using EPA SW-846 Method 8260B, 8330B, and 6850 analysis and reporting protocols.

The data contained in this SDG were validated with regard to the following parameters: data completeness, hold times, GC/MS tuning, initial/continuing calibrations, laboratory method blank results, surrogate spike recoveries, blank spike results, matrix spike/matrix spike duplicate results, internal standard recoveries, field duplicate results, chromatographic resolution, compound identification, compound quantitation, and detection limits. Areas of concern are listed below.

MAJOR

- The relative response factor (RRF) was less than the 0.05 quality control limit for 1,4-dioxane for the initial calibration on instrument MS-VOA3 on 05/26/11 and the initial calibration on instrument MS-VOA4 on 06/02/11. The continuing calibration verification (CCV) 1,4-dioxane RRFs for both instruments were also less than the 0.05 quality control limit when performed. In some instances there was no CCV for 1,4-dioxane performed by the laboratory. All 1,4-dioxane results for all aqueous and soil samples were non-detected and qualified rejected, (UR).

MINOR

- Positive results reported below the quantitation limit but above the method detection limit were qualified as estimated, (J).

- The VOC common laboratory contaminant acetone was detected in the method blank for batch 1F22002 at the concentration as listed below.

Analyte	Maximum Conc. (µg/kg)	Action Level (µg/kg)
Acetone	7.53	75.3

  An action level of 10X the maximum concentration for the common laboratory contaminant acetone was established to evaluate the sample for blank contamination. Sample aliquot, dilution factors and percent solids, if applicable, were taken into account when applying the action level. The affected sample S43SB012-0507 acetone positive result was less than the action level and was qualified as non-detected due to method blank contamination, (B).

- The VOC CCV %D was greater than the 20% and less than 50% quality control limit for acetone, 2-butanone, 4-methyl-2-pentanone, tetrachloroethene, and trichlorofluoromethane for instrument MS-VOA3 on 06/17/11 @ 08:16 affecting samples S43SB017-0608, S43SB018-0507, S43SB011-0507, and S43SB022-0708. No action was taken for the non-detected acetone, 2-butanone, 4-methyl-2-pentanone, tetrachloroethene, and trichlorofluoromethane aforementioned sample results. The positive 4-methyl-2-pentanone result for sample S43SB022-0708 was qualified estimated, (J).

- The VOC CCV %D was greater than the 20% and less than 50% quality control limit for acetone and 1,4-dioxane for instrument MS-VOA3 on 06/20/11 @ 08:35 and 09:02 affecting samples S43SB009-0708, S43SB009-0708-D, S43SB008-0607, S43SB012-0507-D, S43SB016-0607, and S43SB019-0607. No action was taken for 1.4-dioxane aforementioned sample results as they were rejected for an RRF quality control limit non-compliance. The positive acetone results for the aforementioned samples were qualified estimated, (J).

- The explosives aqueous sample time to extraction hold time of seven days was exceeded for the explosives SW-846 8330B analysis for aqueous samples S43TW11-3034, S43TW12-2630, S43TW006-2832, and S43RB02-20110612 by less than 2X. As a result of the sample time to extraction hold time exceedance, all aforementioned sample results for the explosives analysis (excluding nitroguanidine) were qualified estimated, (J) and (UJ), respectively.

- The explosives LCS %Rs were greater than the quality control limit for 1,3,5-trinitrobenzene and nitroglycerin in batch 1F23022 affecting the aqueous samples S43TW11-3034, S43TW12-2630, S43TW006-2832, and S43RB02-20110612. No action was taken for the

aforementioned sample non-detected 1,3,5-trinitrobenzene and nitroglycerin results. The positive nitroglycerin results for samples S43TW11-3034 and S43TW12-2630 were qualified estimated, (J).

- The explosives analysis relative percent difference (RPD) between the two analytical columns for the positive explosive results were greater than 40% as listed below. The positive explosives results for the samples were qualified estimated, (J). The C-18 (primary) column results were reported except when the RPD between the analytical columns was greater than 100%, in which case the lower of the two results from the columns was reported. The table below lists the samples and analytes qualified as well as the results for both analytical columns (the results reported are in bold).

Sample	Analyte	C-18	Ultra II Aromax	RPD
S43TW006-2832	RDX	**0.370 µg/l**	0.883 µg/l	82%
S43TW11-3034	1,3-dinitrobenzene	1.51 µg/l	**0.421 µg/l**	113%
	HMX	**1.33 µg/l**	0.517 µg/l	88%
	Nitroglycerin	**0.639 µg/l**	1.71 µg/l	91%
S43TW12-2630	Nitroglycerin	**0.341 µg/l**	1.07 µg/l	103%

- The explosive CCV %D was greater than the 20% quality control limit for 2,4,6-trinitrotoluene on instrument HPLC1 on 07/14/11 @ 05:20, @ 12:10, and @ 23:05 affecting samples S43SB017-0608, S43SB018-0507, S43SB012-0507, S43SB012-0507-D, S43TW11-3034, S43TW12-2630, S43TW006-2832, and S43RB02-20110612. No validation action was taken for the aqueous samples S43TW11-3034, S43TW12-2630, S43TW006-2832, and S43RB02-20110612, and soil sample S43SB017-0608 as they had non-detected results for 2,4,6-trinitrotoluene and the alternate instrument HPLC2 CCV %Ds for 2,4,6-trinitrotoluene were within the quality control limits. Samples S43SB018-0507, S43SB012-0507, and S43SB012-0507-D were not re-analyzed on the alternate instrument/column HPLC2, therefore, the non-detected 2,4,6-trinitrotoluene results for samples S43SB018-0507, S43SB012-0507, and S43SB012-0507-D were qualified estimated, (UJ).

- The nitroguanidine non-detected results for all soil samples were qualified estimated due to matrix interference effects indicated in the raw data for the samples. The raw data chromatograms associated with the nitroguanidine analyses indicated significant matrix interference with the soil sample analyses. The laboratory raised the reported non-detection results for the soil samples based on the matrix spike (MS) and MS duplicate (MSD) detection of sample S43SB017-0608. As a result of the matrix interference, a comparison of the chromatograms for the soil samples, the LCS, the CCV, the MS and MSD, and the method blanks indicated that there were significant interferences which did not make it possible for quantitation of lower level sample nitroguanidine concentrations. In addition to the soil samples, the aqueous sample S43TW006-2832 raw data also indicated a matrix interference. The laboratory used the MS/MSD spike amount as the limit of detection (LOD) for the soil samples S43SB017-0608, S43SB018-0507, S43SB012-0507, and S43SB012-0507-D and the aqueous sample S43TW006-2832. The raw data for the sample chromatograms is included in the data validation package.

- The perchlorate low level CCV %D was greater than the 30% laboratory established quality control limit for perchlorate for instrument LCMS1 on 06/24/11 @ 16:33 affecting samples S43SB017-0608, S43SB018-0507, and S43SB012-0507. The laboratory established CCV %D quality control limit of 30% was used for the data evaluation although the EPA SW-846 6850 procedure uses 50% for the %D quality control limit. The affected samples had non-detected perchlorate results which were qualified estimated, (UJ).

NOTES

Samples S43SB011-0507, S43SB011-0507, and S43SB018-0507 were analyzed diluted at 50X. Due to the dilution, the Limit of Detections (LOD) for non-detected VOC analytes were elevated.

Sample S43SB022-0708 was analyzed diluted at both a 50X and a 20000X due to an extremely high acetone result for the sample. Only the acetone result was reported from the 20000X dilution for the sample. Due to the 50X dilution, the LODs for non-detected VOC analytes were elevated.

The VOC CCV %D was greater than the 20% and less than 50% quality control limit for bromodichloromethane, carbon tetrachloride, and trichlorofluoromethane for instrument MS-VOA3 on 06/21/11 @ 09:06 affecting sample S43SB022-0708 re-analysis. No action was taken as the aforementioned analytes were not reported from the sample dilution re-analysis (only the acetone result was reported from the sample dilution re-analysis).

The VOC CCV %D was greater than the 20% and less than 50% quality control limit for acetone, tetrachloroethene, and trichlorofluoromethane for instrument MS-VOA3 on 06/22/11 @ 08:29 affecting sample S43SB012-0507. No action was taken as all results for the aforementioned analytes were non-detected (acetone qualified non-detected due to method blank contamination).

The VOC CCV %D was greater than the 20% and less than 50% quality control limit for acetone, 2-butanone, chloroethane, 1,2-dibromo-3-chloropropane, methyl acetate, and 1,4-dioxane for instrument MS-VOA4 on 06/20/11 @ 06:41 affecting samples S43RB02-20110612, S43TB03-20110610, S43TW006-2832, S43TW11-3034, and S43TW12-2630. No action was taken as all results for the aforementioned analytes were non-detected (sample 1,4-dioxane non-detected results rejected for RRF quality control limit non-compliances).

The VOC MS for spiked sample S43SB008-0607 had %Rs greater than the quality control limit for many VOC analytes. Additionally, the MSD for the spiked sample had %Rs for chloromethane and vinyl chloride greater than the quality control limit and the MS/MSD RPD for 1,4-dioxane was greater than the quality control limit. No validation action was taken as all analyte results for the sample were non-detected (and sample 1,4-dioxane non-detected results rejected for RRF quality control limit non-compliances).

The explosive CCV %D was greater than the 20% quality control limit for 2,4,6-trinitrotoluene on instrument HPLC1 on 06/27/11 @ 18:09 and @ 22:04. Additionally the CCV %D was greater than the 20% quality control limit for 2,4,6-trinitrotoluene, 4-amino-2,6-dinitrotoluene, and tetryl on instrument HPLC2 on 07/10/11 @ 16:42. No validation action was taken as the CCVs affected only a method blank and an LCS and no samples for this SDG.

The laboratory explosives surrogate standard recovery and retention time summary forms were missing the retention times for the surrogate 1-chloro-3-nitrobenzene for the HPLC2 instrument for a number of samples, blanks, CCVs, etc. making it appear that there were quality control limit retention time exceedances. The data validation chemist provided the correct retention times from the raw data for the samples to verify that the sample surrogate standard retention times were within the quality control limits. All affected samples had surrogate retention times within the quality control limits.

The LCS %R was greater than the quality control limit for nitroguanidine for batch 1F16734 affecting all the aqueous samples. No action was taken as all samples had non-detected results for nitroguanidine.

The explosive positive sample results were originally reported from the lower results of the two analytical columns. This was questioned by the data validator when an inconsistent laboratory reporting pattern for positive explosive results was noted for explosives reporting between different SDGs. The laboratory was contacted on this issue and the response is included in the data package. The laboratory policy is to report the primary analytical column positive explosives results unless there is an RPD between analytical columns greater than 100%, in which case the lower of the two column results was reported. The data validation chemist manually edited sample data to match the laboratory reporting policy for positive explosive results.

As was stated earlier in the validation report, there were significant laboratory analytical difficulties associated with the nitroguanidine analyses.

Non-detected results were reported to the limit of detection (LOD).

Soil samples were air dried for the explosives analysis. Therefore, the percent solids results presented in the 'Appendix A - Qualified Analytical Results' is listed as 100% for the explosive fractions.

EXECUTIVE SUMMARY

Laboratory Performance Issues: VOC sample 1,4-dioxane non-detected results were rejected due to RRF quality control limit non-compliances. The sample S43SB012-0507 acetone result was qualified for blank contamination. Sample VOC results were qualified for CCV %D quality control limit non-compliances. All aqueous sample explosive results were qualified for sample to extraction hold time quality control limit hold time exceedances. Aqueous sample positive nitroglycerin results were qualified for LCS %R quality control limit non-compliances. Some sample non-detected nitroguanidine results were qualified, and the LOD for the sample was raised, due to matrix sample analytical interferences. Non-detected sample perchlorate results were qualified for CCV %D quality control limit non-compliances.

Other Factors Affecting Data Quality: Positive results reported below the quantitation limit but above the method detection limit were qualified as estimated (J). Sample positive explosive results were qualified for RPD between columns quality control limit non-compliances.

The data for these analyses were reviewed with reference to the Region III modifications to U.S. EPA National Functional Guidelines for Organic Data Validation (Sept. 1994), USEPA SW-846 Methods 8260B, 8330B, and 6850, and the Department of Defense (DoD) document entitled "Quality Systems Manual (QSM) for Environmental Laboratories" (April 2009).

Tetra Tech NUS
Joseph Kalinyak
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

Appendix A

Qualified Analytical Results

Value Qualifier Key (Val Qual)

J – The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.

UJ – The result is an estimated non-detected quantity. The associated numerical value is the approximate concentration of the analyte in the sample.

U - Value is a non-detect as reported by the laboratory.

UR – Non-detected result is considered rejected, (UR), as a result of technical non-compliances.

DATA QUALIFICATION CODE (QUAL CODE)

A = Lab Blank Contamination
B = Field Blank Contamination
C = Calibration Noncompliance (e.g. % RSDs, %Ds, ICVs, CCVs, RRFs, etc.)
C01 = GC/MS Tuning Noncompliance
D = MS/MSD Recovery Noncompliance
E = LCS/LCSD Recovery Noncompliance
F = Lab Duplicate Imprecision
G = Field Duplicate Imprecision
H = Holding Time Exceedance
I = ICP Serial Dilution Noncompliance
J = GFAA PDS - GFAA MSA's $r < 0.995$ / ICP PDS Recovery Noncompliance
K = ICP Interference - includes ICS % R Noncompliance
L = Instrument Calibration Range Exceedance
M = Sample Preservation Noncompliance
N = Internal Standard Noncompliance
N01 = Internal Standard Recovery Noncompliance Dioxins
N02 = Recovery Standard Noncompliance Dioxins
N03 = Clean-up Standard Noncompliance Dioxins
O = Poor Instrument Performance (e.g. base-line drifting)
P = Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q = Other problems (can encompass a number of issues; e.g. chromatography,interferences, etc.)
R = Surrogates Recovery Noncompliance
S = Pesticide/PCB Resolution
T = % Breakdown Noncompliance for DDT and Endrin
U = % Difference between columns/detectors >25% for positive results determined via GC/HPLC
V = Non-linear calibrations; correlation coefficient $r < 0.995$
W = EMPC result
X = Signal to noise response drop
Y = Percent solids <30%
Z = Uncertainty at 2 sigma deviation is greater than sample activity

PROJ_NO: 00771 SDG: CTO114_003 FRACTION: OV MEDIA: WATER	NSAMPLE	S43RB02-20110612			S43TB03-20110610			S43TW006-2832			S43TW11-3034		
	LAB_ID	1106158-16			1106158-01			1106158-14			1106158-03		
	SAMP_DATE	6/12/2011			6/10/2011			6/11/2011			6/10/2011		
	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2,2-TETRACHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2,3-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2,4-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DIBROMOETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,3-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,4-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,4-DIOXANE		10	UR	C	10	UR	C	10	UR	C	10	UR	C
2-BUTANONE		5	U		5	U		5	U		5	U	
2-HEXANONE		2.5	U		2.5	U		2.5	U		2.5	U	
4-METHYL-2-PENTANONE		2.5	U		2.5	U		2.5	U		2.5	U	
ACETONE		5	U		5	U		5	U		5	U	
BENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
BROMODICHLOROMETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
BROMOFORM		0.5	U		0.5	U		0.5	U		0.5	U	
BROMOMETHANE		1	U		1	U		1	U		1	U	
CARBON DISULFIDE		0.5	U		0.5	U		0.5	U		0.5	U	
CARBON TETRACHLORIDE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLORODIBROMOMETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROETHANE		1	U		1	U		1	U		1	U	
CHLOROFORM		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROMETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
CIS-1,2-DICHLOROETHENE		0.5	U		0.5	U		4.49			0.5	U	
CYCLOHEXANE		0.5	U		0.5	U		0.5	U		0.5	U	
DICHLORODIFLUOROMETHANE		1	U		1	U		1	U		1	U	
ETHYLBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43TW12-2630
SDG: CTO114_003	LAB_ID	1106158-11
FRACTION: OV	SAMP_DATE	6/11/2011
MEDIA: WATER	QC_TYPE	NM
	UNITS	UG/L
	PCT_SOLIDS	0.0
	DUP_OF	

PARAMETER	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE	0.5	U	
1,1,2,2-TETRACHLOROETHANE	0.5	U	
1,1,2-TRICHLOROETHANE	0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE	0.5	U	
1,1-DICHLOROETHANE	0.5	U	
1,1-DICHLOROETHENE	0.5	U	
1,2,3-TRICHLOROBENZENE	0.5	U	
1,2,4-TRICHLOROBENZENE	0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE	0.5	U	
1,2-DIBROMOETHANE	0.5	U	
1,2-DICHLOROBENZENE	0.5	U	
1,2-DICHLOROETHANE	0.5	U	
1,2-DICHLOROPROPANE	0.5	U	
1,3-DICHLOROPROPANE	0.5	U	
1,4-DICHLOROBENZENE	0.5	U	
1,4-DIOXANE	10	UR	C
2-BUTANONE	5	U	
2-HEXANONE	2.5	U	
4-METHYL-2-PENTANONE	2.5	U	
ACETONE	5	U	
BENZENE	0.5	U	
BROMODICHLOROMETHANE	0.5	U	
BROMOFORM	0.5	U	
BROMOMETHANE	1	U	
CARBON DISULFIDE	0.5	U	
CARBON TETRACHLORIDE	0.5	U	
CHLOROBENZENE	0.5	U	
CHLORODIBROMOMETHANE	0.5	U	
CHLOROETHANE	1	U	
CHLOROFORM	0.5	U	
CHLOROMETHANE	0.5	U	
CIS-1,2-DICHLOROETHENE	0.5	U	
CYCLOHEXANE	0.5	U	
DICHLORODIFLUOROMETHANE	1	U	
ETHYLBENZENE	0.5	U	

PROJ_NO: 00771 SDG: CTO114_003 FRACTION: OV MEDIA: WATER	NSAMPLE	S43RB02-20110612			S43TB03-20110610			S43TW006-2832			S43TW11-3034		
	LAB_ID	1106158-16			1106158-01			1106158-14			1106158-03		
	SAMP_DATE	6/12/2011			6/10/2011			6/11/2011			6/10/2011		
	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
METHYL ACETATE		1	U		1	U		1	U		1	U	
METHYL TERT-BUTYL ETHER		0.5	U		0.5	U		0.5	U		0.5	U	
METHYLENE CHLORIDE		1	U		1	U		1	U		1	U	
STYRENE		0.5	U		0.5	U		0.5	U		0.5	U	
TETRACHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
TOLUENE		0.5	U		0.5	U		0.5	U		0.5	U	
TOTAL XYLENES		1	U		1	U		1	U		1	U	
TRANS-1,2-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
TRICHLOROETHENE		0.5	U		0.5	U		53.9			1.68		
TRICHLOROFLUOROMETHANE		1	U		1	U		1	U		1	U	
VINYL CHLORIDE		0.5	U		0.5	U		0.724	J	P	0.5	U	

PROJ_NO: 00771	NSAMPLE	S43TW12-2630
SDG: CTO114_003	LAB_ID	1106158-11
FRACTION: OV	SAMP_DATE	6/11/2011
MEDIA: WATER	QC_TYPE	NM
	UNITS	UG/L
	PCT_SOLIDS	0.0
	DUP_OF	

PARAMETER	RESULT	VQL	QLCD
ISOPROPYLBENZENE	0.5	U	
METHYL ACETATE	1	U	
METHYL TERT-BUTYL ETHER	0.5	U	
METHYLENE CHLORIDE	1	U	
STYRENE	0.5	U	
TETRACHLOROETHENE	0.5	U	
TOLUENE	0.5	U	
TOTAL XYLENES	1	U	
TRANS-1,2-DICHLOROETHENE	0.5	U	
TRICHLOROETHENE	0.5	U	
TRICHLOROFLUOROMETHANE	1	U	
VINYL CHLORIDE	0.5	U	

PROJ_NO: 00771	NSAMPLE	S43SB008-0607			S43SB009-0708			S43SB009-0708-D			S43SB011-0507		
SDG: CTO114_003	LAB_ID	1106158-08RE1			1106158-06RE1			1106158-07RE1			1106158-05		
FRACTION: OV	SAMP_DATE	6/10/2011			6/10/2011			6/10/2011			6/10/2011		
MEDIA: SOIL	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/KG			UG/KG			UG/KG			UG/KG		
	PCT_SOLIDS	88.9			95.4			84.3			91.8		
	DUP_OF							S43SB009-0708					
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		2.5	U		2.45	U		2.53	U		104	U	
1,1,2,2-TETRACHLOROETHANE		2.5	U		2.45	U		2.53	U		104	U	
1,1,2-TRICHLOROETHANE		2.5	U		2.45	U		2.53	U		104	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		5	U		4.91	U		5.07	U		208	U	
1,1-DICHLOROETHANE		2.5	U		2.45	U		2.53	U		104	U	
1,1-DICHLOROETHENE		2.5	U		2.45	U		2.53	U		104	U	
1,2,3-TRICHLOROBENZENE		2.5	U		2.45	U		2.53	U		104	U	
1,2,4-TRICHLOROBENZENE		2.5	U		2.45	U		2.53	U		104	U	
1,2-DIBROMO-3-CHLOROPROPANE		5	U		4.91	U		5.07	U		208	U	
1,2-DIBROMOETHANE		2.5	U		2.45	U		2.53	U		104	U	
1,2-DICHLOROBENZENE		2.5	U		2.45	U		2.53	U		104	U	
1,2-DICHLOROETHANE		2.5	U		2.45	U		2.53	U		104	U	
1,2-DICHLOROPROPANE		2.5	U		2.45	U		2.53	U		104	U	
1,3-DICHLOROPROPANE		2.5	U		2.45	U		2.53	U		104	U	
1,4-DICHLOROBENZENE		2.5	U		2.45	U		2.53	U		104	U	
1,4-DIOXANE		100	UR	C	98.2	UR	C	101	UR	C	4160	UR	C
2-BUTANONE		5	U		4.91	U		5.07	U		208	U	
2-HEXANONE		2.5	U		2.45	U		2.53	U		104	U	
4-METHYL-2-PENTANONE		2.5	U		2.45	U		2.53	U		104	U	
ACETONE		20	J	CP	14.5	J	CP	13.3	J	CP	416	U	
BENZENE		2.5	U		2.45	U		2.53	U		104	U	
BROMODICHLOROMETHANE		2.5	U		2.45	U		2.53	U		104	U	
BROMOFORM		2.5	U		2.45	U		2.53	U		104	U	
BROMOMETHANE		5	U		4.91	U		5.07	U		208	U	
CARBON DISULFIDE		2.5	U		2.45	U		2.53	U		104	U	
CARBON TETRACHLORIDE		2.5	U		2.45	U		2.53	U		104	U	
CHLOROBENZENE		2.5	U		2.45	U		2.53	U		104	U	
CHLORODIBROMOMETHANE		2.5	U		2.45	U		2.53	U		104	U	
CHLOROETHANE		5	U		4.91	U		5.07	U		208	U	
CHLOROFORM		2.5	U		2.45	U		2.53	U		104	U	
CHLOROMETHANE		5	U		4.91	U		5.07	U		208	U	
CIS-1,2-DICHLOROETHENE		2.5	U		2.45	U		2.53	U		104	U	
CYCLOHEXANE		2.5	U		2.45	U		2.53	U		104	U	
DICHLORODIFLUOROMETHANE		5	U		4.91	U		5.07	U		208	U	
ETHYLBENZENE		2.5	U		2.45	U		2.53	U		104	U	

PROJ_NO: 00771	NSAMPLE	S43SB012-0507			S43SB012-0507-D			S43SB016-0607			S43SB017-0608		
SDG: CTO114_003	LAB_ID	1106158-12RE2			1106158-13RE1			1106158-15RE1			1106158-02		
FRACTION: OV	SAMP_DATE	6/11/2011			6/11/2011			6/12/2011			6/10/2011		
MEDIA: SOIL	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/KG			UG/KG			UG/KG			UG/KG		
	PCT_SOLIDS	84.9			85.9			86.7			85.5		
	DUP_OF				S43SB012-0507								
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		2.52	U		2.52	U		2.37	U		120	U	
1,1,2,2-TETRACHLOROETHANE		2.52	U		2.52	U		2.37	U		120	U	
1,1,2-TRICHLOROETHANE		2.52	U		2.52	U		2.37	U		120	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		5.04	U		5.04	U		4.73	U		239	U	
1,1-DICHLOROETHANE		2.52	U		2.52	U		2.37	U		120	U	
1,1-DICHLOROETHENE		2.52	U		2.52	U		2.37	U		120	U	
1,2,3-TRICHLOROBENZENE		2.52	U		2.52	U		2.37	U		120	U	
1,2,4-TRICHLOROBENZENE		2.52	U		2.52	U		2.37	U		120	U	
1,2-DIBROMO-3-CHLOROPROPANE		5.04	U		5.04	U		4.73	U		239	U	
1,2-DIBROMOETHANE		2.52	U		2.52	U		2.37	U		120	U	
1,2-DICHLOROBENZENE		2.52	U		2.52	U		2.37	U		120	U	
1,2-DICHLOROETHANE		2.52	U		2.52	U		2.37	U		120	U	
1,2-DICHLOROPROPANE		2.52	U		2.52	U		2.37	U		120	U	
1,3-DICHLOROPROPANE		2.52	U		2.52	U		2.37	U		120	U	
1,4-DICHLOROBENZENE		2.52	U		2.52	U		2.37	U		120	U	
1,4-DIOXANE		101	UR	C	101	UR	C	94.6	UR	C	4780	UR	C
2-BUTANONE		5.04	U		5.04	U		4.73	U		239	U	
2-HEXANONE		2.52	U		2.52	U		2.37	U		120	U	
4-METHYL-2-PENTANONE		2.52	U		2.52	U		2.37	U		120	U	
ACETONE		12.1	B	A	12	J	CP	18.3	J	CP	478	U	
BENZENE		2.52	U		2.52	U		2.37	U		120	U	
BROMODICHLOROMETHANE		2.52	U		2.52	U		2.37	U		120	U	
BROMOFORM		2.52	U		2.52	U		2.37	U		120	U	
BROMOMETHANE		5.04	U		5.04	U		4.73	U		239	U	
CARBON DISULFIDE		2.52	U		2.52	U		2.37	U		120	U	
CARBON TETRACHLORIDE		2.52	U		2.52	U		2.37	U		120	U	
CHLOROBENZENE		2.52	U		2.52	U		2.37	U		120	U	
CHLORODIBROMOMETHANE		2.52	U		2.52	U		2.37	U		120	U	
CHLOROETHANE		5.04	U		5.04	U		4.73	U		239	U	
CHLOROFORM		2.52	U		2.52	U		2.37	U		120	U	
CHLOROMETHANE		5.04	U		5.04	U		4.73	U		239	U	
CIS-1,2-DICHLOROETHENE		2.52	U		2.52	U		2.37	U		397		
CYCLOHEXANE		2.52	U		2.52	U		2.37	U		120	U	
DICHLORODIFLUOROMETHANE		5.04	U		5.04	U		4.73	U		239	U	
ETHYLBENZENE		2.52	U		2.52	U		2.37	U		120	U	

PROJ_NO: 00771	NSAMPLE	S43SB018-0507			S43SB019-0607			S43SB022-0708			S43SB022-0708RE2		
SDG: CTO114_003	LAB_ID	1106158-04			1106158-10RE1			1106158-09			1106158-09RE2		
FRACTION: OV	SAMP_DATE	6/10/2011			6/11/2011			6/11/2011			6/11/2011		
MEDIA: SOIL	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/KG			UG/KG			UG/KG			UG/KG		
	PCT_SOLIDS	84.8			86.1			87.1			87.1		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		118	U		2.26	U		132	U		53000	U	
1,1,2,2-TETRACHLOROETHANE		118	U		2.26	U		132	U				
1,1,2-TRICHLOROETHANE		118	U		2.26	U		132	U				
1,1,2-TRICHLOROTRIFLUOROETHANE		236	U		4.52	U		265	U				
1,1-DICHLOROETHANE		118	U		2.26	U		132	U				
1,1-DICHLOROETHENE		118	U		2.26	U		132	U				
1,2,3-TRICHLOROBENZENE		118	U		2.26	U		132	U				
1,2,4-TRICHLOROBENZENE		118	U		2.26	U		132	U				
1,2-DIBROMO-3-CHLOROPROPANE		236	U		4.52	U		265	U				
1,2-DIBROMOETHANE		118	U		2.26	U		132	U				
1,2-DICHLOROBENZENE		118	U		2.26	U		132	U				
1,2-DICHLOROETHANE		118	U		2.26	U		132	U				
1,2-DICHLOROPROPANE		118	U		2.26	U		132	U				
1,3-DICHLOROPROPANE		118	U		2.26	U		132	U				
1,4-DICHLOROBENZENE		118	U		2.26	U		132	U				
1,4-DIOXANE		4720	UR	C	90.4	UR	C	5300	UR	C			
2-BUTANONE		236	U		4.52	U		837					
2-HEXANONE		118	U		2.26	U		132	U				
4-METHYL-2-PENTANONE		118	U		2.26	U		19100	J	C			
ACETONE		472	U		23.6	J	C				4660000		
BENZENE		118	U		2.26	U		132	U				
BROMODICHLOROMETHANE		118	U		2.26	U		132	U				
BROMOFORM		118	U		2.26	U		132	U				
BROMOMETHANE		236	U		4.52	U		265	U				
CARBON DISULFIDE		118	U		2.26	U		132	U				
CARBON TETRACHLORIDE		118	U		2.26	U		132	U				
CHLOROBENZENE		118	U		2.26	U		132	U				
CHLORODIBROMOMETHANE		118	U		2.26	U		132	U				
CHLOROETHANE		236	U		4.52	U		265	U				
CHLOROFORM		118	U		2.26	U		132	U				
CHLOROMETHANE		236	U		4.52	U		265	U				
CIS-1,2-DICHLOROETHENE		118	U		2.26	U		585					
CYCLOHEXANE		118	U		2.26	U		132	U				
DICHLORODIFLUOROMETHANE		236	U		4.52	U		265	U				
ETHYLBENZENE		118	U		2.26	U		132	U				

PROJ_NO: 00771 SDG: CTO114_003 FRACTION: OV MEDIA: SOIL	NSAMPLE	S43SB008-0607			S43SB009-0708			S43SB009-0708-D			S43SB011-0507		
	LAB_ID	1106158-08RE1			1106158-06RE1			1106158-07RE1			1106158-05		
	SAMP_DATE	6/10/2011			6/10/2011			6/10/2011			6/10/2011		
	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/KG			UG/KG			UG/KG			UG/KG		
	PCT_SOLIDS	88.9			95.4			84.3			91.8		
	DUP_OF							S43SB009-0708					
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		2.5	U		2.45	U		2.53	U		104	U	
METHYL ACETATE		5	U		4.91	U		5.07	U		208	U	
METHYL TERT-BUTYL ETHER		2.5	U		2.45	U		2.53	U		104	U	
METHYLENE CHLORIDE		5	U		4.91	U		5.07	U		208	U	
STYRENE		2.5	U		2.45	U		2.53	U		104	U	
TETRACHLOROETHENE		2.5	U		2.45	U		2.53	U		104	U	
TOLUENE		2.5	U		2.45	U		2.53	U		104	U	
TOTAL XYLENES		5	U		4.91	U		5.07	U		208	U	
TRANS-1,2-DICHLOROETHENE		2.5	U		2.45	U		2.53	U		104	U	
TRICHLOROETHENE		2.5	U		2.45	U		2.53	U		470		
TRICHLOROFLUOROMETHANE		5	U		4.91	U		5.07	U		208	U	
VINYL CHLORIDE		2.5	U		2.45	U		2.53	U		104	U	

PROJ_NO: 00771	NSAMPLE	S43SB012-0507			S43SB012-0507-D			S43SB016-0607			S43SB017-0608		
SDG: CTO114_003	LAB_ID	1106158-12RE2			1106158-13RE1			1106158-15RE1			1106158-02		
FRACTION: OV	SAMP_DATE	6/11/2011			6/11/2011			6/12/2011			6/10/2011		
MEDIA: SOIL	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/KG			UG/KG			UG/KG			UG/KG		
	PCT_SOLIDS	84.9			85.9			86.7			85.5		
	DUP_OF				S43SB012-0507								
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		2.52	U		2.52	U		2.37	U		120	U	
METHYL ACETATE		5.04	U		5.04	U		4.73	U		239	U	
METHYL TERT-BUTYL ETHER		2.52	U		2.52	U		2.37	U		120	U	
METHYLENE CHLORIDE		5.04	U		5.04	U		4.73	U		239	U	
STYRENE		2.52	U		2.52	U		2.37	U		120	U	
TETRACHLOROETHENE		2.52	U		2.52	U		2.37	U		120	U	
TOLUENE		2.52	U		2.52	U		2.37	U		120	U	
TOTAL XYLENES		5.04	U		5.04	U		4.73	U		239	U	
TRANS-1,2-DICHLOROETHENE		2.52	U		2.52	U		2.37	U		120	U	
TRICHLOROETHENE		2.52	U		2.52	U		2.37	U		3940		
TRICHLOROFLUOROMETHANE		5.04	U		5.04	U		4.73	U		239	U	
VINYL CHLORIDE		2.52	U		2.52	U		2.37	U		120	U	

PROJ_NO: 00771	NSAMPLE	S43SB018-0507			S43SB019-0607			S43SB022-0708			S43SB022-0708RE2		
SDG: CTO114_003	LAB_ID	1106158-04			1106158-10RE1			1106158-09			1106158-09RE2		
FRACTION: OV	SAMP_DATE	6/10/2011			6/11/2011			6/11/2011			6/11/2011		
MEDIA: SOIL	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/KG			UG/KG			UG/KG			UG/KG		
	PCT_SOLIDS	84.8			86.1			87.1			87.1		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		118	U		2.26	U		132	U				
METHYL ACETATE		236	U		4.52	U		265	U				
METHYL TERT-BUTYL ETHER		118	U		2.26	U		132	U				
METHYLENE CHLORIDE		236	U		4.52	U		265	U				
STYRENE		118	U		2.26	U		132	U				
TETRACHLOROETHENE		118	U		2.26	U		132	U				
TOLUENE		118	U		2.26	U		132	U				
TOTAL XYLENES		236	U		4.52	U		265	U				
TRANS-1,2-DICHLOROETHENE		118	U		2.26	U		132	U				
TRICHLOROETHENE		776			2.26	U		132	U				
TRICHLOROFLUOROMETHANE		236	U		4.52	U		265	U				
VINYL CHLORIDE		118	U		14.3			132	U				

PROJ_NO: 00771	NSAMPLE	S43RB02-20110612			S43TW006-2832			S43TW11-3034			S43TW12-2630		
SDG: CTO114_003	LAB_ID	1106158-16			1106158-14			1106158-03			1106158-11		
FRACTION: EXP	SAMP_DATE	6/12/2011			6/11/2011			6/10/2011			6/11/2011		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,3,5-TRINITROBENZENE		0.151	UJ	H	0.157	UJ	H	0.478	UJ	H	0.248	UJ	H
1,3-DINITROBENZENE		0.151	UJ	H	0.157	UJ	H	0.421	J	HPQU	0.248	UJ	H
2,4,6-TRINITROTOLUENE		0.151	UJ	H	0.157	UJ	H	0.478	UJ	H	0.248	UJ	H
2,4-DINITROTOLUENE		0.151	UJ	H	0.157	UJ	H	0.478	UJ	H	0.248	UJ	H
2,6-DINITROTOLUENE		0.151	UJ	H	0.157	UJ	H	0.478	UJ	H	0.248	UJ	H
2-AMINO-4,6-DINITROTOLUENE		0.151	UJ	H	0.157	UJ	H	0.478	UJ	H	0.248	UJ	H
2-NITROTOLUENE		0.151	UJ	H	0.157	UJ	H	0.478	UJ	H	0.248	UJ	H
3-NITROTOLUENE		0.151	UJ	H	0.157	UJ	H	0.478	UJ	H	0.811	J	H
4-AMINO-2,6-DINITROTOLUENE		0.151	UJ	H	0.157	UJ	H	0.478	UJ	H	0.248	UJ	H
4-NITROTOLUENE		0.151	UJ	H	0.157	UJ	H	0.478	UJ	H	0.248	UJ	H
HMX		0.151	UJ	H	0.157	UJ	H	1.33	J	HU	0.248	UJ	H
NITROBENZENE		0.151	UJ	H	0.157	UJ	H	0.478	UJ	H	0.248	UJ	H
NITROGLYCERIN		0.377	UJ	H	0.392	UJ	H	0.639	J	EHPU	0.341	J	EHPQU
NITROGUANIDINE		5	U		10	UJ	Q	5	U		5	U	
RDX		0.151	UJ	H	0.37	J	HU	0.478	UJ	H	0.248	UJ	H
TETRYL		0.151	UJ	H	0.157	UJ	H	0.478	UJ	H	0.248	UJ	H

PROJ_NO: 00771 SDG: CTO114_003 FRACTION: EXP MEDIA: SOIL	NSAMPLE	S43SB012-0507			S43SB012-0507-D			S43SB017-0608			S43SB018-0507		
	LAB_ID	1106158-12			1106158-13			1106158-02			1106158-04		
	SAMP_DATE	6/11/2011			6/11/2011			6/10/2011			6/10/2011		
	QC_TYPE	NM			NM			NM			NM		
	UNITS	MG/KG			MG/KG			MG/KG			MG/KG		
	PCT_SOLIDS	100.0			100.0			100.0			100.0		
	DUP_OF				S43SB012-0507								
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,3,5-TRINITROBENZENE		0.0367	U		0.0396	U		0.0377	U		0.0381	U	
1,3-DINITROBENZENE		0.0367	U		0.0396	U		0.0377	U		0.0381	U	
2,4,6-TRINITROTOLUENE		0.0367	UJ	C	0.0396	UJ	C	0.0377	U		0.0381	UJ	C
2,4-DINITROTOLUENE		0.0367	U		0.0396	U		0.0377	U		0.0381	U	
2,6-DINITROTOLUENE		0.0367	U		0.0396	U		0.0377	U		0.0381	U	
2-AMINO-4,6-DINITROTOLUENE		0.0367	U		0.0396	U		0.0377	U		0.0381	U	
2-NITROTOLUENE		0.0367	U		0.0396	U		0.0377	U		0.0381	U	
3-NITROTOLUENE		0.0367	U		0.0396	U		0.0377	U		0.0381	U	
4-AMINO-2,6-DINITROTOLUENE		0.0367	U		0.0396	U		0.0377	U		0.0381	U	
4-NITROTOLUENE		0.0367	U		0.0396	U		0.0377	U		0.0381	U	
HMX		0.0367	U		0.0396	U		0.0377	U		0.0381	U	
NITROBENZENE		0.0367	U		0.0396	U		0.0377	U		0.0381	U	
NITROGLYCERIN		0.183	U		0.198	U		0.189	U		0.19	U	
NITROGUANIDINE		0.476	UJ	Q	0.455	UJ	Q	0.476	UJ	Q	0.455	UJ	Q
RDX		0.0367	U		0.0396	U		0.0377	U		0.0381	U	
TETRYL		0.0367	U		0.0396	U		0.0377	U		0.0381	U	

PROJ_NO: 00771 SDG: CTO114_003 FRACTION: MISC MEDIA: WATER	NSAMPLE	S43RB02-20110612						S43TW006-2832					
	LAB_ID	1106158-16						1106158-14					
	SAMP_DATE	6/12/2011						6/11/2011					
	QC_TYPE	NM						NM					
	UNITS	MG/L			UG/L			MG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
CYANIDE		0.02	U					0.02	U				
PERCHLORATE					0.2	U					0.2	U	

PROJ_NO: 00771	NSAMPLE	S43TW11-3034						S43TW12-2630					
SDG: CTO114_003	LAB_ID	1106158-03						1106158-11					
FRACTION: MISC	SAMP_DATE	6/10/2011						6/11/2011					
MEDIA: WATER	QC_TYPE	NM						NM					
	UNITS	MG/L			UG/L			MG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
CYANIDE		0.02	U					0.02	U				
PERCHLORATE					0.2	U					0.2	U	

PROJ_NO: 00771 SDG: CTO114_003 FRACTION: MISC MEDIA: SOIL	NSAMPLE	S43SB012-0507						S43SB012-0507-D					
	LAB_ID	1106158-12						1106158-13					
	SAMP_DATE	6/11/2011						6/11/2011					
	QC_TYPE	NM						NM					
	UNITS	MG/KG			UG/KG			MG/KG			UG/KG		
	PCT_SOLIDS	84.9			84.9			85.9			85.9		
	DUP_OF							S43SB012-0507			S43SB012-0507		
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
CYANIDE		0.883	U					0.873	U				
PERCHLORATE					2.36	UJ	C				2.33	U	
TOTAL ORGANIC CARBON		1260	J	P				1690					

PROJ_NO: 00771	NSAMPLE	S43SB017-0608						S43SB018-0507					
SDG: CTO114_003	LAB_ID	1106158-02						1106158-04					
FRACTION: MISC	SAMP_DATE	6/10/2011						6/10/2011					
MEDIA: SOIL	QC_TYPE	NM						NM					
	UNITS	MG/KG			UG/KG			MG/KG			UG/KG		
	PCT_SOLIDS	85.5			85.5			84.8			84.8		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
CYANIDE		0.877	U					0.884	U				
PERCHLORATE					2.34	UJ	C				2.36	UJ	C
TOTAL ORGANIC CARBON		588	J	P				1130	J	P			

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**R. SOK**	**DATE:**	**SEPTEMBER 7, 2011**
FROM:	**J. KALINYAK**	**COPIES:**	**DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – VOC / OVG / EXPLOSIVES / PERCHLORATE**
NSF INDIAN HEAD, CTO 114
SAMPLE DELIVERY GROUP 1106198

SAMPLES: 7 / Aqueous / VOC

S43MW00301	S43MW00401	S43MW00401-D
S43MW00601	S43MW0103	S43MW0501
TB061311-01		

1 / Aqueous / VOC – Trichloroethene Only

S43MW0203

6 / Aqueous / Explosives / Perchlorate

S43MW00301	S43MW00401	S43MW00401-D
S43MW00601	S43MW0103	S43MW0501

5 / Aqueous / OVG

S43MW00401	S43MW00401-D	S43MW00601
S43MW0103	S43MW0203	

OVERVIEW

The sample set for NSF Indian Head CTO 114 SDG 1106198 consisted of eight (8) aqueous environmental samples including one (1) aqueous trip blank sample. The samples were analyzed as listed above for explosives, perchlorate, volatile organic compounds (VOC) (trichloroethene only for sample S43MW0203), and Organic Volatile Gases (OVG) in this sample delivery group (SDG). One (1) field duplicate pair was contained within this SDG: S43MW00401-D / S43MW00401.

The samples were collected by TetraTech NUS on June 17, 2011 and analyzed by Empirical Laboratory LLC. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using EPA SW-846 Methods 8260B, 8330B, 6850, and EPA Method RSK-175 analysis and reporting protocols.

The data contained in this SDG were validated with regard to the following parameters: data completeness, hold times, GC/MS tuning, initial/continuing calibrations, laboratory method blank results, surrogate spike recoveries, blank spike results, matrix spike/matrix spike duplicate results, internal standard recoveries, field duplicate results, chromatographic resolution, compound identification, compound quantitation, and detection limits. Areas of concern are listed below.

MAJOR

- The relative response factor (RRF) was less than the 0.05 quality control limit for the VOC 1,4-dioxane for the initial calibration on instrument MS-VOA4 on 06/02/11 and all the continuing calibration verifications (CCV) for instrument MS-VOA4 affecting all samples. All samples had non-detected results for 1,4-dioxane which were qualified rejected, (UR).

MINOR

- Positive results reported below the quantitation limit but above the method detection limit were qualified as estimated, (J).

- The VOC CCV %D was greater than the 20% and less than 50% quality control limit for acetone, 2-butanone, chloroethane, 1,2-dibromo-3-chloropropane, methyl acetate, 4-methyl-2-pentanone, 1,1,2,2-tetrachloroethane, and 1,4-dioxane for instrument MS-VOA4 on 06/23/11 @ 07:25 and @ 07:51 affecting samples TB061311-01, S43MW00301, S43MW0501, S43MW00401, S43MW00401-D, S43MW00601, and S43MW0103. No action was taken for the non-detected aforementioned sample analyte results (1,4-dioxane rejected for RRF quality control limit non-compliance). The positive acetone result for sample TB061311-01 was qualified estimated, (J).

- The explosives analysis relative percent difference (RPD) between the two analytical columns were greater than 40% for some sample positive explosives results. The positive explosives results for these samples were qualified estimated, (J). The C-18 (primary) column results were reported except when the RPD between the analytical columns was greater than 100%, in which case the lower of the two results from the columns was reported. The table below lists the samples and analytes qualified as well as the results for both analytical columns (the results reported are in bold).

Sample	Analyte	C-18 µg/l	Ultra II Aromax µg/l	RPD
S43MW00301	Nitroglycerin	**0.262**	1.20	128%
S43MW00401	HMX	**0.125**	247	200%
	RDX	0.967	**0.212**	128%
S43MW00401-D	3-Nitrotoluene	**3.57**	1.45	84%
	HMX	**0.125**	255	200%
	RDX	**0.415**	3.80	161%
S43MW00601	4-Amino-2,6-dinitrotoluene	**0.128**	0.633	133%
	4-Nitrotoluene	**0.195**	0.0994	65%
	Nitroglycerin	**32.3**	2310	194%
	RDX	**1.70**	13.0	154%
S43MW0103	1,3-Dinitrobenzene	**0.659**	0.150	126%
	2-Amino-4,6-dinitrotoluene	**0.274**	1.71	145%
	2-Nitrotoluene	**0.236**	1.24	136%
	3-Nitrotoluene	**0.723**	1.55	73%
	Nitroglycerin	**25.2**	2510	196%
S43MW0501	1,3-Dinitrobenzene	0.533	**0.131**	121%
	RDX	0.420	**0.0886**	145%

- The laboratory indicated a matrix interference for some sample positive explosive results in all samples. These sample positive explosive results were qualified estimated, (J), due to the matrix interference.

- The explosives LCS %Rs were greater than the quality control limit for 1,3,5-trinitrobenzene and nitroglycerin for batch 1F23022 affecting samples S43MW00301, S43MW00401, S43MW00401-D, S43MW00601, S43MW0103, and S43MW0501. The non-detected 1,3,5-trinitrobenzene and nitroglycerin sample results were not qualified and the positive nitroglycerin results for samples

S43MW00301, S43MW00601, and S43MW0103,were qualified estimated, (J).

- The non-detected nitroguanidine result for sample S43MW0103 was qualified estimated, (UJ), due to chromatographic interference. As a result of the interference, the sample Limit of Detection (LOD) result was raised by the laboratory

- The OVG CCV %D was greater than the 15% quality control limit for ethane and ethene for instrument GL-GCVOA on 06/26/11 @ 14:05 affecting samples S43MW00401, S43MW00401-D, S43MW00601, and S43MW0203. Additionally, the CCVs from 06/26/11 @ 20:07 and 00:34 had 0% recoveries due to bad injections (per an examination of the raw data). As a result of these issues the positive and non-detected methane, ethane, and ethene results for the aforementioned samples were qualified estimated, (J) and (UJ), respectively.

- The OVG CCV %D was greater than the 15% quality control limit for methane for instrument GL-GCVOA on 06/30/11 @ 15:37 and 07/01/11 @ 14:32 affecting sample S43MW0103. The methane result for the sample S43MW0103 was qualified estimated, (J).

- The OVG methane result for sample S43MW00401 was greater than the highest calibration level for the instrument. There was insufficient sample volume remaining for a sample re-analysis, therefore, the methane result for sample S43MW00401 was qualified estimated, (J).

- The OVG gas ethane, ethene, and methane RPDs were greater than the 30% quality control limit for the field duplicate samples S43MW00401-D and S43MW00401. The ethane, ethene, and methane positive and non-detected results for the aforementioned samples were qualified estimated, (J) and (UJ), respectively.

NOTES

The common laboratory VOC contaminants were detected in the trip blank sample at the following concentrations.

Analyte	Maximum Conc. (µg/l)	Action Level (µg/l)
Acetone	5.05	50.5
Methylene Chloride	6.23	62.3

An action level of 10X the maximum concentration for the common laboratory contaminants acetone and methylene chloride was established to evaluate the sample for blank contamination. Sample aliquot and dilution factors, if applicable, were taken into account when applying the action level. All samples had non-detected results for acetone and methylene chloride and no samples were qualified.

The VOC CCV %D was greater than the 20% and less than 50% quality control limit for acetone, 2-butanone, chloroethane, 1,2-dibromo-3-chloropropane, methyl acetate, 4-methyl-2-pentanone, 1,1,2,2-tetrachloroethane, tetrachloroethene, and 1.4-dioxane for instrument MS-VOA4 on 06/24/11 @ 08:34 and @ 09:24 affecting sample S43MW0103 re-analysis at a lower dilution. As the aforementioned analytes for the sample were reported from this analysis, and the analytes were non-detected, no validation action was taken with the exception of the 1,4-dioxane non-detected result which was rejected for the RRF quality control limit non-compliance.

The following samples were analyzed for VOC analytes at dilutions, as listed below, resulting in elevated detection limits for the non-detected VOC analytes.

Sample	Dilution
S43MW00401	5X

S43MW00401-D	5X
S43MW00601	10X
S43MW0103	50X, 200X

The VOC surrogate dibromofluoromethane %R was greater than the quality control limit for sample S43MW0103 200X analysis. As only the sample trichloroethene result was reported from this analysis and due to the high sample dilution, no validation action was taken.

The explosive CCV %D was greater than the 20% quality control limit for 2,4,6-trinitrotoluene on 06/27/11 @ 18:09 and @ 22:04 affecting a method blank and an LCS for instrument HPLC1. No samples were affected and no sample validation action was necessary.

The explosive CCV %Ds were greater than the 20% quality control limits for 2,4,6-trinitrotoluene, 4-amino-2,6-dinitrotoluene, and tetryl on 07/10/11 @ 16:42 affecting a method blank for instrument HPLC2. No samples were affected and no sample validation action was necessary.

The explosive CCV %D was greater than the 20% quality control limit for 2,4,6-trinitrotoluene on instrument HPLC1 on 07/14/11 @ 05:20 affecting all the samples. No validation action was taken as the samples had non-detected results for 2,4,6-trinitrotoluene and the alternate column CCV %Ds for the analyte were within the quality control limits.

The laboratory explosives surrogate standard recovery and retention time summary forms were missing the retention times for the surrogate 1-chloro-3-nitrobenzene for a number of samples, blanks, CCVs, etc. making it appear that there were quality control limit retention time exceedances. The data validation chemist provided the correct retention times from the raw data for the samples to verify that the sample surrogate standard retention times were within the quality control limits.

The laboratory report was missing the raw sample data for the instrument HPLC1 for explosives. The laboratory was contacted on this issue.

The explosives positive sample results were reported from the two analytical columns inconsistently for different SDGs by the laboratory. The laboratory was contacted on this issue and the response is included in the data package. The laboratory policy is to report the primary analytical column positive explosives results unless there is an RPD between analytical columns greater than 100%, in which case the lower of the two column results was reported. The data validation chemist manually edited sample data to match the laboratory reporting policy for positive explosive results.

As was stated earlier in the validation report, there were significant laboratory analytical difficulties associated with the nitroguanidine analyses.

The nitroguanidine MSD %R was less than the quality control limit and the RPD for the MS/MSD was greater than the quality control limit for spiked sample S43MW00301. No action was taken as the MS %R was within the quality control limit for nitroguanidine.

The OVG LCSD %R was greater than the quality control limit for ethene for batch 1F26003 affecting samples S43MW00401, S43MW00401-D, S43MW00601, and S43MW0203. The OVG LCSD %R was greater than the quality control limit for ethene for batch 1F30008 affecting sample S43MW0103. The positive ethene results for the samples were not qualified as the LCS in both cases was within the quality control limits as was the RPD for the LCS/LCSD.

Non-detected results were reported to the limit of detection (LOD).

EXECUTIVE SUMMARY

Laboratory Performance Issues: VOC sample 1,4-dioxane non-detected results were rejected due to RRF quality control limit non-compliances. The sample TB061311-01 acetone result was qualified for a CCV %D quality control limit non-compliance. Positive explosives results were qualified for sample matrix interferences. Sample positive nitroglycerin results were qualified for a LCS %R quality control limit non-compliance. Sample S43MW0103 non-detected nitroguanidine result was qualified and the detection limit raised due to a sample matrix interference. OVG results for sample S43MW00401, S43MW00401-D, S43MW00601, and S43MW0203 were qualified for CCV %D quality control limit non-compliances and missing CCV data. The methane result for sample S43MW0103 was qualified due to a CCV %D quality control limit non-compliance. The methane result for sample S43MW00401 was qualified due to exceeding the highest calibration level.

Other Factors Affecting Data Quality: Positive results reported below the quantitation limit but above the method detection limit were qualified as estimated (J). Sample positive explosive results were qualified for analytical column RPD quality control limit non-compliances. OVG results for the field duplicate sample pair were qualified for RPD quality control limit non-compliances.

The data for these analyses were reviewed with reference to the Region III modifications to U.S. EPA National Functional Guidelines for Organic Data Validation (Sept. 1994), USEPA SW-846 Methods 8260B, 8330B, 6850, and RSK-175, and the Department of Defense (DoD) document entitled "Quality Systems Manual (QSM) for Environmental Laboratories" (April 2009).

Tetra Tech NUS
Joseph Kalinyak
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

Appendix A

Qualified Analytical Results

PROJ_NO: 00771	NSAMPLE	S43MW00301			S43MW00401			S43MW00401-D			S43MW00601		
SDG: 1106198	LAB_ID	1106198-12			1106198-02			1106198-04			1106198-08		
FRACTION: OV	SAMP_DATE	6/17/2011			6/17/2011			6/17/2011			6/17/2011		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF							S43MW00401					
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		0.5	U		2.5	U		2.5	U		5	U	
1,1,2,2-TETRACHLOROETHANE		0.5	U		2.5	U		2.5	U		5	U	
1,1,2-TRICHLOROETHANE		0.5	U		2.5	U		2.5	U		5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		0.5	U		2.5	U		2.5	U		5	U	
1,1-DICHLOROETHANE		0.5	U		2.5	U		2.5	U		5	U	
1,1-DICHLOROETHENE		0.5	U		2.56	J	P	2.43	J	P	5	U	
1,2,3-TRICHLOROBENZENE		0.5	U		2.5	U		2.5	U		5	U	
1,2,4-TRICHLOROBENZENE		0.5	U		2.5	U		2.5	U		5	U	
1,2-DIBROMO-3-CHLOROPROPANE		0.5	U		2.5	U		2.5	U		5	U	
1,2-DIBROMOETHANE		0.5	U		2.5	U		2.5	U		5	U	
1,2-DICHLOROBENZENE		0.5	U		2.5	U		2.5	U		5	U	
1,2-DICHLOROETHANE		0.5	U		2.5	U		2.5	U		5	U	
1,2-DICHLOROPROPANE		0.5	U		2.5	U		2.5	U		5	U	
1,3-DICHLOROPROPANE		0.5	U		2.5	U		2.5	U		5	U	
1,4-DICHLOROBENZENE		0.5	U		2.5	U		2.5	U		5	U	
1,4-DIOXANE		10	UR	C	50	UR	C	50	UR	C	100	UR	C
2-BUTANONE		5	U		25	U		25	U		50	U	
2-HEXANONE		2.5	U		12.5	U		12.5	U		25	U	
4-METHYL-2-PENTANONE		2.5	U		12.5	U		12.5	U		25	U	
ACETONE		5	U		25	U		25	U		50	U	
BENZENE		0.5	U		2.5	U		2.5	U		5	U	
BROMODICHLOROMETHANE		0.5	U		2.5	U		2.5	U		5	U	
BROMOFORM		0.5	U		2.5	U		2.5	U		5	U	
BROMOMETHANE		1	U		5	U		5	U		10	U	
CARBON DISULFIDE		0.5	U		2.5	U		2.5	U		5	U	
CARBON TETRACHLORIDE		0.5	U		2.5	U		2.5	U		5	U	
CHLOROBENZENE		0.5	U		2.5	U		2.5	U		5	U	
CHLORODIBROMOMETHANE		0.5	U		2.5	U		2.5	U		5	U	
CHLOROETHANE		1	U		5	U		5	U		10	U	
CHLOROFORM		0.5	U		2.5	U		2.5	U		5	U	
CHLOROMETHANE		6.35			5.05			2.5	U		5	U	
CIS-1,2-DICHLOROETHENE		0.896	J	P	152			156			41.6		
CYCLOHEXANE		0.5	U		2.5	U		2.5	U		5	U	
DICHLORODIFLUOROMETHANE		1	U		5	U		5	U		10	U	
ETHYLBENZENE		0.5	U		2.5	U		2.5	U		5	U	

PROJ_NO: 00771	NSAMPLE	S43MW0103			S43MW0103RE			S43MW0203			S43MW0501		
SDG: 1106198	LAB_ID	1106198-06			1106198-06RE1			1106198-10			1106198-14		
FRACTION: OV	SAMP_DATE	6/17/2011			6/17/2011			6/17/2011			6/17/2011		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE											0.5	U	
1,1,2,2-TETRACHLOROETHANE					25	U					0.5	U	
1,1,2-TRICHLOROETHANE					25	U					0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE					25	U					0.5	U	
1,1-DICHLOROETHANE					25	U					0.5	U	
1,1-DICHLOROETHENE					25	U					0.5	U	
1,2,3-TRICHLOROBENZENE					25	U					0.5	U	
1,2,4-TRICHLOROBENZENE					25	U					0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE					25	U					0.5	U	
1,2-DIBROMOETHANE					25	U					0.5	U	
1,2-DICHLOROBENZENE					25	U					0.5	U	
1,2-DICHLOROETHANE					25	U					0.5	U	
1,2-DICHLOROPROPANE					25	U					0.5	U	
1,3-DICHLOROPROPANE					25	U					0.5	U	
1,4-DICHLOROBENZENE					25	U					0.5	U	
1,4-DIOXANE					500	UR	C				10	UR	C
2-BUTANONE					250	U					5	U	
2-HEXANONE					125	U					2.5	U	
4-METHYL-2-PENTANONE					125	U					2.5	U	
ACETONE					250	U					5	U	
BENZENE					25	U					0.5	U	
BROMODICHLOROMETHANE					25	U					0.5	U	
BROMOFORM					25	U					0.5	U	
BROMOMETHANE					50	U					1	U	
CARBON DISULFIDE					25	U					0.5	U	
CARBON TETRACHLORIDE					25	U					0.5	U	
CHLOROBENZENE					25	U					0.5	U	
CHLORODIBROMOMETHANE					25	U					0.5	U	
CHLOROETHANE					50	U					1	U	
CHLOROFORM					8.32	J	P				0.5	U	
CHLOROMETHANE					25	U					3.41		
CIS-1,2-DICHLOROETHENE					284						0.5	U	
CYCLOHEXANE					25	U					0.5	U	
DICHLORODIFLUOROMETHANE					50	U					1	U	
ETHYLBENZENE					25	U					0.5	U	

PROJ_NO: 00771	NSAMPLE	TB061311-01
SDG: 1106198	LAB_ID	1106198-01
FRACTION: OV	SAMP_DATE	6/13/2011
MEDIA: WATER	QC_TYPE	NM
	UNITS	UG/L
	PCT_SOLIDS	0.0
	DUP_OF	

PARAMETER	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE	0.5	U	
1,1,2,2-TETRACHLOROETHANE	0.5	U	
1,1,2-TRICHLOROETHANE	0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE	0.5	U	
1,1-DICHLOROETHANE	0.5	U	
1,1-DICHLOROETHENE	0.5	U	
1,2,3-TRICHLOROBENZENE	0.5	U	
1,2,4-TRICHLOROBENZENE	0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE	0.5	U	
1,2-DIBROMOETHANE	0.5	U	
1,2-DICHLOROBENZENE	0.5	U	
1,2-DICHLOROETHANE	0.5	U	
1,2-DICHLOROPROPANE	0.5	U	
1,3-DICHLOROPROPANE	0.5	U	
1,4-DICHLOROBENZENE	0.5	U	
1,4-DIOXANE	10	UR	C
2-BUTANONE	5	U	
2-HEXANONE	2.5	U	
4-METHYL-2-PENTANONE	2.5	U	
ACETONE	5.05	J	CP
BENZENE	0.5	U	
BROMODICHLOROMETHANE	0.5	U	
BROMOFORM	0.5	U	
BROMOMETHANE	1	U	
CARBON DISULFIDE	0.5	U	
CARBON TETRACHLORIDE	0.5	U	
CHLOROBENZENE	0.5	U	
CHLORODIBROMOMETHANE	0.5	U	
CHLOROETHANE	1	U	
CHLOROFORM	0.5	U	
CHLOROMETHANE	0.5	U	
CIS-1,2-DICHLOROETHENE	0.5	U	
CYCLOHEXANE	0.5	U	
DICHLORODIFLUOROMETHANE	1	U	
ETHYLBENZENE	0.5	U	

PROJ_NO: 00771	NSAMPLE	S43MW00301			S43MW00401			S43MW00401-D			S43MW00601		
SDG: 1106198	LAB_ID	1106198-12			1106198-02			1106198-04			1106198-08		
FRACTION: OV	SAMP_DATE	6/17/2011			6/17/2011			6/17/2011			6/17/2011		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF							S43MW00401					
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		0.5	U		2.5	U		2.5	U		5	U	
METHYL ACETATE		1	U		5	U		5	U		10	U	
METHYL TERT-BUTYL ETHER		0.5	U		2.5	U		2.5	U		5	U	
METHYLENE CHLORIDE		1	U		5	U		5	U		10	U	
STYRENE		0.5	U		2.5	U		2.5	U		5	U	
TETRACHLOROETHENE		0.5	U		2.5	U		2.5	U		5	U	
TOLUENE		0.5	U		2.5	U		2.5	U		5	U	
TOTAL XYLENES		1	U		5	U		5	U		10	U	
TRANS-1,2-DICHLOROETHENE		0.5	U		2.5	U		2.5	U		5	U	
TRICHLOROETHENE		1.74			699			682			1130		
TRICHLOROFLUOROMETHANE		1	U		5	U		5	U		10	U	
VINYL CHLORIDE		1.16			15.7			14.1			5	U	

PROJ_NO: 00771	NSAMPLE	S43MW0103			S43MW0103RE			S43MW0203			S43MW0501		
SDG: 1106198	LAB_ID	1106198-06			1106198-06RE1			1106198-10			1106198-14		
FRACTION: OV	SAMP_DATE	6/17/2011			6/17/2011			6/17/2011			6/17/2011		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE					25	U					0.5	U	
METHYL ACETATE					50	U					1	U	
METHYL TERT-BUTYL ETHER					25	U					0.5	U	
METHYLENE CHLORIDE					50	U					1	U	
STYRENE					25	U					0.5	U	
TETRACHLOROETHENE					25	U					0.5	U	
TOLUENE					25	U					0.5	U	
TOTAL XYLENES					50	U					1	U	
TRANS-1,2-DICHLOROETHENE					25	U					0.5	U	
TRICHLOROETHENE		10900						0.398	J	P	0.5	U	
TRICHLOROFLUOROMETHANE					50	U					1	U	
VINYL CHLORIDE					25	U					0.5	U	

PROJ_NO: 00771	NSAMPLE	TB061311-01		
SDG: 1106198	LAB_ID	1106198-01		
FRACTION: OV	SAMP_DATE	6/13/2011		
MEDIA: WATER	QC_TYPE	NM		
	UNITS	UG/L		
	PCT_SOLIDS	0.0		
	DUP_OF			
PARAMETER		RESULT	VQL	QLCD
ISOPROPYLBENZENE		0.5	U	
METHYL ACETATE		1	U	
METHYL TERT-BUTYL ETHER		0.5	U	
METHYLENE CHLORIDE		6.23		
STYRENE		0.5	U	
TETRACHLOROETHENE		0.148	J	P
TOLUENE		0.5	U	
TOTAL XYLENES		1	U	
TRANS-1,2-DICHLOROETHENE		0.5	U	
TRICHLOROETHENE		0.5	U	
TRICHLOROFLUOROMETHANE		1	U	
VINYL CHLORIDE		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43MW00401			S43MW00401-D			S43MW00601			S43MW0103		
SDG: 1106198	LAB_ID	1106198-02			1106198-04			1106198-08			1106198-06RE1		
FRACTION: OVG	SAMP_DATE	6/17/2011			6/17/2011			6/17/2011			6/17/2011		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF	S43MW00401											
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ETHANE		60.6	J	CG	2	UJ	CG	2.94	J	CP	15.8		
ETHENE		11.5	J	CG	2	UJ	CG	2	UJ	C	2	U	
METHANE		623	J	CGL	5.14	J	CG	257	J	C	687	J	C

PROJ_NO: 00771	NSAMPLE	S43MW0203		
SDG: 1106198	LAB_ID	1106198-10		
FRACTION: OVG	SAMP_DATE	6/17/2011		
MEDIA: WATER	QC_TYPE	NM		
	UNITS	UG/L		
	PCT_SOLIDS	0.0		
	DUP_OF			
PARAMETER		RESULT	VQL	QLCD
ETHANE		2	UJ	C
ETHENE		2	UJ	C
METHANE		2	UJ	C

PROJ_NO: 00771	NSAMPLE	S43MW00301			S43MW00401			S43MW00401-D			S43MW00601		
SDG: 1106198	LAB_ID	1106198-12			1106198-02			1106198-04			1106198-08		
FRACTION: EXP	SAMP_DATE	6/17/2011			6/17/2011			6/17/2011			6/17/2011		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF							S43MW00401					
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,3,5-TRINITROBENZENE		0.15	U		0.15	U		0.16	U		0.168	U	
1,3-DINITROBENZENE		0.15	U		0.15	U		0.16	U		0.244	J	P
2,4,6-TRINITROTOLUENE		0.15	U		0.15	U		0.16	U		0.168	U	
2,4-DINITROTOLUENE		0.15	U		0.15	U		0.16	U		0.168	U	
2,6-DINITROTOLUENE		0.15	U		0.15	U		0.16	U		0.168	U	
2-AMINO-4,6-DINITROTOLUENE		0.15	U		0.15	U		0.16	U		0.168	U	
2-NITROTOLUENE		0.15	U		0.15	U		0.16	U		0.168	U	
3-NITROTOLUENE		0.15	U		2.91			3.57	J	U	0.168	U	
4-AMINO-2,6-DINITROTOLUENE		0.15	U		0.15	U		0.16	U		0.128	J	PQU
4-NITROTOLUENE		0.15	U		0.15	U		0.16	U		0.195	J	PU
HMX		0.15	U		0.125	J	PQU	0.125	J	PQU	0.904		
NITROBENZENE		0.15	U		0.15	U		0.16	U		0.168	U	
NITROGLYCERIN		0.262	J	EPQU	0.374	U		0.4	U		32.3	J	EQU
NITROGUANIDINE		5	U		5	U		5	U		5	U	
RDX		0.15	U		0.212	J	PQU	0.415	J	QU	1.7	J	QU
TETRYL		0.15	U		0.15	U		0.16	U		0.168	U	

PROJ_NO: 00771	NSAMPLE	S43MW0103			S43MW0501		
SDG: 1106198	LAB_ID	1106198-06			1106198-14		
FRACTION: EXP	SAMP_DATE	6/17/2011			6/17/2011		
MEDIA: WATER	QC_TYPE	NM			NM		
	UNITS	UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0		
	DUP_OF						
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,3,5-TRINITROBENZENE		0.15	U		0.157	U	
1,3-DINITROBENZENE		0.15	J	PQU	0.131	J	PQU
2,4,6-TRINITROTOLUENE		0.15	U		0.157	U	
2,4-DINITROTOLUENE		0.15	U		0.157	U	
2,6-DINITROTOLUENE		0.15	U		0.157	U	
2-AMINO-4,6-DINITROTOLUENE		0.274	J	PQU	0.157	U	
2-NITROTOLUENE		0.236	J	PQU	0.157	U	
3-NITROTOLUENE		0.723	J	U	0.157	U	
4-AMINO-2,6-DINITROTOLUENE		0.15	U		0.0929	J	P
4-NITROTOLUENE		0.15	U		0.157	U	
HMX		0.15	U		0.157	U	
NITROBENZENE		0.15	U		0.157	U	
NITROGLYCERIN		25.2	J	EQU	0.392	U	
NITROGUANIDINE		72	UJ	Q	5	U	
RDX		0.15	U		0.0886	J	PQU
TETRYL		0.15	U		0.157	U	

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**R. SOK**	**DATE:**	**August 31, 2011**
FROM:	**MEGAN CARSON**	**COPIES:**	**DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION –SELECT METALS, CYANIDE, SULFIDE, TOTAL ORGANIC CARBON, CHLORIDE, NITRATE-N, NITRITE-N, AND SULFATE**
NSF INDIAN HEAD, CTO 114
SAMPLE DELIVERY GROUP (SDG) – 1106198

SAMPLES: 7/Water/

S43MW00301	S43MW00401
S43MW00401-D	S43MW00601
S43MW0103	S43MW0203
S43MW0501	

Overview

The sample set for NSF Indian Head, SDG 1106198 consists of seven (7) aqueous samples. This SDG contained one field duplicate pair: S43MW00401/S43MW00401-D.

All samples (except S43MW0203) were analyzed for select total and dissolved metals. All samples were analyzed for cyanide. Samples S43MW00401, S43MW00401-D, S43MW00601, S43MW0103, and S43MW0203 were analyzed for sulfide, TOC, chloride, nitrate, nitrite, sulfide, and sulfate. Sample S43MW0203 was analyzed for total and dissolved cobalt. The samples were collected by Tetra Tech NUS, Inc. on June 17th, 2011 and analyzed by Empirical Laboratories, LLC under Naval Facilities Engineering Service Center (NFESC) Quality Assurance / Quality Control (QA/QC) criteria. Metals analyses were conducted using SW846 method 6010C. Cyanide analyses were conducted using method SM9012A. TOC analyses were conducted using method SW9060. Sulfide analyses were conducted using method SM4500S2CF. Chloride, nitrate-N, nitrite-N, and sulfate were analyzed using EPA method 300.

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, ICP/MS tune, laboratory method/preparation blanks, interference check sample (ICS) results, matrix spike / matrix spike duplicate results, field duplicate precision, laboratory duplicate precision, laboratory control sample (LCS) results, ICP serial dilution results, ICP/MS internal standard recoveries, detection limits and analyte quantitation.

Areas of concern with respect to data quality are listed below.

Major Problems:

- None.

Minor Problems:

- The continuing calibrations analyzed on 7/5/11 at 17:57 and 18:55 had percent recoveries >110% for iron. All samples were affected except S43MW00301 (dissolved) and S43MW0501 (total and dissolved). Positive iron results were qualified as biased high (K).

- The CRDL standard analyzed on 7/5/11 had a percent recovery < 90% for lead and thallium. All samples were affected. Positive results for lead were qualified as biased low (L) or estimated (J) due to conflicting directional bias. Non-detected lead results were qualified as biased low (UL). Non-detected thallium results were qualified as biased low (UL).

- The CRDL standard analyzed on 7/6/11 had a percent recovery < 90% for lead. Dissolved sample S43MW00601 was affected. The non-detected lead result was qualified as biased low (UL).

- The matrix spike duplicate for sample S43MW0203 had a percent recovery <80% for nitrite. All samples were affected. Positive results were qualified as estimated (J) and non-detected results were qualified as estimated (UJ).

- All analyses for nitrate-N and nitrite-N were analyzed one day past the 48 hour hold time. Positive results were qualified as estimated (J) and non-detected results were qualified as estimated (UJ).

Notes

The continuing calibration analyzed on 6/24/11 at 15:22 had a percent recovery > 110% for cyanide. Samples S43MW00401, S43MW00401-D, S43MW0103, S43MW00601, and S43MW0203 were affected. No validation action was warranted as sample results were non-detected.

Executive Summary

Laboratory Performance: Continuing calibration non-compliances resulted in the qualification of sample results. CRDL standard non-compliances resulted in the qualification of sample results. Hold time non-compliances for nitrate-N and nitrite-N resulted in qualification of sample results.

Other Factors Affecting Data Quality: Matrix spike non-compliances for nitrite resulted in the qualification of sample results.

The data for these analyses were reviewed with reference to Region III modifications to the "National Functional Guidelines for Inorganic Data Validation", April 1993, and the Department of Defense (DoD) document entitled "Quality Systems Manual (QSM) for Environmental Laboratories "(April, 2009).

The text of this report has been formulated to address only those problem areas affecting data quality.

Megan Carson

Tetra Tech NUS
Megan Carson
Chemist/Data Validator

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

APPENDIX A

QUALIFIED ANALYTICAL RESULTS

Data Validation Qualifier Codes:

A	=	Lab Blank Contamination
B	=	Field Blank Contamination
C	=	Calibration Noncompliance (e.g. % RSDs, %Ds, ICVs, CCVs, RRFs, etc.)
C01	=	GC/MS Tuning Noncompliance
D	=	MS/MSD Recovery Noncompliance
E	=	LCS/LCSD Recovery Noncompliance
F	=	Lab Duplicate Imprecision
G	=	Field Duplicate Imprecision
H	=	Holding Time Exceedance
I	=	ICP Serial Dilution Noncompliance
J	=	GFAA PDS - GFAA MSA's $r < 0.995$
K	=	ICP Interference - includes ICS % R Noncompliance
L	=	Instrument Calibration Range Exceedance
M	=	Sample Preservation Noncompliance
N	=	Internal Standard Noncompliance
N01	=	Internal Standard Recovery Noncompliance Dioxins
N02	=	Recovery Standard Noncompliance Dioxins
N03	=	Clean-up Standard Noncompliance Dioxins
O	=	Poor Instrument Performance (e.g. base-line drifting)
P	=	Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q	=	Other problems (can be any number of issues; e.g. poor chromatography,interferences, etc.)
R	=	Surrogates Recovery Noncompliance
S	=	Pesticide/PCB Resolution
T	=	% Breakdown Noncompliance for DDT and Endrin
U	=	% Difference between columns/detectors >25% for positive results determined via GC/HPLC
V	=	Non-linear calibrations; correlation coefficient $r < 0.995$
W	=	EMPC result
X	=	Signal to noise response drop
Y	=	Percent solids <30%
Z	=	Uncertainty at 2 sigma deviation is greater than sample activity

PROJ_NO: 00771	NSAMPLE	S43MW00301			S43MW00401			S43MW00401-D			S43MW00601		
SDG: 1106198	LAB_ID	1106198-12			1106198-02			1106198-04			1106198-08		
FRACTION: M	SAMP_DATE	6/17/2011			6/17/2011			6/17/2011			6/17/2011		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF							S43MW00401					
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM		22.5	J	P	18.2	J	P	14.1	J	P	4050		
ANTIMONY		2	U		2	U		2	U		2	U	
ARSENIC		16.9			1.72	J	P	1.7	J	P	2.76		
BARIUM		132			96.6			90.9			138		
BERYLLIUM		0.5	U		0.5	U		0.5	U		0.536	J	P
CADMIUM		0.5	U		0.5	U		0.5	U		0.5	U	
CHROMIUM		1	U		1	U		1	U		9.79		
COBALT		4.25			24.7			23.4			40.7		
COPPER		2	U		2	U		2	U		9.93		
IRON		42600	K	C	16600	K	C	16200	K	C	35800	K	C
LEAD		0.75	UL	C	0.75	UL	C	0.75	UL	C	3.73		
MANGANESE		602			409			383			611		
NICKEL		0.875	J	P	14.3			14			28.8		
SELENIUM		1.25	U		1.25	U		1.25	U		1.25	U	
SILVER		0.5	U		0.5	U		0.5	U		0.5	U	
THALLIUM		1	UL	C	1	UL	C	1	UL	C	1	UL	C
VANADIUM		2.5	U		2.5	U		2.5	U		15.7		
ZINC		11.6			14.8			13.2			33.2		

PROJ_NO: 00771 SDG: 1106198 FRACTION: M MEDIA: WATER	NSAMPLE	S43MW0103			S43MW0203			S43MW0501		
	LAB_ID	1106198-06			1106198-10			1106198-14		
	SAMP_DATE	6/17/2011			6/17/2011			6/17/2011		
	QC_TYPE	NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0		
	DUP_OF									
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM		1550						1090		
ANTIMONY		2	U					2	U	
ARSENIC		2.65						1.58	J	P
BARIUM		30.8						106		
BERYLLIUM		0.385	J	P				0.386	J	P
CADMIUM		0.558	J	P				0.5	U	
CHROMIUM		11.6						2.76		
COBALT		9.03			70.4			31.1		
COPPER		14.3						2.92		
IRON		2420	K	C				10400		
LEAD		4.57						1.41	L	C
MANGANESE		101						345		
NICKEL		11.7						25.5		
SELENIUM		0.786	J	P				1.25	U	
SILVER		0.5	U					0.5	U	
THALLIUM		1	UL	C				1	UL	C
VANADIUM		14.2						4.61		
ZINC		102						38.3		

PROJ_NO: 00771	NSAMPLE	S43MW00301			S43MW00401			S43MW00401-D			S43MW00601		
SDG: 1106198	LAB_ID	1106198-13			1106198-03			1106198-05			1106198-09		
FRACTION: MF	SAMP_DATE	6/17/2011			6/17/2011			6/17/2011			6/17/2011		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF							S43MW00401					
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM		16.2	J	P	25	U		25	U		17	J	P
ANTIMONY		2	U		2	U		2	U		2	U	
ARSENIC		15.2			1.67	J	P	1.53	J	P	2.09	J	P
BARIUM		129			91.9			94.1			126		
BERYLLIUM		0.5	U		0.5	U		0.5	U		0.5	U	
CADMIUM		0.5	U		0.5	U		0.5	U		0.5	U	
CHROMIUM		1	U		1	U		1	U		1	U	
COBALT		4.21			23.9			24.5			35.4		
COPPER		2	U		2	U		2	U		2	U	
IRON		38600			15900	K	C	16400	K	C	34800	K	C
LEAD		0.75	UL	C	0.75	UL	C	0.75	UL	C	1.5	UL	C
MANGANESE		572			394			396			616		
NICKEL		1.5	U		14.4			14.5			24.9		
SELENIUM		1.25	U		1.25	U		1.25	U		1.25	U	
SILVER		0.5	U		0.5	U		0.5	U		0.5	U	
THALLIUM		1	UL	C	1	UL	C	1	UL	C	1	UL	C
VANADIUM		2.5	U		2.5	U		2.5	U		2.5	U	
ZINC		11.5			14.1			13.9			13.9		

PROJ_NO: 00771 SDG: 1106198 FRACTION: MF MEDIA: WATER	NSAMPLE	S43MW0103			S43MW0203			S43MW0501		
	LAB_ID	1106198-07			1106198-11			1106198-15		
	SAMP_DATE	6/17/2011			6/17/2011			6/17/2011		
	QC_TYPE	NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0		
	DUP_OF									
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM		195						26.5	J	P
ANTIMONY		2	U					2	U	
ARSENIC		2.13	J	P				1.22	J	P
BARIUM		25.3						110		
BERYLLIUM		0.5	U					0.5	U	
CADMIUM		0.427	J	P				0.5	U	
CHROMIUM		6.58						1	U	
COBALT		8.28			73.5			33.5		
COPPER		8.94						2	U	
IRON		768	K	C				10900		
LEAD		0.444	J	CP				0.75	UL	C
MANGANESE		90						383		
NICKEL		10.2						27.7		
SELENIUM		0.916	J	P				1.25	U	
SILVER		0.5	U					0.5	U	
THALLIUM		1	UL	C				1	UL	C
VANADIUM		9.48						2.5	U	
ZINC		60.6						36		

PROJ_NO: 00771	NSAMPLE	S43MW00301						S43MW00401					
SDG: 1106198	LAB_ID	1106198-12						1106198-02					
FRACTION: MISC	SAMP_DATE	6/17/2011						6/17/2011					
MEDIA: WATER	QC_TYPE	NM						NM					
	UNITS	MG/L			UG/L			MG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
CHLORIDE								39.2					
CYANIDE		0.01	U					0.01	U				
DISSOLVED ORGANIC CARBON								1.71					
NITRATE-N								0.1	UJ	H			
NITRITE-N								0.1	UJ	DH			
PERCHLORATE					0.2	U					0.244	J	P
SULFATE								5.82					
SULFIDE								1.82	U				

PROJ_NO: 00771	NSAMPLE	S43MW00401-D						S43MW00601					
SDG: 1106198	LAB_ID	1106198-04						1106198-08					
FRACTION: MISC	SAMP_DATE	6/17/2011						6/17/2011					
MEDIA: WATER	QC_TYPE	NM						NM					
	UNITS	MG/L			UG/L			MG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF	S43MW00401			S43MW00401								
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
CHLORIDE		39.4						57					
CYANIDE		0.01	U					0.01	U				
DISSOLVED ORGANIC CARBON		1.76						3.08					
NITRATE-N		0.1	UJ	H				0.1	UJ	H			
NITRITE-N		0.1	UJ	DH				0.1	UJ	DH			
PERCHLORATE					0.2	U					0.2	U	
SULFATE		5.93						4.96					
SULFIDE		1.82	U					1.82	U				

PROJ_NO: 00771	NSAMPLE	S43MW0103						S43MW0203			S43MW0501		
SDG: 1106198	LAB_ID	1106198-06						1106198-10			1106198-14		
FRACTION: MISC	SAMP_DATE	6/17/2011						6/17/2011			6/17/2011		
MEDIA: WATER	QC_TYPE	NM						NM			NM		
	UNITS	MG/L			UG/L			MG/L			MG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
CHLORIDE		32.3						125					
CYANIDE		0.01	U					0.01	U		0.01	U	
DISSOLVED ORGANIC CARBON		9.41						1.77					
NITRATE-N		0.845	J	H				0.388	J	H			
NITRITE-N		0.059	J	DHP				0.1	UJ	DH			
PERCHLORATE					0.251	J	P						
SULFATE		34.2						14					
SULFIDE		1.82	U					1.82	U				

PROJ_NO: 00771	NSAMPLE	S43MW0501		
SDG: 1106198	LAB_ID	1106198-14		
FRACTION: MISC	SAMP_DATE	6/17/2011		
MEDIA: WATER	QC_TYPE	NM		
	UNITS	UG/L		
	PCT_SOLIDS	0.0		
	DUP_OF			
PARAMETER		RESULT	VQL	QLCD
CHLORIDE				
CYANIDE				
DISSOLVED ORGANIC CARBON				
NITRATE-N				
NITRITE-N				
PERCHLORATE		0.2	U	
SULFATE				
SULFIDE				

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**R. SOK**	**DATE:**	**SEPTEMBER 2, 2011**
FROM:	**A. COGNETTI**	**COPIES:**	**DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – VOC**
NSF INDIAN HEAD, CTO 114
SAMPLE DELIVERY GROUP (SDG) – 1106304R

SAMPLES: 4/Soil Gas/VOC

S430DA01 S43SG0106 S43SG0305
S43SG0406

Overview

The sample set for NSF Indian Head CTO 114, SDG 1106304R consisted of four (4) soil gas samples. All samples were analyzed for volatile organic compounds (VOC). No field duplicate pair is included in this SDG.

The samples were collected by Tetra Tech on June 11, 2011 and analyzed by Air Toxics Ltd. All analyses were conducted in accordance with EPA Method TO-15 analytical and reporting protocols.

The data contained in this SDG were validated with regard to the following parameters: data completeness, holding times, GC/MS tuning, initial/continuing calibrations, laboratory method blank results, surrogate spike recoveries, blank spike results, internal standard recoveries, chromatographic resolution, compound identification, compound quantitation, and detection limits. Areas of concern are listed below; documentation supporting these findings is presented in Appendix C. Qualified analytical results are presented in Appendix A. Results as reported by the laboratory are presented in Appendix B.

Major

No major noncompliances were noted.

Minor

- The initial calibration percent relative standard deviation (%RSD) for carbon tetrachloride was greater than the 30% quality control limit but less than 50% on June 8, 2011 on instrument MSD-A affecting samples S430DA01 and S43SG0305. The positive carbon tetrachloride result in sample S430DA01 was qualified as estimated (J).

Notes

The initial calibration %RSD for 1,2-dibromo-3-chloropropane was greater than 30% but less than 50% on May 25, 2011 on instrument MSD-14 affecting samples S43SG0406 and S43SG0106. No action was taken on the nondetected 1,2-dibromo-3-chloropropane results in the affected samples.

The laboratory method blank analyzed on June 22, 2011 @ 4:36 on instrument MSD-A contained a contaminant.

Contaminant	Maximum Concentration (ug/m^3)	Action Level (ug/m^3)
Benzene	0.021	0.105

An action level of 5X the maximum concentration of benzene was established in order to evaluate samples for blank contamination. Sample aliquot and dilution factors were taken into account when applying the action level. The positive benzene results in the affected samples S430DA01 and S43SG0305 were greater than the action level. No action was taken.

The laboratory control samples/laboratory control sample duplicates (LCS/LCSD) associated with batches 1106304R1-07A analyzed on June 22, 2011 @ 8:18 and 1106304R1-07C analyzed on June 24, 2011 @ 10:21 were not spiked with 1,2-dibromo-3-chloropropane and methyl acetate. No action was taken.

The LCS/LCSD percent recoveries (%Rs) of 1,2,4-trichlorobenzene was greater than the upper quality control limit in batch 1106304R1-07C analyzed on June 24, 2011. No action was taken on the nondetected 1,2,4-trichlorobenzene results in the affected samples.

Samples S43SG0305 and S430DA01 were analyzed using SIM.

A library search was performed for the analytes 1,2,3-trichlorobenzene and 1,3-dichloropropene. The aforementioned analytes were not detected.

Nondetected results were reported to the limit of detection (LOD) except for 1,2-dibromo3-chloropropane and methyl acetate which were reported to the reporting limit (RL).

Executive Summary

Laboratory Performance: The initial calibration %RSD for carbon tetrachloride exceeded quality control limits resulting in the qualification of positive results.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to Region III modifications to U.S. EPA National Functional Guidelines for Organic Data Validation (Sept. 1994), EPA Method TO-15, and the Department of Defense (DoD) document entitled "Quality Systems Manual (QSM) for Environmental Laboratories (April 2009). The text of this report has been formulated to address only those problem areas affecting data quality.

Ann Cognetti

Tetra Tech NUS
Ann Cognetti
Chemist/Data Validator

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

Appendix A

Qualified Analytical Results

Data Validation Qualifier Codes:

A = Lab Blank Contamination
B = Field Blank Contamination
C = Calibration Noncompliance (e.g. % RSDs, %Ds, ICVs, CCVs, RRFs, etc.)
C01 = GC/MS Tuning Noncompliance
D = MS/MSD Recovery Noncompliance
E = LCS/LCSD Recovery Noncompliance
F = Lab Duplicate Imprecision
G = Field Duplicate Imprecision
H = Holding Time Exceedance
I = ICP Serial Dilution Noncompliance
J = GFAA PDS - GFAA MSA's $r < 0.995$
K = ICP Interference - includes ICS % R Noncompliance
L = Instrument Calibration Range Exceedance
M = Sample Preservation Noncompliance
N = Internal Standard Noncompliance
N01 = Internal Standard Recovery Noncompliance Dioxins
N02 = Recovery Standard Noncompliance Dioxins
N03 = Clean-up Standard Noncompliance Dioxins
O = Poor Instrument Performance (e.g. base-line drifting)
P = Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q = Other problems (can be any number of issues; e.g. poor chromatography,interferences, etc.)
R = Surrogates Recovery Noncompliance
S = Pesticide/PCB Resolution
T = % Breakdown Noncompliance for DDT and Endrin
U = % Difference between columns/detectors >25% for positive results determined via GC/HPLC
V = Non-linear calibrations; correlation coefficient $r < 0.995$
W = EMPC result
X = Signal to noise response drop
Y = Percent solids <30%
Z = Uncertainty at 2 sigma deviation is greater than sample activity

PROJ_NO: 00771 SDG: 1106304R1 FRACTION: OV-M3 MEDIA: AIR	NSAMPLE	S43ODA01			S43SG0106			S43SG0305			S43SG0406		
	LAB_ID	1106304R1-01A			1106304R1-04A			1106304R1-02A			1106304R1-03A		
	SAMP_DATE	6/11/2011			6/11/2011			6/11/2011			6/11/2011		
	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/M3			UG/M3			UG/M3			UG/M3		
	PCT_SOLIDS												
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		0.071	J	P	45	U		0.24	J	P	1000	U	
1,1,2,2-TETRACHLOROETHANE		0.044	U		56	U		0.088	U		1300	U	
1,1,2-TRICHLOROETHANE		0.029	U		45	U		0.058	U		1000	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		0.56	U		63	U		1.1	U		1400	U	
1,1-DICHLOROETHANE		0.029	U		140			0.069	J	P	760	U	
1,1-DICHLOROETHENE		0.029	U		33	U		0.19			740	U	
1,2,4-TRICHLOROBENZENE		1.3	U		140	U		2.6	U		3100	U	
1,2-DIBROMO-3-CHLOROPROPANE		7	U		800	U		14	U		18000	U	
1,2-DIBROMOETHANE		0.56	U		63	U		1.1	U		1400	U	
1,2-DICHLOROBENZENE		0.44	U		50	U		0.88	U		1100	U	
1,2-DICHLOROETHANE		0.046	J	P	33	U		0.07	J	P	760	U	
1,2-DICHLOROPROPANE		0.34	U		38	U		0.67	U		860	U	
1,4-DICHLOROBENZENE		0.44	U		50	U		0.88	U		1100	U	
1,4-DIOXANE		0.27	U		67	U		0.68	J	P	1500	U	
2-BUTANONE		6.1			160	J	P	100			1600	J	P
2-HEXANONE		0.86	J	P	76	U		12			1700	U	
4-METHYL-2-PENTANONE		0.3	U		76	U		0.6	U		1600	J	P
ACETONE		17			3100			190			690000		
BENZENE		0.31			26	U		1.1			600	U	
BROMODICHLOROMETHANE		0.49	U		55	U		0.98	U		1200	U	
BROMOFORM		0.75	U		85	U		1.5	U		1900	U	
BROMOMETHANE		0.45	U		32	U		0.91	U		730	U	
CARBON DISULFIDE		0.55	J	P	26	U		2.8	J	P	580	U	
CARBON TETRACHLORIDE		0.66	J	CP	52	U		0.92	U		1200	U	
CHLOROBENZENE		0.34	U		38	U		0.67	U		860	U	
CHLORODIBROMOMETHANE		0.62	U		70	U		1.2	U		1600	U	
CHLOROETHANE		0.31	U		180	J	P	0.64	J	P	1100	U	
CHLOROFORM		0.36	U		40	U		0.71	U		910	U	
CHLOROMETHANE		1.8			100	J	P	2.3			870	U	
CIS-1,2-DICHLOROETHENE		0.029	U		140			59			29000		
CYCLOHEXANE		0.25	U		28	U		0.5	U		640	U	
DICHLORODIFLUOROMETHANE		2.6			41	U		2.7			920	U	
ETHYLBENZENE		0.068	J	P	36	U		0.53			810	U	
ISOPROPYLBENZENE		0.36	U		40	U		0.72	U		920	U	
M+P-XYLENES		0.11	J	P	100			1.1			810	U	

PROJ_NO: 00771 SDG: 1106304R1 FRACTION: OV-M3 MEDIA: AIR	NSAMPLE	S43ODA01			S43SG0106			S43SG0305			S43SG0406		
	LAB_ID	1106304R1-01A			1106304R1-04A			1106304R1-02A			1106304R1-03A		
	SAMP_DATE	6/11/2011			6/11/2011			6/11/2011			6/11/2011		
	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/M3			UG/M3			UG/M3			UG/M3		
	PCT_SOLIDS												
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
METHYL ACETATE		2.2	U		250	U		4.4	U		5700	U	
METHYL TERT-BUTYL ETHER		0.026	J	P	30	U		0.083	J	P	670	U	
METHYLENE CHLORIDE		0.68	J	P	29	U		5			650	U	
O-XYLENE		0.055	J	P	36	U		0.68			810	U	
STYRENE		0.31	U		35	U		0.62	U		800	U	
TETRACHLOROETHENE		0.1	J	P	56	U		0.19	J	P	1300	U	
TOLUENE		0.52			790			2			700	U	
TRANS-1,2-DICHLOROETHENE		0.029	U		33	U		0.44	J	P	740	U	
TRICHLOROETHENE		0.029	U		44	U		0.33			1000	U	
TRICHLOROFLUOROMETHANE		1.6			46	U		1.6	J	P	1000	U	
VINYL CHLORIDE		0.015	U		30000			100			1100	U	

2012

Validation Letters and Tables

Tetra Tech INC **INTERNAL CORRESPONDENCE**

TO:	**R. SOK**	**DATE:**	**JULY 9, 2012**
FROM:	**J. KALINYAK**	**COPIES:**	**DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – VOC / EXPLOSIVES**
INORGANIC DATA VALIDATION - METALS
NSF INDIAN HEAD, CTO 114
SAMPLE DELIVERY GROUP 1204118

SAMPLES: 20 / Aqueous / VOC

S43FB01-20120422	S43FB02-20120422	S43RB01-20120422
S43TB01-20120420	S43TW13-2933	S43TW14-1317
S43TW14-2933	S43TW15-1721	S43TW15-2933
S43TW16-1721	S43TW16-1721-D	S43TW16-2933
S43TW17-1923	S43TW17-2933	S43TW19-2832
S43TW20-1933	S43TW20-2933	S43TW20-2933-D
S43TW21-1923	S43TW21-2630	

2 / Aqueous / Explosives / Nitroguanidine / Total Metals / Dissolved Metals

S43FB01-20120422 S43FB02-20120422

OVERVIEW

The sample set for NSF Indian Head, CTO 114, SDG 1204118, consisted of twenty (20) aqueous environmental samples including one (1) aqueous trip blank sample, two (2) aqueous field blank samples, and one (1) aqueous rinse blank sample. The samples were analyzed for explosives including nitroguanidine, volatile organic compounds (VOC), total metals, and dissolved metals as listed above for this sample delivery group (SDG). Two (2) field duplicate sample pairs were contained within this SDG: S43TW16-1721-D / S43TW16-1721 and S43TW20-2933-D / S43TW20-2933.

The samples were collected by Tetra Tech on April 20, 21, and 22, 2012 and analyzed by Empirical Laboratory LLC. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using EPA SW-846 Methods 8260B, 8330A, 8330B, 7470A, and 6010C, analysis and reporting protocols.

The data contained in this SDG were validated with regard to the following parameters: data completeness, hold times, GC/MS tuning, initial/continuing calibrations, laboratory method blank results, surrogate spike recoveries, blank spike results, matrix spike/matrix spike duplicate results, internal standard recoveries, field duplicate results, chromatographic resolution, compound identification, compound quantitation, and detection limits. Areas of concern are listed below.

MAJOR

- The relative response factor (RRF) was less than the 0.05 quality control limit for the VOC 1,4-dioxane for the initial calibration on instrument MS-VOA6 on 04/11/12 and MS-VOA5 on 04/20/12 and all the continuing calibration verifications (CCV) for both instrument MS-VOA6 and MS-VOA5 affecting all samples. All samples had non-detected results for 1,4-dioxane which were qualified rejected, (UR).

MINOR

- Positive results reported below the quantitation limit but above the method detection limit were qualified as estimated, (J).

- The sample collection to analysis hold time of 7 days was exceeded for the nitroguanidine analysis for samples S43FB01-20120422 and S43FB02-20120422. The non-detected sample results were qualified estimated, (UJ).

- A common laboratory VOC contaminant was detected in the field blank sample S43FB01-20120422 at the following concentration.

Analyte	Maximum Conc. (µg/l)	Action Level (µg/l)
Acetone	9.66	96.60

  An action level of 10X the maximum concentration for the common laboratory contaminant acetone was established to evaluate the sample for blank contamination. Sample aliquot and dilution factors, if applicable, were taken into account when applying the action level. Sample acetone results less than the action level were qualified, (B), due to method blank contamination. Field blank, rinse blank, and trip blank samples were not qualified for the sample field blank contamination.

- The VOC continuing calibration verification (CCV) percent difference (%D) was greater than the 20% and greater than the 50% quality control limit for dichlorodifluoromethane for instrument MS-VOA5 on 04/25/12 @ 06:24.
  Affected Samples:

S43TB01-20120420	S43TW13-2933	S43TW14-1317
S43TW14-2933	S43TW15-1721	S43TW15-2933
S43TW16-1721	S43TW16-1721-D	S43TW16-2933
S43TW17-2933	S43TW19-2832	S43TW20-2933
S43TW20-2933-D	S43TW21-1923	S43TW21-2630

  Action: The non-detected affected sample dichlorodifluoromethane results were qualified estimated, (UJ).

- The VOC CCV %Ds were greater than the 20% and less than 50% quality control limit for bromodichloromethane, 1,2-dichloroethane, 1,2,3-trichlorobenzene, 1,2,4-trichlorobenzene, 1,1,1-trichloroethane, trichlorofluoromethane, and 1,1,2-trichlorotrifluoroethane for instrument MS-VOA6 on 04/25/12 @ 07:40.
  Affected Samples:
  S43FB01-20120422 S43FB02-20120422 S43RB01-20120422
  S43TW17-1923
  Action: The positive sample S43FB02-20120422 bromodichloromethane result was qualified estimated, (J). The aforementioned analyte results for the affected samples were non-detected and were not qualified.

- The laboratory control sample duplicate (LCSD) percent recovery (%R) was less than the quality control limit and the LCS/LCSD relative percent difference (RPD) was greater than the quality control limit for bromomethane for batch 2D26002.
  Affected Samples: S43TW20-1933
  Action: The sample bromomethane result was non-detected and was qualified estimated, (UJ).

- The explosives analysis relative percent differences (RPD) between the two analytical columns were greater than the 40% quality control limit for some sample detected explosive analyte results. The explosive analyte results for these samples were qualified estimated, (J). The lower results of the two columns were reported. The table below lists the samples and analytes qualified as well as the results for both analytical columns (the results reported are in bold). The laboratory also indicated a matrix interference for the sample results listed below, and the sample results were qualified estimated, (J), for the matrix interference.

Sample	Analyte	Ultra C-18 µg/l	Ultra II Aromax µg/l	RPD
S43FB01-20120422	1,3-dinitrobenzene	0.931	**0.304**	102%
	RDX	**0.0910**	0.284	103%
S43FB02-20120422	1,3-dinitrobenzene	2.15	**0.242**	160%
	2-nitrotoluene	**0.361**	1.11	102%
	3-nitrotoluene	**0.111**	0.618	139%
	Nitrobenzene	**0.115**	1.21	165%
	RDX	1.28	**0.391**	107%

- The metals iron CCV %D was greater than the 110% control limit for iron for instrument ME-ICP on 05/11/12 @ 14:53.
  Affected Samples: S43FB01-20120422 and S43FB02-20120422 for both total and dissolved metals
  Action: Iron results were qualified biased high, (K), with the exception of the sample S43FB01-20120422 dissolved iron result which was qualified estimated, (J). The non-detected iron result for sample S43FB01-20120422 was not qualified.

NOTES

The VOC CCV %D was greater than the 20% and less than the 50% quality control limit for dichlorodifluoromethane for instrument MS-VOA5 on 04/26/12 @ 07:11.
Affected Samples: S43TW20-1933
Action: The sample dichlorodifluoromethane result was non-detected and was not qualified.

The following samples were analyzed for VOC analytes at dilutions, as listed below, resulting in elevated detection limits for the non-detected VOC analytes.

Sample	Dilution
S43TW15-1721	2X
S43TW20-1933	2X
S43TW20-2933	5X
S43TW20-2933-D	5X

The LCS %Rs were greater than the quality control limit for the explosives HMX and nitroglycerin for batch 2D26008 affecting samples S43FB01-20120422 and S43FB02-20120422. The samples HMX and nitroglycerin results were non-detected and were not qualified.

The laboratory explosives surrogate standard recovery and retention time summary forms were missing the retention times for the surrogate 1-chloro-3-nitrobenzene for a number of samples, blanks, CCVs, etc. making it appear that there were quality control limit retention time exceedances. The data validation chemist manually added the correct retention times from the raw data for the samples to verify that the sample surrogate standard retention times were within the quality control limits. No further action was required.

Non-detected results were reported to the limit of detection (LOD).

EXECUTIVE SUMMARY

Laboratory Performance Issues: VOC sample 1,4-dioxane non-detected results were rejected due to RRF non-compliances. Sample acetone results were qualified for field blank sample contamination. Sample VOC results were qualified for CCV %D and LCSD %R non-compliances. The field blank water samples were qualified for a hold time non-compliance for nitroguanidine. Sample iron total and dissolved metal positive results were qualified biased high for a CCV %D non-compliance.

Other Factors Affecting Data Quality: Positive results reported below the quantitation limit but above the method detection limit were qualified as estimated (J). Sample positive explosive results were qualified for analytical column RPD non-compliances.

The data for these analyses were reviewed with reference to the Region III modifications to U.S. EPA National Functional Guidelines for Organic Data Validation (Sept. 1994), Region III modifications to the "National Functional Guidelines for Inorganic Data Validation" (April 1993), USEPA SW-846 Methods 8260B, 8330A, 8330B, 7470A, and 6010C, and the Department of Defense (DoD) document entitled "Quality Systems Manual (QSM) for Environmental Laboratories" (April 2009).

Tetra Tech
Joseph Kalinyak
Chemist/Data Validator

Tetra Tech
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

Appendix A

Qualified Analytical Results

Qualifier Codes:

A = Lab Blank Contamination
B = Field Blank Contamination
C = Calibration Noncompliance (i.e., % RSDs, %Ds, ICVs, CCVs, RRFs, etc.)
C01 = GC/MS Tuning Noncompliance
D = MS/MSD Recovery Noncompliance
E = LCS/LCSD Recovery Noncompliance
F = Lab Duplicate Imprecision
G = Field Duplicate Imprecision
H = Holding Time Exceedance
I = ICP Serial Dilution Noncompliance
J = ICP PDS Recovery Noncompliance; MSA's $r < 0.995$
K = ICP Interference - includes ICS % R Noncompliance
L = Instrument Calibration Range Exceedance
M = Sample Preservation Noncompliance
N = Internal Standard Noncompliance
N01 = Internal Standard Recovery Noncompliance Dioxins
N02 = Recovery Standard Noncompliance Dioxins
N03 = Clean-up Standard Noncompliance Dioxins
O = Poor Instrument Performance (i.e., base-time drifting)
P = Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q = Other problems (can encompass a number of issues; i.e.chromatography,interferences, etc.)
R = Surrogates Recovery Noncompliance
S = Pesticide/PCB Resolution
T = % Breakdown Noncompliance for DDT and Endrin
U = RPD between columns/detectors >40% for positive results determined via GC/HPLC
V = Non-linear calibrations; correlation coefficient $r < 0.995$
W = EMPC result
X = Signal to noise response drop
Y = Percent solids <30%
Z = Uncertainty at 2 sigma deviation is less than sample activity
Z1 = Tentatively Identified Compound considered presumptively present
Z2 = Tentatively Identified Compound column bleed

PROJ_NO: 00771	NSAMPLE	S43FB01-20120422			S43FB02-20120422			S43RB01-20120422			S43TB01-20120420		
SDG: 1204118	LAB_ID	1204118-19			1204118-21			1204118-18			1204118-01		
FRACTION: OV	SAMP_DATE	4/22/2012			4/22/2012			4/22/2012			4/20/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2,2-TETRACHLOROETHANE		0.5	U		4.34			0.5	U		0.5	U	
1,1,2-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2,3-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2,4-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DIBROMOETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,3-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,4-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,4-DIOXANE		10	UR	C	10	UR	C	10	UR	C	10	UR	C
2-BUTANONE		5	U		5	U		5	U		5	U	
2-HEXANONE		2.5	U		2.5	U		2.5	U		2.5	U	
4-METHYL-2-PENTANONE		2.5	U		2.5	U		2.5	U		2.5	U	
ACETONE		9.66	J	P	3.53	J	P	8.19	J	P	5	U	
BENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
BROMODICHLOROMETHANE		0.5	U		1.54	J	C	0.5	U		0.5	U	
BROMOFORM		0.5	U		0.5	U		0.5	U		0.5	U	
BROMOMETHANE		1	U		1	U		1	U		1	U	
CARBON DISULFIDE		0.5	U		0.5	U		0.5	U		0.5	U	
CARBON TETRACHLORIDE		0.5	U		2.04			0.5	U		0.5	U	
CHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLORODIBROMOMETHANE		0.5	U		1.44			0.5	U		0.5	U	
CHLOROETHANE		1	U		1	U		1	U		1	U	
CHLOROFORM		0.5	U		4.49			0.5	U		0.5	U	
CHLOROMETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
CIS-1,2-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
CYCLOHEXANE		0.5	U		0.5	U		0.5	U		0.5	U	
DICHLORODIFLUOROMETHANE		1	U		1	U		1	U		1	UJ	C
ETHYLBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43TW13-2933			S43TW14-1317			S43TW14-2933			S43TW15-1721		
SDG: 1204118	LAB_ID	1204118-02			1204118-03			1204118-04			1204118-11		
FRACTION: OV	SAMP_DATE	4/20/2012			4/20/2012			4/20/2012			4/22/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U		1	U	
1,1,2,2-TETRACHLOROETHANE		0.5	U		0.5	U		0.5	U		1	U	
1,1,2-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U		1	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		0.5	U		0.5	U		0.5	U		1	U	
1,1-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		1	U	
1,1-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.56	J	P
1,2,3-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U		1	U	
1,2,4-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U		1	U	
1,2-DIBROMO-3-CHLOROPROPANE		0.5	U		0.5	U		0.5	U		1	U	
1,2-DIBROMOETHANE		0.5	U		0.5	U		0.5	U		1	U	
1,2-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U		1	U	
1,2-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		1	U	
1,2-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U		1	U	
1,3-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U		1	U	
1,4-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U		1	U	
1,4-DIOXANE		10	UR	C	10	UR	C	10	UR	C	20	UR	C
2-BUTANONE		5	U		5	U		5	U		10	U	
2-HEXANONE		2.5	U		2.5	U		2.5	U		5	U	
4-METHYL-2-PENTANONE		2.5	U		2.5	U		2.5	U		5	U	
ACETONE		4.26	B	B	5	U		5	U		10	U	
BENZENE		0.5	U		0.5	U		0.5	U		1	U	
BROMODICHLOROMETHANE		0.5	U		0.5	U		0.5	U		1	U	
BROMOFORM		0.5	U		0.5	U		0.5	U		1	U	
BROMOMETHANE		1	U		1	U		1	U		2	U	
CARBON DISULFIDE		0.5	U		0.5	U		0.4	J	P	1	U	
CARBON TETRACHLORIDE		0.5	U		0.5	U		0.5	U		1	U	
CHLOROBENZENE		0.5	U		0.5	U		0.5	U		1	U	
CHLORODIBROMOMETHANE		0.5	U		0.5	U		0.5	U		1	U	
CHLOROETHANE		1	U		1	U		1	U		2	U	
CHLOROFORM		0.5	U		0.5	U		0.5	U		1	U	
CHLOROMETHANE		0.5	U		0.5	U		0.5	U		1	U	
CIS-1,2-DICHLOROETHENE		1.71			0.5	U		3.35			25.7		
CYCLOHEXANE		0.5	U		0.5	U		0.5	U		1	U	
DICHLORODIFLUOROMETHANE		1	UJ	C	1	UJ	C	1	UJ	C	2	UJ	C
ETHYLBENZENE		0.5	U		0.5	U		0.5	U		1	U	

PROJ_NO: 00771	NSAMPLE	S43TW15-2933			S43TW16-1721			S43TW16-1721-D			S43TW16-2933		
SDG: 1204118	LAB_ID	1204118-12			1204118-14			1204118-15			1204118-13		
FRACTION: OV	SAMP_DATE	4/22/2012			4/22/2012			4/22/2012			4/22/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF							S43TW16-1721					
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2,2-TETRACHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2,3-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2,4-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DIBROMOETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,3-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,4-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,4-DIOXANE		10	UR	C	10	UR	C	10	UR	C	10	UR	C
2-BUTANONE		5	U		5	U		5	U		5	U	
2-HEXANONE		2.5	U		2.5	U		2.5	U		2.5	U	
4-METHYL-2-PENTANONE		2.5	U		2.5	U		2.5	U		2.5	U	
ACETONE		5	U		5	U		5	U		5	U	
BENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
BROMODICHLOROMETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
BROMOFORM		0.5	U		0.5	U		0.5	U		0.5	U	
BROMOMETHANE		1	U		1	U		1	U		1	U	
CARBON DISULFIDE		0.63	J	P	0.5	U		0.5	U		0.65	J	P
CARBON TETRACHLORIDE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLORODIBROMOMETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROETHANE		1	U		1	U		1	U		1	U	
CHLOROFORM		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROMETHANE		0.5	U		0.37	J	P	0.5	U		0.5	U	
CIS-1,2-DICHLOROETHENE		1.17			0.5	U		0.5	U		0.5	U	
CYCLOHEXANE		0.5	U		0.5	U		0.5	U		0.5	U	
DICHLORODIFLUOROMETHANE		1	UJ	C	1	UJ	C	1	UJ	C	1	UJ	C
ETHYLBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43TW17-1923			S43TW17-2933			S43TW19-2832			S43TW20-1933		
SDG: 1204118	LAB_ID	1204118-17			1204118-16			1204118-08			1204118-07RE1		
FRACTION: OV	SAMP_DATE	4/22/2012			4/22/2012			4/21/2012			4/21/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U		1	U	
1,1,2,2-TETRACHLOROETHANE		0.5	U		0.5	U		0.5	U		1	U	
1,1,2-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U		1	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		0.5	U		0.5	U		0.5	U		1	U	
1,1-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		1	U	
1,1-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		1.34	J	P
1,2,3-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U		1	U	
1,2,4-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U		1	U	
1,2-DIBROMO-3-CHLOROPROPANE		0.5	U		0.5	U		0.5	U		1	U	
1,2-DIBROMOETHANE		0.5	U		0.5	U		0.5	U		1	U	
1,2-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U		1	U	
1,2-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		1	U	
1,2-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U		1	U	
1,3-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U		1	U	
1,4-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U		1	U	
1,4-DIOXANE		10	UR	C	10	UR	C	10	UR	C	20	UR	C
2-BUTANONE		5	U		5	U		5	U		10	U	
2-HEXANONE		2.5	U		2.5	U		2.5	U		5	U	
4-METHYL-2-PENTANONE		2.5	U		2.5	U		2.5	U		5	U	
ACETONE		5	U		5	U		5	U		5.74	B	B
BENZENE		0.5	U		0.5	U		0.5	U		1	U	
BROMODICHLOROMETHANE		0.5	U		0.5	U		0.5	U		1	U	
BROMOFORM		0.5	U		0.5	U		0.5	U		1	U	
BROMOMETHANE		1	U		1	U		1	U		2	UJ	E
CARBON DISULFIDE		0.5	U		0.5	U		0.5	U		1	U	
CARBON TETRACHLORIDE		0.5	U		0.5	U		0.5	U		1	U	
CHLOROBENZENE		0.5	U		0.5	U		0.5	U		1	U	
CHLORODIBROMOMETHANE		0.5	U		0.5	U		0.5	U		1	U	
CHLOROETHANE		1	U		1	U		1	U		2	U	
CHLOROFORM		0.5	U		0.5	U		0.5	U		1	U	
CHLOROMETHANE		0.5	U		0.5	U		0.5	U		1	U	
CIS-1,2-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		81.8		
CYCLOHEXANE		0.5	U		0.5	U		0.5	U		1	U	
DICHLORODIFLUOROMETHANE		1	U		1	UJ	C	1	UJ	C	2	U	
ETHYLBENZENE		0.5	U		0.5	U		0.5	U		1	U	

PROJ_NO: 00771	NSAMPLE	S43TW20-2933			S43TW20-2933-D			S43TW21-1923			S43TW21-2630		
SDG: 1204118	LAB_ID	1204118-05			1204118-06			1204118-09			1204118-10		
FRACTION: OV	SAMP_DATE	4/21/2012			4/21/2012			4/21/2012			4/21/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF				S43TW20-2933								
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		2.5	U		2.5	U		0.5	U		0.5	U	
1,1,2,2-TETRACHLOROETHANE		2.5	U		2.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROETHANE		2.5	U		2.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		2.5	U		2.5	U		0.5	U		0.5	U	
1,1-DICHLOROETHANE		2.5	U		2.5	U		0.5	U		0.5	U	
1,1-DICHLOROETHENE		2.5	U		2.5	U		0.5	U		0.5	U	
1,2,3-TRICHLOROBENZENE		2.5	U		2.5	U		0.5	U		0.5	U	
1,2,4-TRICHLOROBENZENE		2.5	U		2.5	U		0.5	U		0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE		2.5	U		2.5	U		0.5	U		0.5	U	
1,2-DIBROMOETHANE		2.5	U		2.5	U		0.5	U		0.5	U	
1,2-DICHLOROBENZENE		2.5	U		2.5	U		0.5	U		0.5	U	
1,2-DICHLOROETHANE		2.5	U		2.5	U		0.5	U		0.5	U	
1,2-DICHLOROPROPANE		2.5	U		2.5	U		0.5	U		0.5	U	
1,3-DICHLOROPROPANE		2.5	U		2.5	U		0.5	U		0.5	U	
1,4-DICHLOROBENZENE		2.5	U		2.5	U		0.5	U		0.5	U	
1,4-DIOXANE		50	UR	C	50	UR	C	10	UR	C	10	UR	C
2-BUTANONE		25	U		25	U		5	U		5	U	
2-HEXANONE		12.5	U		12.5	U		2.5	U		2.5	U	
4-METHYL-2-PENTANONE		12.5	U		12.5	U		2.5	U		2.5	U	
ACETONE		25	U		25	U		5	U		5	U	
BENZENE		2.5	U		2.5	U		0.5	U		0.5	U	
BROMODICHLOROMETHANE		2.5	U		2.5	U		0.5	U		0.5	U	
BROMOFORM		2.5	U		2.5	U		0.5	U		0.5	U	
BROMOMETHANE		5	U		5	U		1	U		1	U	
CARBON DISULFIDE		2.5	U		2.5	U		0.5	U		0.5	U	
CARBON TETRACHLORIDE		2.5	U		2.5	U		0.5	U		0.5	U	
CHLOROBENZENE		2.5	U		2.5	U		0.5	U		0.5	U	
CHLORODIBROMOMETHANE		2.5	U		2.5	U		0.5	U		0.5	U	
CHLOROETHANE		5	U		5	U		1	U		1	U	
CHLOROFORM		2.5	U		2.5	U		0.5	U		0.5	U	
CHLOROMETHANE		2.5	U		2.5	U		0.5	U		0.5	U	
CIS-1,2-DICHLOROETHENE		50.2			47			0.69	J	P	0.5	U	
CYCLOHEXANE		2.5	U		2.5	U		0.5	U		0.5	U	
DICHLORODIFLUOROMETHANE		5	UJ	C	5	UJ	C	1	UJ	C	1	UJ	C
ETHYLBENZENE		2.5	U		2.5	U		0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43FB01-20120422			S43FB02-20120422			S43RB01-20120422			S43TB01-20120420		
SDG: 1204118	LAB_ID	1204118-19			1204118-21			1204118-18			1204118-01		
FRACTION: OV	SAMP_DATE	4/22/2012			4/22/2012			4/22/2012			4/20/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
METHYL ACETATE		1	U		1	U		1	U		1	U	
METHYL TERT-BUTYL ETHER		0.5	U		0.5	U		0.5	U		0.5	U	
METHYLENE CHLORIDE		1	U		1	U		1	U		1	U	
STYRENE		0.5	U		0.5	U		0.5	U		0.5	U	
TETRACHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
TOLUENE		0.5	U		0.5	U		0.5	U		0.5	U	
TOTAL XYLENES		1	U		1	U		1	U		1	U	
TRANS-1,2-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
TRICHLOROETHENE		0.5	U		0.27	J	P	0.5	U		0.5	U	
TRICHLOROFLUOROMETHANE		1	U		1	U		1	U		1	U	
VINYL CHLORIDE		0.5	U		0.5	U		0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43TW13-2933			S43TW14-1317			S43TW14-2933			S43TW15-1721		
SDG: 1204118	LAB_ID	1204118-02			1204118-03			1204118-04			1204118-11		
FRACTION: OV	SAMP_DATE	4/20/2012			4/20/2012			4/20/2012			4/22/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		0.5	U		0.5	U		0.5	U		1	U	
METHYL ACETATE		1	U		1	U		1	U		2	U	
METHYL TERT-BUTYL ETHER		0.5	U		0.5	U		0.5	U		1	U	
METHYLENE CHLORIDE		1	U		1	U		1	U		2	U	
STYRENE		0.5	U		0.5	U		0.5	U		1	U	
TETRACHLOROETHENE		0.5	U		0.5	U		0.5	U		1	U	
TOLUENE		0.5	U		0.5	U		0.5	U		1	U	
TOTAL XYLENES		1	U		1	U		1	U		2	U	
TRANS-1,2-DICHLOROETHENE		0.61	J	P	0.5	U		0.5	U		1	U	
TRICHLOROETHENE		20.3			0.5	U		79.9			158		
TRICHLOROFLUOROMETHANE		1	U		1	U		1	U		2	U	
VINYL CHLORIDE		0.5	U		0.5	U		0.74	J	P	1.4	J	P

PROJ_NO: 00771	NSAMPLE	S43TW15-2933			S43TW16-1721			S43TW16-1721-D			S43TW16-2933		
SDG: 1204118	LAB_ID	1204118-12			1204118-14			1204118-15			1204118-13		
FRACTION: OV	SAMP_DATE	4/22/2012			4/22/2012			4/22/2012			4/22/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF							S43TW16-1721					
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
METHYL ACETATE		1	U		1	U		1	U		1	U	
METHYL TERT-BUTYL ETHER		0.5	U		0.5	U		0.5	U		0.5	U	
METHYLENE CHLORIDE		1	U		1	U		1	U		1	U	
STYRENE		0.5	U		0.5	U		0.5	U		0.5	U	
TETRACHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
TOLUENE		0.5	U		0.5	U		0.5	U		0.5	U	
TOTAL XYLENES		1	U		1	U		1	U		1	U	
TRANS-1,2-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
TRICHLOROETHENE		0.64	J	P	0.5	U		0.5	U		0.5	U	
TRICHLOROFLUOROMETHANE		1	U		1	U		1	U		1	U	
VINYL CHLORIDE		0.58	J	P	0.5	U		0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43TW17-1923			S43TW17-2933			S43TW19-2832			S43TW20-1933		
SDG: 1204118	LAB_ID	1204118-17			1204118-16			1204118-08			1204118-07RE1		
FRACTION: OV	SAMP_DATE	4/22/2012			4/22/2012			4/21/2012			4/21/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		0.5	U		0.5	U		0.5	U		1	U	
METHYL ACETATE		1	U		1	U		1	U		2	U	
METHYL TERT-BUTYL ETHER		0.5	U		0.5	U		0.5	U		1	U	
METHYLENE CHLORIDE		1	U		1	U		1	U		1.28	J	P
STYRENE		0.5	U		0.5	U		0.5	U		1	U	
TETRACHLOROETHENE		0.5	U		0.5	U		0.5	U		1	U	
TOLUENE		0.5	U		0.5	U		0.5	U		1	U	
TOTAL XYLENES		1	U		1	U		1	U		2	U	
TRANS-1,2-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.56	J	P
TRICHLOROETHENE		0.5	U		0.5	U		0.5	U		298		
TRICHLOROFLUOROMETHANE		1	U		1	U		1	U		2	U	
VINYL CHLORIDE		0.5	U		0.5	U		0.5	U		13.1		

PROJ_NO: 00771	NSAMPLE	S43TW20-2933			S43TW20-2933-D			S43TW21-1923			S43TW21-2630		
SDG: 1204118	LAB_ID	1204118-05			1204118-06			1204118-09			1204118-10		
FRACTION: OV	SAMP_DATE	4/21/2012			4/21/2012			4/21/2012			4/21/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF				S43TW20-2933								
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		2.5	U		2.5	U		0.5	U		0.5	U	
METHYL ACETATE		5	U		5	U		1	U		1	U	
METHYL TERT-BUTYL ETHER		2.5	U		2.5	U		0.5	U		0.5	U	
METHYLENE CHLORIDE		5	U		5	U		1	U		1	U	
STYRENE		2.5	U		2.5	U		0.5	U		0.5	U	
TETRACHLOROETHENE		2.5	U		2.5	U		0.5	U		0.5	U	
TOLUENE		2.5	U		2.5	U		0.5	U		0.5	U	
TOTAL XYLENES		5	U		5	U		1	U		1	U	
TRANS-1,2-DICHLOROETHENE		2.5	U		2.5	U		0.5	U		0.5	U	
TRICHLOROETHENE		298			287			1.04			0.35	J	P
TRICHLOROFLUOROMETHANE		5	U		5	U		1	U		1	U	
VINYL CHLORIDE		12.3			11.5			0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43FB01-20120422			S43FB02-20120422		
SDG: 1204118	LAB_ID	1204118-19			1204118-21		
FRACTION: EXP	SAMP_DATE	4/22/2012			4/22/2012		
MEDIA: WATER	QC_TYPE	NM			NM		
	UNITS	UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0		
	DUP_OF						
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,3,5-TRINITROBENZENE		0.16	U		0.16	U	
1,3-DINITROBENZENE		0.304	J	PQU	0.242	J	PQU
2,4,6-TRINITROTOLUENE		0.16	U		0.393		
2,4-DINITROTOLUENE		0.16	U		0.16	U	
2,6-DINITROTOLUENE		0.16	U		0.16	U	
2-AMINO-4,6-DINITROTOLUENE		0.16	U		0.109	J	PQ
2-NITROTOLUENE		1.63			0.361	J	QU
3-NITROTOLUENE		0.171	J	P	0.111	J	PQU
4-AMINO-2,6-DINITROTOLUENE		0.16	U		0.16	U	
4-NITROTOLUENE		0.16	U		0.16	U	
HMX		0.16	U		0.16	U	
NITROBENZENE		0.16	U		0.115	J	PQU
NITROGLYCERIN		0.4	U		0.4	U	
NITROGUANIDINE		20	UJ	H	20	UJ	H
RDX		0.091	J	PQU	0.391	J	QU
TETRYL		0.16	U		0.16	U	

PROJ_NO: 00771	NSAMPLE	S43FB01-20120422			S43FB02-20120422		
SDG: 1204118	LAB_ID	1204118-19			1204118-21		
FRACTION: M	SAMP_DATE	4/22/2012			4/22/2012		
MEDIA: WATER	QC_TYPE	NM			NM		
	UNITS	UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0		
	DUP_OF						
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM		25	U		27.6	J	P
ANTIMONY		2	U		2	U	
ARSENIC		1.5	U		1.5	U	
BARIUM		2.5	U		33.6		
BERYLLIUM		0.5	U		0.5	U	
CADMIUM		0.5	U		0.5	U	
CHROMIUM		1	U		1	U	
COBALT		2.5	U		2.5	U	
COPPER		2	U		13.4		
IRON		15	U		73.7	K	C
LEAD		0.75	U		0.75	U	
MANGANESE		1.5	U		4.4		
MERCURY		0.2	U		0.2	U	
NICKEL		1.5	U		2.74		
SELENIUM		1.25	U		1.25	U	
SILVER		0.5	U		0.5	U	
THALLIUM		1	U		1	U	
VANADIUM		2.5	U		2.5	U	
ZINC		2.5	U		15		

PROJ_NO: 00771	NSAMPLE	S43FB01-20120422			S43FB02-20120422		
SDG: 1204118	LAB_ID	1204118-20			1204118-22		
FRACTION: MF	SAMP_DATE	4/22/2012			4/22/2012		
MEDIA: WATER	QC_TYPE	NM			NM		
	UNITS	UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0		
	DUP_OF						
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM		25	U		29	J	P
ANTIMONY		2	U		2	U	
ARSENIC		1.5	U		1.5	U	
BARIUM		2.5	U		34.3		
BERYLLIUM		0.5	U		0.5	U	
CADMIUM		0.5	U		0.5	U	
CHROMIUM		1	U		1	U	
COBALT		2.5	U		2.5	U	
COPPER		2	U		14.5		
IRON		16.6	J	CP	82.8	K	C
LEAD		0.75	U		0.75	U	
MANGANESE		1.5	U		4.63		
MERCURY		0.2	U		0.2	U	
NICKEL		1.5	U		2.83		
SELENIUM		1.25	U		1.25	U	
SILVER		0.5	U		0.5	U	
THALLIUM		1	U		1	U	
VANADIUM		2.5	U		2.5	U	
ZINC		1.57	J	P	16.1		

Tetra Tech **INTERNAL CORRESPONDENCE**

TO: **R. SOK** **DATE:** **MAY 30, 2012**

FROM: **EDWARD SEDLMYER** **COPIES:** **DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – VOC**
NSF INDIAN HEAD
SDG 1204471

SAMPLES: 4/Air/VOC

S43IND01 S43IND01-D
S43IND02 S43ODA02

Overview

The sample set for NSF Indian Head, SDG 1204471 consists of four (4) air environmental samples. The following field duplicate pair was associated with this SDG: S43IND01 / S43IND01-D. Samples were analyzed for volatile organic compounds (VOC).

The samples were collected by Tetra Tech on April 20, 2012 and analyzed by Air Toxics. All analyses were conducted in accordance with SW-846 Method TO-15 analytical and reporting protocols.

The data contained in this SDG were validated with regard to the following parameters: data completeness, holding times, GC/MS tuning, initial/continuing calibrations, laboratory method blank results, surrogate spike recoveries, blank spike/blank spike duplicate results, internal standard recoveries, field duplicate results, chromatographic resolution, compound identification, compound quantitation, and detection limits. Areas of concern are listed below.

Major

- None.

Minor

- The following contaminants were detected in the laboratory blank at the following maximum concentrations:

Analyte	Maximum Concentration	Action Level
Acetone	0.23 ug/m3	2.3 ug/m3
1,2-Dichloroethane	0.032 ug/m3	0.16 ug/m3
Cis-1,2-Dichloroethene	0.021 ug/m3	0.105 ug/m3
Toluene	0.036 ug/m3	0.18 ug/m3
Trans-1,2-Dichloroethene	0.024 ug/m3	0.12 ug/m3
Trichloroethene	0.021 ug/m3	0.105 ug/m3

An action level of 10X the maximum contaminant level for acetone; 5X for the remaining compounds have 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. The positive results less than the blank action level reported for

1,2-dichloroethane, cis-1,2-dichloroethene, and trichloroethene were qualified "B" as a result of laboratory blank contamination.

- Initial calibration percent relative standard deviation (%RSD) exceeded the 30% quality control limit for acetone on instrument MSDV.i on 04/25/12. The positive results for acetone in all samples have been qualified as estimated (J).

- The surrogate toluene-d8 had a percent recovery greater than the quality control limit for samples S43IND01-D and S43IND02. The positive results were qualified as estimated (J) for samples S43IND01-D and S43IND02. No action was taken on the nondetected results.

- Positive results between the method detection limit (MDL) and the limit of quantitation (LOQ) were qualified as estimated (J).

Notes

Laboratory results were reported to the limit of detection (LOD)

Executive Summary

Laboratory Performance: Laboratory blank contamination resulted in the qualification of data. Initial calibration noncompliance resulted in the qualification of results for one compound. Surrogate %R noncompliance resulted in the qualification of results.

Other Factors Affecting Data Quality: Positive results between the method detection limit (MDL) and the limit of quantitation (LOQ) were qualified as estimated (J).

The data for these analyses were reviewed with reference to Region III modifications to U.S. EPA National Functional Guidelines for Organic Data Validation (Sept. 1994) and Department of Defense (DoD) document entitled "Quality Systems Manual (QSM) for Environmental Laboratories" (April 2009). The text of this report has been formulated to address only those problem areas affecting data quality.

Tetra Tech
Edward Sedlmyer
Chemist/Data Validator

Tetra Tech
Joseph A. Samchuck
Quality Assurance Officer

Attachments:
Appendix A – Qualified Analytical Results
Appendix B – Results as Reported by the Laboratory
Appendix C – Support Documentation

Appendix A

Qualified Analytical Results

Qualifier Codes:

A = Lab Blank Contamination
B = Field Blank Contamination
C = Calibration Noncompliance (i.e., % RSDs, %Ds, ICVs, CCVs, RRFs, etc.)
C01 = GC/MS Tuning Noncompliance
D = MS/MSD Recovery Noncompliance
E = LCS/LCSD Recovery Noncompliance
F = Lab Duplicate Imprecision
G = Field Duplicate Imprecision
H = Holding Time Exceedance
I = ICP Serial Dilution Noncompliance
J = ICP PDS Recovery Noncompliance; MSA's $r < 0.995$
K = ICP Interference - includes ICS % R Noncompliance
L = Instrument Calibration Range Exceedance
M = Sample Preservation Noncompliance
N = Internal Standard Noncompliance
N01 = Internal Standard Recovery Noncompliance Dioxins
N02 = Recovery Standard Noncompliance Dioxins
N03 = Clean-up Standard Noncompliance Dioxins
O = Poor Instrument Performance (i.e., base-time drifting)
P = Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q = Other problems (can encompass a number of issues; i.e.chromatography,interferences, etc.)
R = Surrogates Recovery Noncompliance
S = Pesticide/PCB Resolution
T = % Breakdown Noncompliance for DDT and Endrin
U = RPD between columns/detectors >40% for positive results determined via GC/HPLC
V = Non-linear calibrations; correlation coefficient $r < 0.995$
W = EMPC result
X = Signal to noise response drop
Y = Percent solids <30%
Z = Uncertainty at 2 sigma deviation is less than sample activity
Z1 = Tentatively Identified Compound considered presumptively present
Z2 = Tentatively Identified Compound column bleed

PROJ_NO: 00771	NSAMPLE	S43IND01			S43IND01-D			S43IND02			S43ODA02		
SDG: 1204471	LAB_ID	1204471-01A			1204471-02A			1204471-03A			1204471-04A		
FRACTION: OV-M3	SAMP_DATE	4/20/2012			4/20/2012			4/20/2012			4/20/2012		
MEDIA: AIR	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/M3			UG/M3			UG/M3			UG/M3		
	PCT_SOLIDS	100.0			100.0			100.0			100.0		
	DUP_OF				S43IND01								
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		0.072	J	P	0.035	J	PR	0.04	J	PR	0.036	J	P
1,1-DICHLOROETHANE		0.014	U		0.014	U		0.015	U		0.015	U	
1,1-DICHLOROETHENE		0.014	U		0.014	U		0.015	U		0.014	U	
1,2-DICHLOROETHANE		0.098	B	A	0.08	B	A	0.088	B	A	0.074	B	A
1,4-DIOXANE		0.52	U		0.52	U		0.55	U		0.52	U	
2-BUTANONE		1	J	P	0.91	J	PR	1	J	PR	1.2	J	P
2-HEXANONE		0.59	U		0.59	U		0.62	U		0.59	U	
4-METHYL-2-PENTANONE		0.59	U		0.59	U		0.62	U		0.59	U	
ACETONE		6.5	J	C	5	J	CR	5.7	J	CR	12	J	C
BENZENE		0.45			0.28	J	PR	0.27	J	PR	0.3		
BROMOFORM		1.5	U		1.5	U		1.6	U		1.5	U	
CARBON DISULFIDE		0.44	U		0.44	U		0.48	U		0.45	U	
CARBON TETRACHLORIDE		0.9	U		0.9	U		0.96	U		0.91	U	
CHLOROETHANE		0.38	U		0.38	U		0.4	U		0.38	U	
CHLOROFORM		0.7	U		0.7	U		0.75	U		0.71	U	
CHLOROMETHANE		0.91			0.68	J	R	1.1	J	R	1.2		
CIS-1,2-DICHLOROETHENE		0.015	B	A	0.014	U		0.015	U		0.017	B	A
DICHLORODIFLUOROMETHANE		2.8			2.7	J	R	2.4	J	R	2.5		
ETHYLBENZENE		0.13	J	P	0.11	J	PR	0.12	J	PR	0.064	J	P
METHYL TERT-BUTYL ETHER		0.1	U		0.1	U		0.11	U		0.1	U	
METHYLENE CHLORIDE		0.5	U		0.5	U		0.53	U		0.5	U	
TETRACHLOROETHENE		0.17	J	P	0.074	J	PR	0.076	J	PR	0.075	J	P
TOLUENE		1.3			0.63	J	R	0.66	J	R	0.61		
TRANS-1,2-DICHLOROETHENE		0.014	U		0.014	U		0.015	U		0.014	U	
TRICHLOROETHENE		0.16	J	P	0.019	U		0.023	B	A	0.03	B	A
TRICHLOROFLUOROMETHANE		1.1			1.2	J	R	1.3	J	R	1.2		
VINYL CHLORIDE		0.0091	U		0.0091	U		0.011	J	PR	0.0092	U	

Tetra Tech **INTERNAL CORRESPONDENCE**

TO:	**R. SOK**	**DATE:**	**MAY 25, 2012**
FROM:	**EDWARD SEDLMYER**	**COPIES:**	**DV FILE**
SUBJECT:	**ORGANIC DATA VALIDATION – VOC NSF INDIAN HEAD SDG 1205004**		
SAMPLES:	5/Aqueous/VOC		

S43TB02-20120427 S43TW22-2226 S43TW23-1014
S43TW23-2226 S43TW23-3236

Overview

The sample set for NSF Indian Head, SDG 1205004 consists of four (4) aqueous environmental samples and one (1) trip blank. Samples were analyzed for volatile organic compounds (VOC).

The samples were collected by Tetra Tech on April 27, 2012 and analyzed by Empirical Laboratories. All analyses were conducted in accordance with SW-846 Method 8260B analytical and reporting protocols.

The data contained in this SDG were validated with regard to the following parameters: data completeness, holding times, GC/MS 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, and detection limits. Areas of concern are listed below.

Major

- The volatile initial and continuing calibrations of instrument MS-VOA6 had relative response factors (RRFs) less than the 0.05 quality control limit for 1,4-dioxane. The nondetected results for 1,4-dioxane in all samples were rejected (UR).

Minor

- The volatile continuing calibration percent difference (%D) for acetone was greater than 20% but less than 50% on instrument MS-VOA6 on 05/01/12 @11:02. The positive acetone results for samples S43TW23-1014 and S43TW23-3236 have been qualified as estimated (J).

- Positive results between the method detection limit (MDL) and the limit of quantitation (LOQ) were qualified as estimated (J).

Notes

The volatile continuing calibration %Ds for bromomethane and chloromethane were greater than 20% but less than 50% on instrument MS-VOA6 on 05/01/12 @11:02. No action was taken on the nondetected compounds reported for the associated samples.

The laboratory control sample / laboratory control sample duplicate (LCS/LCSD) associated with batch

2E01010 had a relative percent difference (RPD) outside the quality control limit for acetone. No action was taken on this basis because the percent recoveries for acetone were acceptable.

Sample S43TW22-2226 was analyzed at a 50 times dilution because concentrations of cis-1,2-dichloroethene and trichloroethene were greater than the linear calibration range of the instrument. This accounts for the elevated detection limits for the nondetected results.

Sample S43TW23-2226 was analyzed at a 10 times dilution because concentrations of cis-1,2-dichloroethene, trichloroethene, and vinyl chloride were greater than the linear calibration range of the instrument. This accounts for the elevated detection limits for the nondetected results.

Laboratory results were reported to the limit of detection (LOD)

Executive Summary

Laboratory Performance: None.

Other Factors Affecting Data Quality: Positive results between the method detection limit (MDL) and the limit of quantitation (LOQ) were qualified as estimated (J).

The data for these analyses were reviewed with reference to Region III modifications to U.S. EPA National Functional Guidelines for Organic Data Validation (Sept. 1994) and Department of Defense (DoD) document entitled "Quality Systems Manual (QSM) for Environmental Laboratories" (April 2009). The text of this report has been formulated to address only those problem areas affecting data quality.

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Attachments:
Appendix A – Qualified Analytical Results
Appendix B – Results as Reported by the Laboratory
Appendix C – Support Documentation

Appendix A

Qualified Analytical Results

Qualifier Codes:

A = Lab Blank Contamination
B = Field Blank Contamination
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C01 = GC/MS Tuning Noncompliance
D = MS/MSD Recovery Noncompliance
E = LCS/LCSD Recovery Noncompliance
F = Lab Duplicate Imprecision
G = Field Duplicate Imprecision
H = Holding Time Exceedance
I = ICP Serial Dilution Noncompliance
J = ICP PDS Recovery Noncompliance; MSA's $r < 0.995$
K = ICP Interference - includes ICS % R Noncompliance
L = Instrument Calibration Range Exceedance
M = Sample Preservation Noncompliance
N = Internal Standard Noncompliance
N01 = Internal Standard Recovery Noncompliance Dioxins
N02 = Recovery Standard Noncompliance Dioxins
N03 = Clean-up Standard Noncompliance Dioxins
O = Poor Instrument Performance (i.e., base-time drifting)
P = Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q = Other problems (can encompass a number of issues; i.e.chromatography,interferences, etc.)
R = Surrogates Recovery Noncompliance
S = Pesticide/PCB Resolution
T = % Breakdown Noncompliance for DDT and Endrin
U = RPD between columns/detectors >40% for positive results determined via GC/HPLC
V = Non-linear calibrations; correlation coefficient $r < 0.995$
W = EMPC result
X = Signal to noise response drop
Y = Percent solids <30%
Z = Uncertainty at 2 sigma deviation is less than sample activity
Z1 = Tentatively Identified Compound considered presumptively present
Z2 = Tentatively Identified Compound column bleed

PROJ_NO: 00771	NSAMPLE	S43TB02-20120427			S43TW22-2226			S43TW23-1014			S43TW23-2226		
SDG: 1205004	LAB_ID	1205004-01			1205004-04			1205004-05			1205004-03		
FRACTION: OV	SAMP_DATE	4/27/2012			4/27/2012			4/27/2012			4/27/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		0.5	U		25	U		0.5	U		5	U	
1,1,2,2-TETRACHLOROETHANE		0.5	U		25	U		0.5	U		5	U	
1,1,2-TRICHLOROETHANE		0.5	U		25	U		0.5	U		5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		0.5	U		25	U		0.5	U		5	U	
1,1-DICHLOROETHANE		0.5	U		25	U		0.5	U		5	U	
1,1-DICHLOROETHENE		0.5	U		25	U		0.5	U		5.5	J	P
1,2,3-TRICHLOROBENZENE		0.5	U		25	U		0.5	U		5	U	
1,2,4-TRICHLOROBENZENE		0.5	U		25	U		0.5	U		5	U	
1,2-DIBROMO-3-CHLOROPROPANE		0.5	U		25	U		0.5	U		5	U	
1,2-DIBROMOETHANE		0.5	U		25	U		0.5	U		5	U	
1,2-DICHLOROBENZENE		0.5	U		25	U		0.5	U		5	U	
1,2-DICHLOROETHANE		0.5	U		25	U		0.5	U		5	U	
1,2-DICHLOROPROPANE		0.5	U		25	U		0.5	U		5	U	
1,3-DICHLOROPROPANE		0.5	U		25	U		0.5	U		5	U	
1,4-DICHLOROBENZENE		0.5	U		25	U		0.5	U		5	U	
1,4-DIOXANE		10	UR	C	500	UR	C	10	UR	C	100	UR	C
2-BUTANONE		5	U		250	U		5	U		50	U	
2-HEXANONE		2.5	U		125	U		2.5	U		25	U	
4-METHYL-2-PENTANONE		2.5	U		125	U		2.5	U		25	U	
ACETONE		5	U		250	U		4.94	J	CP	50	U	
BENZENE		0.5	U		25	U		0.5	U		5	U	
BROMODICHLOROMETHANE		0.5	U		25	U		0.5	U		5	U	
BROMOFORM		0.5	U		25	U		0.5	U		5	U	
BROMOMETHANE		1	U		50	U		1	U		10	U	
CARBON DISULFIDE		0.5	U		25	U		0.59	J	P	5	U	
CARBON TETRACHLORIDE		0.5	U		25	U		0.5	U		5	U	
CHLOROBENZENE		0.5	U		25	U		0.5	U		5	U	
CHLORODIBROMOMETHANE		0.5	U		25	U		0.5	U		5	U	
CHLOROETHANE		1	U		50	U		1	U		10	U	
CHLOROFORM		0.5	U		25	U		0.5	U		5	U	
CHLOROMETHANE		0.5	U		25	U		0.5	U		5	U	
CIS-1,2-DICHLOROETHENE		0.5	U		288			0.37	J	P	197		
CYCLOHEXANE		0.5	U		25	U		0.5	U		5	U	
DICHLORODIFLUOROMETHANE		1	U		50	U		1	U		10	U	
ETHYLBENZENE		0.5	U		25	U		0.5	U		5	U	

PROJ_NO: 00771	NSAMPLE	S43TW23-3236		
SDG: 1205004	LAB_ID	1205004-02		
FRACTION: OV	SAMP_DATE	4/27/2012		
MEDIA: WATER	QC_TYPE	NM		
	UNITS	UG/L		
	PCT_SOLIDS	0.0		
	DUP_OF			
PARAMETER		RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		0.5	U	
1,1,2,2-TETRACHLOROETHANE		0.5	U	
1,1,2-TRICHLOROETHANE		0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		0.5	U	
1,1-DICHLOROETHANE		0.5	U	
1,1-DICHLOROETHENE		0.5	U	
1,2,3-TRICHLOROBENZENE		0.5	U	
1,2,4-TRICHLOROBENZENE		0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE		0.5	U	
1,2-DIBROMOETHANE		0.5	U	
1,2-DICHLOROBENZENE		0.5	U	
1,2-DICHLOROETHANE		0.5	U	
1,2-DICHLOROPROPANE		0.5	U	
1,3-DICHLOROPROPANE		0.5	U	
1,4-DICHLOROBENZENE		0.5	U	
1,4-DIOXANE		10	UR	C
2-BUTANONE		5	U	
2-HEXANONE		2.5	U	
4-METHYL-2-PENTANONE		2.5	U	
ACETONE		3.3	J	CP
BENZENE		0.5	U	
BROMODICHLOROMETHANE		0.5	U	
BROMOFORM		0.5	U	
BROMOMETHANE		1	U	
CARBON DISULFIDE		0.44	J	P
CARBON TETRACHLORIDE		0.5	U	
CHLOROBENZENE		0.5	U	
CHLORODIBROMOMETHANE		0.5	U	
CHLOROETHANE		1	U	
CHLOROFORM		0.5	U	
CHLOROMETHANE		0.5	U	
CIS-1,2-DICHLOROETHENE		0.5	U	
CYCLOHEXANE		0.5	U	
DICHLORODIFLUOROMETHANE		1	U	
ETHYLBENZENE		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43TB02-20120427			S43TW22-2226			S43TW23-1014			S43TW23-2226		
SDG: 1205004	LAB_ID	1205004-01			1205004-04			1205004-05			1205004-03		
FRACTION: OV	SAMP_DATE	4/27/2012			4/27/2012			4/27/2012			4/27/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		0.5	U		25	U		0.5	U		5	U	
METHYL ACETATE		1	U		50	U		1	U		10	U	
METHYL TERT-BUTYL ETHER		0.5	U		25	U		0.5	U		5	U	
METHYLENE CHLORIDE		1	U		50	U		1	U		10	U	
STYRENE		0.5	U		25	U		0.5	U		5	U	
TETRACHLOROETHENE		0.5	U		25	U		0.5	U		5	U	
TOLUENE		0.5	U		25	U		0.5	U		5	U	
TOTAL XYLENES		1	U		50	U		1	U		10	U	
TRANS-1,2-DICHLOROETHENE		0.5	U		25	U		0.5	U		5	U	
TRICHLOROETHENE		0.5	U		4440			1.21			833		
TRICHLOROFLUOROMETHANE		1	U		50	U		1	U		10	U	
VINYL CHLORIDE		0.5	U		54			0.5	U		29.7		

PROJ_NO: 00771	NSAMPLE	S43TW23-3236		
SDG: 1205004	LAB_ID	1205004-02		
FRACTION: OV	SAMP_DATE	4/27/2012		
MEDIA: WATER	QC_TYPE	NM		
	UNITS	UG/L		
	PCT_SOLIDS	0.0		
	DUP_OF			
PARAMETER		RESULT	VQL	QLCD
ISOPROPYLBENZENE		0.5	U	
METHYL ACETATE		1	U	
METHYL TERT-BUTYL ETHER		0.5	U	
METHYLENE CHLORIDE		0.57	J	P
STYRENE		0.5	U	
TETRACHLOROETHENE		0.5	U	
TOLUENE		0.5	U	
TOTAL XYLENES		1	U	
TRANS-1,2-DICHLOROETHENE		0.5	U	
TRICHLOROETHENE		1.61		
TRICHLOROFLUOROMETHANE		1	U	
VINYL CHLORIDE		0.5	U	

Tetra Tech **INTERNAL CORRESPONDENCE**

TO:	**R. SOK**	**DATE:**	**MAY 29, 2012**
FROM:	**EDWARD SEDLMYER**	**COPIES:**	**DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – VOC**
NSF INDIAN HEAD
SDG 1205040

SAMPLES: 29/Aqueous/VOC

S43FB03	S43RB03	S43TB03
S43TW18-1923	S43TW18-3034	S43TW19-2024
S43TW22-1014	S43TW22-3337	S43TW24-2327
S43TW24-3236	S43TW25-1115	S43TW25-2933
S43TW26-1014	S43TW26-3236	S43TW27-2933
S43TW28-1721	S43TW28-2933	S43TW28-2933D
S43TW29-2226	S43TW30-1317	S43TW30-1317D
S43TW30-2226	S43TW30-3236	S43TW31-1014
S43TW31-2226	S43TW31-3236	S43TW32-2226
S43TW32-2226D	S43TW32-3236	

Overview

The sample set for NSF Indian Head, SDG 1205040 consists of twenty six (26) aqueous environmental samples, one (1) field blank (S43FB03), one (1) rinse blank (S43RB03), and one (1) trip blank (S43TB03). Three (3) field duplicates were included in this SDG: S43TW28-2933 / S43TW28-2933D, S43TW30-1317 / S43TW30-1317D, and S43TW32-2226 / S43TW32-2226D. Samples were analyzed for target compound list (TCL) volatile organic compounds (VOC).

The samples were collected by Tetra Tech on May 4, 5, and 6, 2012 and analyzed by Empirical Laboratories. All analyses were conducted in accordance with SW-846 Method 8260B analytical and reporting protocols.

The data contained in this SDG were validated with regard to the following parameters: data completeness, holding times, GC/MS tuning, initial/continuing calibrations, laboratory method blank results, surrogate spike recoveries, blank spike/blank spike duplicate results, field duplicate results, internal standard recoveries, chromatographic resolution, compound identification, compound quantitation, and detection limits. Areas of concern are listed below.

Major

- The volatile initial and continuing calibrations of instruments MS-VOA5 and MS-VOA6 had relative response factors (RRFs) less than the 0.05 quality control limit for 1,4-dioxane. The nondetected results for 1,4-dioxane in all samples were rejected (UR).

Minor

- The following contaminants were detected in the trip blank at the following maximum concentrations:

Analyte	Maximum Concentration	Action Level
Acetone	6.89 ug/L	68.9 ug/L
2-Butanone	5.18 ug/L	51.8 ug/L
Methylene chloride	0.610 ug/L	6.1 ug/L

  An action level of 10X 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. The positive results less than the blank action level reported for acetone and methylene chloride were qualified "B" as a result of laboratory blank contamination.

- The volatile continuing calibration percent differences (%Ds) for carbon tetrachloride, chloromethane, and dichlorodifluoromethane were greater than 20% but less than 50% on instrument MS-VOA5 on 05/09/12 @02:45. The positive chloromethane results for samples S43TW30-3236 and S43TW32-3236 has been qualified as estimated (J).

- The volatile continuing calibration %Ds for carbon tetrachloride, chloromethane, and dichlorodifluoromethane were greater than 20% but less than 50% on instrument MS-VOA6 on 05/08/12 @07:57. The positive chloromethane result for sample S43TW24-3236 and carbon tetrachloride result for sample S43FB03 have been qualified as estimated (J).

- The volatile continuing calibration %Ds for carbon tetrachloride, chloromethane, and dichlorodifluoromethane were greater than 20% but less than 50% on instrument MS-VOA6 on 05/09/12 @05:47. The positive chloromethane results for samples S43TW32-2226, S43TW18-3034, S43TW25-2933, S43TW30-1317D, and S43TW32-2226D have been qualified as estimated (J).

- Positive results between the method detection limit (MDL) and the limit of quantitation (LOQ) were qualified as estimated (J).

Notes

The field blank sample (S43FB03) had detections for acetone, bromodichloromethane, carbon tetrachloride, chloroform, chlorodibromomethane, and 1,1,2,2-tetrachloroethane. No action was taken on this basis.

The rinse blank (S43RB03) had detections for acetone, 2-butanone, and methylene chloride. No action was taken on this basis.

The surrogate 1,2-dichloroethane-d4 had a percent recovery greater than the quality control limit for sample S43TW28-2933D. No action was taken on this basis because all results were nondetect.

The matrix spike / matrix spike duplicate (MS/MSD) performed on sample S43TW32-3236 had a percent recovery greater than the quality control limit for dichlorodifluoromethane in the MS. No action was taken on this basis because the MSD had an acceptable recovery and dichlorodifluoromethane was not detected in the sample.

Sample S43TW22-3337 was analyzed at a 2 times dilution because the concentration of trichloroethene was greater than the linear calibration range of the instrument. This accounts for the elevated detection limits for the nondetected results.

Laboratory results were reported to the limit of detection (LOD)

Executive Summary

Laboratory Performance: Initial and continuing calibration RRF noncompliances resulted in the rejection of all 1,4-dioxane results. Trip blank contamination resulted in the qualification for two compounds. Continuing calibration %D noncompliances resulted in the qualification of several results.

Other Factors Affecting Data Quality: Positive results between the method detection limit (MDL) and the limit of quantitation (LOQ) were qualified as estimated (J).

The data for these analyses were reviewed with reference to Region III modifications to U.S. EPA National Functional Guidelines for Organic Data Validation (Sept. 1994) and Department of Defense (DoD) document entitled "Quality Systems Manual (QSM) for Environmental Laboratories" (April 2009). The text of this report has been formulated to address only those problem areas affecting data quality.

Tetra Tech
Edward Sedlmyer
Chemist/Data Validator

Tetra Tech
Joseph A. Samchuck
Quality Assurance Officer

Attachments:
Appendix A – Qualified Analytical Results
Appendix B – Results as Reported by the Laboratory
Appendix C – Support Documentation

Appendix A

Qualified Analytical Results

Qualifier Codes:

A = Lab Blank Contamination
B = Field Blank Contamination
C = Calibration Noncompliance (i.e., % RSDs, %Ds, ICVs, CCVs, RRFs, etc.)
C01 = GC/MS Tuning Noncompliance
D = MS/MSD Recovery Noncompliance
E = LCS/LCSD Recovery Noncompliance
F = Lab Duplicate Imprecision
G = Field Duplicate Imprecision
H = Holding Time Exceedance
I = ICP Serial Dilution Noncompliance
J = ICP PDS Recovery Noncompliance; MSA's $r < 0.995$
K = ICP Interference - includes ICS % R Noncompliance
L = Instrument Calibration Range Exceedance
M = Sample Preservation Noncompliance
N = Internal Standard Noncompliance
N01 = Internal Standard Recovery Noncompliance Dioxins
N02 = Recovery Standard Noncompliance Dioxins
N03 = Clean-up Standard Noncompliance Dioxins
O = Poor Instrument Performance (i.e., base-time drifting)
P = Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q = Other problems (can encompass a number of issues; i.e.chromatography,interferences, etc.)
R = Surrogates Recovery Noncompliance
S = Pesticide/PCB Resolution
T = % Breakdown Noncompliance for DDT and Endrin
U = RPD between columns/detectors >40% for positive results determined via GC/HPLC
V = Non-linear calibrations; correlation coefficient $r < 0.995$
W = EMPC result
X = Signal to noise response drop
Y = Percent solids <30%
Z = Uncertainty at 2 sigma deviation is less than sample activity
Z1 = Tentatively Identified Compound considered presumptively present
Z2 = Tentatively Identified Compound column bleed

PROJ_NO: 00771	NSAMPLE	S43FB03			S43RB03			S43TB03			S43TW18-1923		
SDG: 1205040	LAB_ID	1205040-28			1205040-27			1205040-29			1205040-24		
FRACTION: OV	SAMP_DATE	5/6/2012			5/6/2012			5/4/2012			5/5/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2,2-TETRACHLOROETHANE		1.58			0.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2,3-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2,4-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DIBROMOETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,3-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,4-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,4-DIOXANE		10	UR	C	10	UR	C	10	UR	C	10	UR	C
2-BUTANONE		5	U		5.29	J	P	5.18	J	P	5	U	
2-HEXANONE		2.5	U		2.5	U		2.5	U		2.5	U	
4-METHYL-2-PENTANONE		2.5	U		2.5	U		2.5	U		2.5	U	
ACETONE		3.45	J	P	6.63	J	P	6.89	J	P	5	U	
BENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
BROMODICHLOROMETHANE		1.36			0.5	U		0.5	U		0.5	U	
BROMOFORM		0.5	U		0.5	U		0.5	U		0.5	U	
BROMOMETHANE		1	U		1	U		1	U		1	U	
CARBON DISULFIDE		0.5	U		0.5	U		0.5	U		0.5	U	
CARBON TETRACHLORIDE		0.47	J	CP	0.5	U		0.5	U		0.5	U	
CHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLORODIBROMOMETHANE		1.42			0.5	U		0.5	U		0.5	U	
CHLOROETHANE		1	U		1	U		1	U		1	U	
CHLOROFORM		3.63			0.5	U		0.5	U		0.5	U	
CHLOROMETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
CIS-1,2-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
CYCLOHEXANE		0.5	U		0.5	U		0.5	U		0.5	U	
DICHLORODIFLUOROMETHANE		1	U		1	U		1	U		1	U	
ETHYLBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43TW18-3034			S43TW19-2024			S43TW22-1014			S43TW22-3337		
SDG: 1205040	LAB_ID	1205040-23			1205040-01			1205040-02			1205040-03		
FRACTION: OV	SAMP_DATE	5/5/2012			5/4/2012			5/4/2012			5/4/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U		1	U	
1,1,2,2-TETRACHLOROETHANE		0.5	U		0.5	U		0.5	U		1	U	
1,1,2-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U		1	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		0.5	U		0.5	U		0.5	U		1	U	
1,1-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		1	U	
1,1-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		1.7	J	P
1,2,3-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U		1	U	
1,2,4-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U		1	U	
1,2-DIBROMO-3-CHLOROPROPANE		0.5	U		0.5	U		0.5	U		1	U	
1,2-DIBROMOETHANE		0.5	U		0.5	U		0.5	U		1	U	
1,2-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U		1	U	
1,2-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		1	U	
1,2-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U		1	U	
1,3-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U		1	U	
1,4-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U		1	U	
1,4-DIOXANE		10	UR	C	10	UR	C	10	UR	C	20	UR	C
2-BUTANONE		5	U		5	U		5	U		10	U	
2-HEXANONE		2.5	U		2.5	U		2.5	U		5	U	
4-METHYL-2-PENTANONE		2.5	U		2.5	U		2.5	U		5	U	
ACETONE		5	U		5	U		5	U		10	U	
BENZENE		0.5	U		0.5	U		0.5	U		1	U	
BROMODICHLOROMETHANE		0.5	U		0.5	U		0.5	U		1	U	
BROMOFORM		0.5	U		0.5	U		0.5	U		1	U	
BROMOMETHANE		1	U		1	U		1	U		2	U	
CARBON DISULFIDE		0.5	U		0.29	J	P	0.5	U		0.88	J	P
CARBON TETRACHLORIDE		0.5	U		0.5	U		0.5	U		1	U	
CHLOROBENZENE		0.5	U		0.5	U		0.5	U		1	U	
CHLORODIBROMOMETHANE		0.5	U		0.5	U		0.5	U		1	U	
CHLOROETHANE		1	U		1	U		1	U		2	U	
CHLOROFORM		0.5	U		0.5	U		0.37	J	P	1	U	
CHLOROMETHANE		0.43	J	CP	0.5	U		0.5	U		1	U	
CIS-1,2-DICHLOROETHENE		0.5	U		0.5	U		0.64	J	P	170		
CYCLOHEXANE		0.5	U		0.5	U		0.5	U		1	U	
DICHLORODIFLUOROMETHANE		1	U		1	U		1	U		2	U	
ETHYLBENZENE		0.5	U		0.5	U		0.5	U		1	U	

PROJ_NO: 00771	NSAMPLE	S43TW24-2327			S43TW24-3236			S43TW25-1115			S43TW25-2933		
SDG: 1205040	LAB_ID	1205040-05			1205040-04			1205040-18			1205040-19		
FRACTION: OV	SAMP_DATE	5/4/2012			5/4/2012			5/5/2012			5/5/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2,2-TETRACHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2,3-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2,4-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DIBROMOETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,3-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,4-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,4-DIOXANE		10	UR	C	10	UR	C	10	UR	C	10	UR	C
2-BUTANONE		5	U		5	U		5	U		5	U	
2-HEXANONE		2.5	U		2.5	U		2.5	U		2.5	U	
4-METHYL-2-PENTANONE		2.5	U		2.5	U		2.5	U		2.5	U	
ACETONE		3.97	B	B	12.5	B	B	2.5	B	B	11.6	B	B
BENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
BROMODICHLOROMETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
BROMOFORM		0.5	U		0.5	U		0.5	U		0.5	U	
BROMOMETHANE		1	U		1	U		1	U		1	U	
CARBON DISULFIDE		0.31	J	P	0.39	J	P	0.5	U		0.77	J	P
CARBON TETRACHLORIDE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLORODIBROMOMETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROETHANE		1	U		1	U		1	U		1	U	
CHLOROFORM		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROMETHANE		0.5	U		0.5	J	CP	0.5	U		0.65	J	CP
CIS-1,2-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
CYCLOHEXANE		0.5	U		0.5	U		0.5	U		0.5	U	
DICHLORODIFLUOROMETHANE		1	U		1	U		1	U		1	U	
ETHYLBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43TW26-1014			S43TW26-3236			S43TW27-2933			S43TW28-1721		
SDG: 1205040	LAB_ID	1205040-17			1205040-16			1205040-15			1205040-07		
FRACTION: OV	SAMP_DATE	5/5/2012			5/5/2012			5/4/2012			5/4/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2,2-TETRACHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.43	J	P
1,2,3-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2,4-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DIBROMOETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,3-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,4-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,4-DIOXANE		10	UR	C	10	UR	C	10	UR	C	10	UR	C
2-BUTANONE		5	U		5	U		5	U		5	U	
2-HEXANONE		2.5	U		2.5	U		2.5	U		2.5	U	
4-METHYL-2-PENTANONE		2.5	U		2.5	U		2.5	U		2.5	U	
ACETONE		3.31	B	B	19.8	B	B	2.93	B	B	5	U	
BENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
BROMODICHLOROMETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
BROMOFORM		0.5	U		0.5	U		0.5	U		0.5	U	
BROMOMETHANE		1	U		1	U		1	U		1	U	
CARBON DISULFIDE		0.25	J	P	0.5	U		0.5	U		0.26	J	P
CARBON TETRACHLORIDE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLORODIBROMOMETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROETHANE		1	U		1	U		1	U		1	U	
CHLOROFORM		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROMETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
CIS-1,2-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		120		
CYCLOHEXANE		0.5	U		0.5	U		0.5	U		0.5	U	
DICHLORODIFLUOROMETHANE		1	U		1	U		1	U		1	U	
ETHYLBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43TW28-2933			S43TW28-2933D			S43TW29-2226			S43TW30-1317		
SDG: 1205040	LAB_ID	1205040-06			1205040-22			1205040-14			1205040-13		
FRACTION: OV	SAMP_DATE	5/4/2012			5/4/2012			5/6/2012			5/6/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF				S43TW28-2933								
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2,2-TETRACHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2,3-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2,4-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DIBROMOETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,3-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,4-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,4-DIOXANE		10	UR	C	10	UR	C	10	UR	C	10	UR	C
2-BUTANONE		5	U		5	U		5	U		5	U	
2-HEXANONE		2.5	U		2.5	U		2.5	U		2.5	U	
4-METHYL-2-PENTANONE		2.5	U		2.5	U		2.5	U		2.5	U	
ACETONE		5	U		5	U		11.4	B	B	5	U	
BENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
BROMODICHLOROMETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
BROMOFORM		0.5	U		0.5	U		0.5	U		0.5	U	
BROMOMETHANE		1	U		1	U		1	U		1	U	
CARBON DISULFIDE		0.38	J	P	0.5	U		0.5	U		0.5	U	
CARBON TETRACHLORIDE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLORODIBROMOMETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROETHANE		1	U		1	U		1	U		1	U	
CHLOROFORM		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROMETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
CIS-1,2-DICHLOROETHENE		0.5	U		0.5	U		0.32	J	P	0.5	U	
CYCLOHEXANE		0.5	U		0.5	U		0.5	U		0.5	U	
DICHLORODIFLUOROMETHANE		1	U		1	U		1	U		1	U	
ETHYLBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43TW30-1317D			S43TW30-2226			S43TW30-3236			S43TW31-1014		
SDG: 1205040	LAB_ID	1205040-26			1205040-12			1205040-11			1205040-09		
FRACTION: OV	SAMP_DATE	5/6/2012			5/6/2012			5/6/2012			5/6/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF	S43TW30-1317											
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2,2-TETRACHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1-DICHLOROETHENE		0.5	U		0.29	J	P	0.52	J	P	0.5	U	
1,2,3-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2,4-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DIBROMOETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,3-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,4-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,4-DIOXANE		10	UR	C	10	UR	C	10	UR	C	10	UR	C
2-BUTANONE		5	U		5	U		5	U		5	U	
2-HEXANONE		2.5	U		2.5	U		2.5	U		2.5	U	
4-METHYL-2-PENTANONE		2.5	U		2.5	U		2.5	U		2.5	U	
ACETONE		5	U		4.09	B	B	5	U		5	U	
BENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
BROMODICHLOROMETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
BROMOFORM		0.5	U		0.5	U		0.5	U		0.5	U	
BROMOMETHANE		1	U		1	U		1	U		1	U	
CARBON DISULFIDE		0.26	J	P	0.5	U		0.32	J	P	0.5	U	
CARBON TETRACHLORIDE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLORODIBROMOMETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROETHANE		1	U		1	U		1	U		1	U	
CHLOROFORM		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROMETHANE		1.24	J	C	0.5	U		0.36	J	CP	0.5	U	
CIS-1,2-DICHLOROETHENE		0.5	U		25.9			66.8			0.5	U	
CYCLOHEXANE		0.5	U		0.5	U		0.5	U		0.5	U	
DICHLORODIFLUOROMETHANE		1	U		1	U		1	U		1	U	
ETHYLBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43TW31-2226			S43TW31-3236			S43TW32-2226			S43TW32-2226D		
SDG: 1205040	LAB_ID	1205040-08			1205040-10			1205040-21			1205040-25		
FRACTION: OV	SAMP_DATE	5/6/2012			5/6/2012			5/6/2012			5/6/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF										S43TW32-2226		
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2,2-TETRACHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2,3-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2,4-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DIBROMOETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,3-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,4-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,4-DIOXANE		10	UR	C	10	UR	C	10	UR	C	10	UR	C
2-BUTANONE		5	U		5	U		5	U		5	U	
2-HEXANONE		2.5	U		2.5	U		2.5	U		2.5	U	
4-METHYL-2-PENTANONE		2.5	U		2.5	U		2.5	U		2.5	U	
ACETONE		5	U		12.5	B	B	5	U		5	U	
BENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
BROMODICHLOROMETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
BROMOFORM		0.5	U		0.5	U		0.5	U		0.5	U	
BROMOMETHANE		1	U		1	U		1	U		1	U	
CARBON DISULFIDE		0.5	U		0.47	J	P	0.5	U		0.5	U	
CARBON TETRACHLORIDE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLORODIBROMOMETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROETHANE		1	U		1	U		1	U		1	U	
CHLOROFORM		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROMETHANE		0.5	U		0.5	U		0.75	J	CP	0.86	J	CP
CIS-1,2-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
CYCLOHEXANE		0.5	U		0.5	U		0.5	U		0.5	U	
DICHLORODIFLUOROMETHANE		1	U		1	U		1	U		1	U	
ETHYLBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43TW32-3236
SDG: 1205040	LAB_ID	1205040-20
FRACTION: OV	SAMP_DATE	5/6/2012
MEDIA: WATER	QC_TYPE	NM
	UNITS	UG/L
	PCT_SOLIDS	0.0
	DUP_OF	

PARAMETER	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE	0.5	U	
1,1,2,2-TETRACHLOROETHANE	0.5	U	
1,1,2-TRICHLOROETHANE	0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE	0.5	U	
1,1-DICHLOROETHANE	0.5	U	
1,1-DICHLOROETHENE	0.5	U	
1,2,3-TRICHLOROBENZENE	0.5	U	
1,2,4-TRICHLOROBENZENE	0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE	0.5	U	
1,2-DIBROMOETHANE	0.5	U	
1,2-DICHLOROBENZENE	0.5	U	
1,2-DICHLOROETHANE	0.5	U	
1,2-DICHLOROPROPANE	0.5	U	
1,3-DICHLOROPROPANE	0.5	U	
1,4-DICHLOROBENZENE	0.5	U	
1,4-DIOXANE	10	UR	C
2-BUTANONE	5	U	
2-HEXANONE	2.5	U	
4-METHYL-2-PENTANONE	2.5	U	
ACETONE	5	U	
BENZENE	0.5	U	
BROMODICHLOROMETHANE	0.5	U	
BROMOFORM	0.5	U	
BROMOMETHANE	1	U	
CARBON DISULFIDE	0.5	U	
CARBON TETRACHLORIDE	0.5	U	
CHLOROBENZENE	0.5	U	
CHLORODIBROMOMETHANE	0.5	U	
CHLOROETHANE	1	U	
CHLOROFORM	0.5	U	
CHLOROMETHANE	1.04	J	C
CIS-1,2-DICHLOROETHENE	0.5	U	
CYCLOHEXANE	0.5	U	
DICHLORODIFLUOROMETHANE	1	U	
ETHYLBENZENE	0.5	U	

PROJ_NO: 00771	NSAMPLE	S43FB03			S43RB03			S43TB03			S43TW18-1923		
SDG: 1205040	LAB_ID	1205040-28			1205040-27			1205040-29			1205040-24		
FRACTION: OV	SAMP_DATE	5/6/2012			5/6/2012			5/4/2012			5/5/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
METHYL ACETATE		1	U		1	U		1	U		1	U	
METHYL TERT-BUTYL ETHER		0.5	U		0.5	U		0.5	U		0.5	U	
METHYLENE CHLORIDE		1	U		0.59	J	P	0.61	J	P	1	U	
STYRENE		0.5	U		0.5	U		0.5	U		0.5	U	
TETRACHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
TOLUENE		0.5	U		0.5	U		0.5	U		0.5	U	
TOTAL XYLENES		1	U		1	U		1	U		1	U	
TRANS-1,2-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
TRICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
TRICHLOROFLUOROMETHANE		1	U		1	U		1	U		1	U	
VINYL CHLORIDE		0.5	U		0.5	U		0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43TW18-3034			S43TW19-2024			S43TW22-1014			S43TW22-3337		
SDG: 1205040	LAB_ID	1205040-23			1205040-01			1205040-02			1205040-03		
FRACTION: OV	SAMP_DATE	5/5/2012			5/4/2012			5/4/2012			5/4/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		0.5	U		0.5	U		0.5	U		1	U	
METHYL ACETATE		1	U		1	U		1	U		2	U	
METHYL TERT-BUTYL ETHER		0.5	U		0.5	U		0.5	U		1	U	
METHYLENE CHLORIDE		1	U		1	U		1	U		2	U	
STYRENE		0.5	U		0.5	U		0.5	U		1	U	
TETRACHLOROETHENE		0.5	U		0.5	U		0.5	U		1	U	
TOLUENE		0.5	U		0.5	U		0.5	U		1	U	
TOTAL XYLENES		1	U		1	U		1	U		2	U	
TRANS-1,2-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.88	J	P
TRICHLOROETHENE		0.5	U		0.5	U		1.64			384		
TRICHLOROFLUOROMETHANE		1	U		1	U		1	U		2	U	
VINYL CHLORIDE		0.5	U		0.5	U		0.5	U		47.2		

PROJ_NO: 00771	NSAMPLE	S43TW24-2327			S43TW24-3236			S43TW25-1115			S43TW25-2933		
SDG: 1205040	LAB_ID	1205040-05			1205040-04			1205040-18			1205040-19		
FRACTION: OV	SAMP_DATE	5/4/2012			5/4/2012			5/5/2012			5/5/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
METHYL ACETATE		1	U		1	U		1	U		1	U	
METHYL TERT-BUTYL ETHER		0.5	U		0.5	U		0.5	U		0.5	U	
METHYLENE CHLORIDE		1	U		0.55	B	B	1	U		1	U	
STYRENE		0.5	U		0.5	U		0.5	U		0.5	U	
TETRACHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
TOLUENE		0.5	U		0.5	U		0.5	U		0.5	U	
TOTAL XYLENES		1	U		1	U		1	U		1	U	
TRANS-1,2-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
TRICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
TRICHLOROFLUOROMETHANE		1	U		1	U		1	U		1	U	
VINYL CHLORIDE		0.5	U		0.5	U		0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43TW26-1014			S43TW26-3236			S43TW27-2933			S43TW28-1721		
SDG: 1205040	LAB_ID	1205040-17			1205040-16			1205040-15			1205040-07		
FRACTION: OV	SAMP_DATE	5/5/2012			5/5/2012			5/4/2012			5/4/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
METHYL ACETATE		1	U		1	U		1	U		1	U	
METHYL TERT-BUTYL ETHER		0.5	U		0.5	U		0.5	U		0.5	U	
METHYLENE CHLORIDE		1	U		0.54	B	B	0.59	B	B	1	U	
STYRENE		0.5	U		0.5	U		0.5	U		0.5	U	
TETRACHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
TOLUENE		0.5	U		0.5	U		0.5	U		0.5	U	
TOTAL XYLENES		1	U		1	U		1	U		1	U	
TRANS-1,2-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.82	J	P
TRICHLOROETHENE		0.5	U		0.5	U		0.5	U		2.52		
TRICHLOROFLUOROMETHANE		1	U		1	U		1	U		1	U	
VINYL CHLORIDE		0.5	U		0.5	U		0.5	U		3.46		

PROJ_NO: 00771	NSAMPLE	S43TW28-2933			S43TW28-2933D			S43TW29-2226			S43TW30-1317		
SDG: 1205040	LAB_ID	1205040-06			1205040-22			1205040-14			1205040-13		
FRACTION: OV	SAMP_DATE	5/4/2012			5/4/2012			5/6/2012			5/6/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF				S43TW28-2933								
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
METHYL ACETATE		1	U		1	U		1	U		1	U	
METHYL TERT-BUTYL ETHER		0.5	U		0.5	U		0.5	U		0.5	U	
METHYLENE CHLORIDE		1	U		1	U		0.55	B	B	1	U	
STYRENE		0.5	U		0.5	U		0.5	U		0.5	U	
TETRACHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
TOLUENE		0.5	U		0.5	U		0.5	U		0.5	U	
TOTAL XYLENES		1	U		1	U		1	U		1	U	
TRANS-1,2-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
TRICHLOROETHENE		0.5	U		0.5	U		1.36			0.5	U	
TRICHLOROFLUOROMETHANE		1	U		1	U		1	U		1	U	
VINYL CHLORIDE		0.5	U		0.5	U		0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43TW30-1317D			S43TW30-2226			S43TW30-3236			S43TW31-1014		
SDG: 1205040	LAB_ID	1205040-26			1205040-12			1205040-11			1205040-09		
FRACTION: OV	SAMP_DATE	5/6/2012			5/6/2012			5/6/2012			5/6/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF	S43TW30-1317											
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
METHYL ACETATE		1	U		1	U		1	U		1	U	
METHYL TERT-BUTYL ETHER		0.5	U		0.5	U		0.5	U		0.5	U	
METHYLENE CHLORIDE		1	U		1	U		1	U		1	U	
STYRENE		0.5	U		0.5	U		0.5	U		0.5	U	
TETRACHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
TOLUENE		0.5	U		0.5	U		0.5	U		0.5	U	
TOTAL XYLENES		1	U		1	U		1	U		1	U	
TRANS-1,2-DICHLOROETHENE		0.5	U		0.5	U		0.57	J	P	0.5	U	
TRICHLOROETHENE		0.5	U		68.5			93.7			0.5	U	
TRICHLOROFLUOROMETHANE		1	U		1	U		1	U		1	U	
VINYL CHLORIDE		0.5	U		2.25			54.5			0.5	U	

PROJ_NO: 00771	NSAMPLE	S43TW31-2226			S43TW31-3236			S43TW32-2226			S43TW32-2226D		
SDG: 1205040	LAB_ID	1205040-08			1205040-10			1205040-21			1205040-25		
FRACTION: OV	SAMP_DATE	5/6/2012			5/6/2012			5/6/2012			5/6/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF										S43TW32-2226		
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
METHYL ACETATE		1	U		1	U		1	U		1	U	
METHYL TERT-BUTYL ETHER		0.5	U		0.5	U		0.5	U		0.5	U	
METHYLENE CHLORIDE		1	U		0.55	B	B	1	U		1	U	
STYRENE		0.5	U		0.5	U		0.5	U		0.5	U	
TETRACHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
TOLUENE		0.5	U		0.5	U		0.5	U		0.5	U	
TOTAL XYLENES		1	U		1	U		1	U		1	U	
TRANS-1,2-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
TRICHLOROETHENE		0.63	J	P	0.5	U		0.5	U		0.5	U	
TRICHLOROFLUOROMETHANE		1	U		1	U		1	U		1	U	
VINYL CHLORIDE		0.5	U		0.5	U		0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43TW32-3236		
SDG: 1205040	LAB_ID	1205040-20		
FRACTION: OV	SAMP_DATE	5/6/2012		
MEDIA: WATER	QC_TYPE	NM		
	UNITS	UG/L		
	PCT_SOLIDS	0.0		
	DUP_OF			
PARAMETER		RESULT	VQL	QLCD
ISOPROPYLBENZENE		0.5	U	
METHYL ACETATE		1	U	
METHYL TERT-BUTYL ETHER		0.5	U	
METHYLENE CHLORIDE		1	U	
STYRENE		0.5	U	
TETRACHLOROETHENE		0.5	U	
TOLUENE		0.5	U	
TOTAL XYLENES		1	U	
TRANS-1,2-DICHLOROETHENE		0.5	U	
TRICHLOROETHENE		0.5	U	
TRICHLOROFLUOROMETHANE		1	U	
VINYL CHLORIDE		0.5	U	

Tetra Tech **INTERNAL CORRESPONDENCE**

TO:	**R. SOK**	**DATE:**	**MAY 30, 2012**
FROM:	**EDWARD SEDLMYER**	**COPIES:**	**DV FILE**
SUBJECT:	**ORGANIC DATA VALIDATION – VOC** **NSF INDIAN HEAD** **SDG 1205097**		
SAMPLES:	12/Aqueous/VOC		

S43TB04-20120511	S43TW29-3236	S43TW33-2226
S43TW33-3236	S43TW34-2226	S43TW34-3236
S43TW34-3236-D	S43TW35-2226	S43TW35-3236
S43TWSA01-3034	S43TWSA02-1418	S43TWSA02-3034

Overview

The sample set for NSF Indian Head, SDG 1205097 consists of eleven (11) aqueous environmental samples and one (1) trip blank (S43TB04-20120511). One (1) field duplicate pair was included in this SDG: S43TW34-3236 / S43TW34-3236-D. Samples were analyzed for target compound list (TCL) volatile organic compounds (VOC).

The samples were collected by Tetra Tech on May 11 and 13, 2012 and analyzed by Empirical Laboratories. All analyses were conducted in accordance with SW-846 Method 8260B analytical and reporting protocols.

The data contained in this SDG were validated with regard to the following parameters: data completeness, holding times, GC/MS tuning, initial/continuing calibrations, laboratory method blank results, surrogate spike recoveries, blank spike/blank spike duplicate results, field duplicate results, internal standard recoveries, chromatographic resolution, compound identification, compound quantitation, and detection limits. Areas of concern are listed below.

Major

- The volatile initial and continuing calibrations of instruments MS-VOA5 and MS-VOA6 had relative response factors (RRFs) less than the 0.05 quality control limit for 1,4-dioxane. The nondetected results for 1,4-dioxane in all samples were rejected (UR).

Minor

- Positive results between the method detection limit (MDL) and the limit of quantitation (LOQ) were qualified as estimated (J).
- Field duplicate imprecision was noted for vinyl chloride in the field duplicate pair S43TW34-3236 / S43TW34-3236-D. The positive vinyl chloride results have been qualified (J) in the field duplicate pair.

Notes

The volatile continuing calibration percent difference (%D) for dichlorodifluoromethane was greater than 20% but less than 50% on instrument MS-VOA5 on 05/16/12 @02:09. No action was taken on this basis because all dichlorodifluoromethane results were nondetected.

The volatile continuing calibration %Ds for bromomethane, carbon tetrachloride, and chloromethane were greater than 20% but less than 50% on instrument MS-VOA6 on 05/15/12 @09:31. No action was taken on this basis because all bromomethane, carbon tetrachloride, and chloromethane results were nondetected.

Sample S43TW33-2226 was analyzed at a 10 times dilution because concentrations of cis-1,2-dichloroethene, trichloroethene, and vinyl chloride were greater than the linear calibration range of the instrument. This accounts for the elevated detection limits for the nondetected results.

Sample S43TWSA02-3034 was analyzed at a 10 times dilution because a concentration of trichloroethene was greater than the linear calibration range of the instrument. This accounts for the elevated detection limits for the nondetected results.

Laboratory results were reported to the limit of detection (LOD).

Executive Summary

Laboratory Performance: Initial and continuing calibration RRF noncompliances resulted in the rejection of all 1,4-dioxane results.

Other Factors Affecting Data Quality: Field duplicate precision noncompliance resulted in the qualification of data. Positive results between the method detection limit (MDL) and the limit of quantitation (LOQ) were qualified as estimated (J).

The data for these analyses were reviewed with reference to Region III modifications to U.S. EPA National Functional Guidelines for Organic Data Validation (Sept. 1994) and Department of Defense (DoD) document entitled "Quality Systems Manual (QSM) for Environmental Laboratories" (April 2009). The text of this report has been formulated to address only those problem areas affecting data quality.

For Tetra Tech
Edward Sedlmyer
Chemist/Data Validator

Tetra Tech
Joseph A. Samchuck
Quality Assurance Officer

Attachments:
Appendix A – Qualified Analytical Results
Appendix B – Results as Reported by the Laboratory
Appendix C – Support Documentation

Appendix A

Qualified Analytical Results

Qualifier Codes:

A = Lab Blank Contamination
B = Field Blank Contamination
C = Calibration Noncompliance (i.e., % RSDs, %Ds, ICVs, CCVs, RRFs, etc.)
C01 = GC/MS Tuning Noncompliance
D = MS/MSD Recovery Noncompliance
E = LCS/LCSD Recovery Noncompliance
F = Lab Duplicate Imprecision
G = Field Duplicate Imprecision
H = Holding Time Exceedance
I = ICP Serial Dilution Noncompliance
J = ICP PDS Recovery Noncompliance; MSA's $r < 0.995$
K = ICP Interference - includes ICS % R Noncompliance
L = Instrument Calibration Range Exceedance
M = Sample Preservation Noncompliance
N = Internal Standard Noncompliance
N01 = Internal Standard Recovery Noncompliance Dioxins
N02 = Recovery Standard Noncompliance Dioxins
N03 = Clean-up Standard Noncompliance Dioxins
O = Poor Instrument Performance (i.e., base-time drifting)
P = Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q = Other problems (can encompass a number of issues; i.e.chromatography,interferences, etc.)
R = Surrogates Recovery Noncompliance
S = Pesticide/PCB Resolution
T = % Breakdown Noncompliance for DDT and Endrin
U = RPD between columns/detectors >40% for positive results determined via GC/HPLC
V = Non-linear calibrations; correlation coefficient $r < 0.995$
W = EMPC result
X = Signal to noise response drop
Y = Percent solids <30%
Z = Uncertainty at 2 sigma deviation is less than sample activity
Z1 = Tentatively Identified Compound considered presumptively present
Z2 = Tentatively Identified Compound column bleed

PROJ_NO: 00771	NSAMPLE	S43TB04-20120511			S43TW29-3236			S43TW33-2226			S43TW33-3236		
SDG: 1205097	LAB_ID	1205097-01			1205097-07			1205097-11			1205097-10		
FRACTION: OV	SAMP_DATE	5/11/2012			5/11/2012			5/11/2012			5/11/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		0.5	U		0.5	U		5	U		0.5	U	
1,1,2,2-TETRACHLOROETHANE		0.5	U		0.5	U		5	U		0.5	U	
1,1,2-TRICHLOROETHANE		0.5	U		0.5	U		5	U		0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		0.5	U		0.5	U		5	U		0.5	U	
1,1-DICHLOROETHANE		0.5	U		0.5	U		5	U		0.5	U	
1,1-DICHLOROETHENE		0.5	U		0.5	U		5.8	J	P	0.5	U	
1,2,3-TRICHLOROBENZENE		0.5	U		0.5	U		5	U		0.5	U	
1,2,4-TRICHLOROBENZENE		0.5	U		0.5	U		5	U		0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE		0.5	U		0.5	U		5	U		0.5	U	
1,2-DIBROMOETHANE		0.5	U		0.5	U		5	U		0.5	U	
1,2-DICHLOROBENZENE		0.5	U		0.5	U		5	U		0.5	U	
1,2-DICHLOROETHANE		0.5	U		0.5	U		5	U		0.5	U	
1,2-DICHLOROPROPANE		0.5	U		0.5	U		5	U		0.5	U	
1,3-DICHLOROPROPANE		0.5	U		0.5	U		5	U		0.5	U	
1,4-DICHLOROBENZENE		0.5	U		0.5	U		5	U		0.5	U	
1,4-DIOXANE		10	UR	C	10	UR	C	100	UR	C	10	UR	C
2-BUTANONE		5	U		5	U		50	U		5	U	
2-HEXANONE		2.5	U		2.5	U		25	U		2.5	U	
4-METHYL-2-PENTANONE		2.5	U		2.5	U		25	U		2.5	U	
ACETONE		5	U		7.81	J	P	50	U		5	U	
BENZENE		0.5	U		0.5	U		5	U		0.5	U	
BROMODICHLOROMETHANE		0.5	U		0.5	U		5	U		0.5	U	
BROMOFORM		0.5	U		0.5	U		5	U		0.5	U	
BROMOMETHANE		1	U		1	U		10	U		1	U	
CARBON DISULFIDE		0.5	U		0.72	J	P	5	U		0.75	J	P
CARBON TETRACHLORIDE		0.5	U		0.5	U		5	U		0.5	U	
CHLOROBENZENE		0.5	U		0.5	U		5	U		0.5	U	
CHLORODIBROMOMETHANE		0.5	U		0.5	U		5	U		0.5	U	
CHLOROETHANE		1	U		1	U		10	U		1	U	
CHLOROFORM		0.5	U		0.5	U		5	U		0.5	U	
CHLOROMETHANE		0.5	U		0.5	U		5	U		0.5	U	
CIS-1,2-DICHLOROETHENE		0.5	U		10.5			164			5.8		
CYCLOHEXANE		0.5	U		0.5	U		5	U		0.5	U	
DICHLORODIFLUOROMETHANE		1	U		1	U		10	U		1	U	
ETHYLBENZENE		0.5	U		0.5	U		5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43TW34-2226			S43TW34-3236			S43TW34-3236-D			S43TW35-2226		
SDG: 1205097	LAB_ID	1205097-04			1205097-02			1205097-03			1205097-06		
FRACTION: OV	SAMP_DATE	5/11/2012			5/11/2012			5/11/2012			5/11/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF							S43TW34-3236					
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2,2-TETRACHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1-DICHLOROETHENE		0.5	U		0.25	J	P	0.28	J	P	0.5	U	
1,2,3-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2,4-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DIBROMOETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,3-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,4-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,4-DIOXANE		10	UR	C	10	UR	C	10	UR	C	10	UR	C
2-BUTANONE		5	U		5	U		5	U		5	U	
2-HEXANONE		2.5	U		2.5	U		2.5	U		2.5	U	
4-METHYL-2-PENTANONE		2.5	U		2.5	U		2.5	U		2.5	U	
ACETONE		5	U		5	U		5	U		5	U	
BENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
BROMODICHLOROMETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
BROMOFORM		0.5	U		0.5	U		0.5	U		0.5	U	
BROMOMETHANE		1	U		1	U		1	U		1	U	
CARBON DISULFIDE		0.5	U		0.5	U		0.5	U		0.5	U	
CARBON TETRACHLORIDE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLORODIBROMOMETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROETHANE		1	U		1	U		1	U		1	U	
CHLOROFORM		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROMETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
CIS-1,2-DICHLOROETHENE		1.8			23.9			25			0.3	J	P
CYCLOHEXANE		0.5	U		0.5	U		0.5	U		0.5	U	
DICHLORODIFLUOROMETHANE		1	U		1	U		1	U		1	U	
ETHYLBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43TW35-3236			S43TWSA01-3034			S43TWSA02-1418			S43TWSA02-3034		
SDG: 1205097	LAB_ID	1205097-05			1205097-12			1205097-09			1205097-08		
FRACTION: OV	SAMP_DATE	5/11/2012			5/13/2012			5/11/2012			5/11/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U		5	U	
1,1,2,2-TETRACHLOROETHANE		0.5	U		0.5	U		0.5	U		5	U	
1,1,2-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U		5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		0.5	U		0.5	U		0.5	U		5	U	
1,1-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		5	U	
1,1-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		5	U	
1,2,3-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U		5	U	
1,2,4-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U		5	U	
1,2-DIBROMO-3-CHLOROPROPANE		0.5	U		0.5	U		0.5	U		5	U	
1,2-DIBROMOETHANE		0.5	U		0.5	U		0.5	U		5	U	
1,2-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U		5	U	
1,2-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		5	U	
1,2-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U		5	U	
1,3-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U		5	U	
1,4-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U		5	U	
1,4-DIOXANE		10	UR	C	10	UR	C	10	UR	C	100	UR	C
2-BUTANONE		5	U		5	U		5	U		50	U	
2-HEXANONE		2.5	U		2.5	U		2.5	U		25	U	
4-METHYL-2-PENTANONE		2.5	U		2.5	U		2.5	U		25	U	
ACETONE		2.95	J	P	5	U		5	U		50	U	
BENZENE		0.5	U		0.5	U		0.5	U		5	U	
BROMODICHLOROMETHANE		0.5	U		0.5	U		0.5	U		5	U	
BROMOFORM		0.5	U		0.5	U		0.5	U		5	U	
BROMOMETHANE		1	U		1	U		1	U		10	U	
CARBON DISULFIDE		0.42	J	P	0.5	U		0.5	U		5	U	
CARBON TETRACHLORIDE		0.5	U		0.5	U		0.5	U		5	U	
CHLOROBENZENE		0.5	U		0.5	U		0.5	U		5	U	
CHLORODIBROMOMETHANE		0.5	U		0.5	U		0.5	U		5	U	
CHLOROETHANE		1	U		1	U		1	U		10	U	
CHLOROFORM		0.5	U		0.5	U		0.5	U		5	U	
CHLOROMETHANE		0.5	U		0.5	U		0.5	U		5	U	
CIS-1,2-DICHLOROETHENE		3.35			0.46	J	P	4.8			62.6		
CYCLOHEXANE		0.5	U		0.5	U		0.5	U		5	U	
DICHLORODIFLUOROMETHANE		1	U		1	U		1	U		10	U	
ETHYLBENZENE		0.5	U		0.5	U		0.5	U		5	U	

PROJ_NO: 00771	NSAMPLE	S43TB04-20120511			S43TW29-3236			S43TW33-2226			S43TW33-3236		
SDG: 1205097	LAB_ID	1205097-01			1205097-07			1205097-11			1205097-10		
FRACTION: OV	SAMP_DATE	5/11/2012			5/11/2012			5/11/2012			5/11/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		0.5	U		0.5	U		5	U		0.5	U	
METHYL ACETATE		1	U		1	U		10	U		1	U	
METHYL TERT-BUTYL ETHER		0.5	U		0.5	U		5	U		0.5	U	
METHYLENE CHLORIDE		1	U		1	U		10	U		1	U	
STYRENE		0.5	U		0.5	U		5	U		0.5	U	
TETRACHLOROETHENE		0.5	U		0.5	U		5	U		0.5	U	
TOLUENE		0.5	U		0.5	U		5	U		0.5	U	
TOTAL XYLENES		1	U		1	U		10	U		1	U	
TRANS-1,2-DICHLOROETHENE		0.5	U		0.67	J	P	5	U		0.29	J	P
TRICHLOROETHENE		0.5	U		23.7			1270			5.81		
TRICHLOROFLUOROMETHANE		1	U		1	U		10	U		1	U	
VINYL CHLORIDE		0.5	U		0.49	J	P	39.1			4.02		

PROJ_NO: 00771	NSAMPLE	S43TW34-2226			S43TW34-3236			S43TW34-3236-D			S43TW35-2226		
SDG: 1205097	LAB_ID	1205097-04			1205097-02			1205097-03			1205097-06		
FRACTION: OV	SAMP_DATE	5/11/2012			5/11/2012			5/11/2012			5/11/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF							S43TW34-3236					
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
METHYL ACETATE		1	U		1	U		1	U		1	U	
METHYL TERT-BUTYL ETHER		0.5	U		0.5	U		0.5	U		0.5	U	
METHYLENE CHLORIDE		1	U		1	U		1	U		1	U	
STYRENE		0.5	U		0.5	U		0.5	U		0.5	U	
TETRACHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
TOLUENE		0.5	U		0.5	U		0.5	U		0.5	U	
TOTAL XYLENES		1	U		1	U		1	U		1	U	
TRANS-1,2-DICHLOROETHENE		0.5	U		0.5	U		0.29	J	P	0.5	U	
TRICHLOROETHENE		8.98			80.6			78.7			1.48		
TRICHLOROFLUOROMETHANE		1	U		1	U		1	U		1	U	
VINYL CHLORIDE		0.5	U		8.01	J	G	11	J	G	0.5	U	

PROJ_NO: 00771	NSAMPLE	S43TW35-3236			S43TWSA01-3034			S43TWSA02-1418			S43TWSA02-3034		
SDG: 1205097	LAB_ID	1205097-05			1205097-12			1205097-09			1205097-08		
FRACTION: OV	SAMP_DATE	5/11/2012			5/13/2012			5/11/2012			5/11/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		0.5	U		0.5	U		0.5	U		5	U	
METHYL ACETATE		1	U		1	U		1	U		10	U	
METHYL TERT-BUTYL ETHER		0.5	U		0.5	U		0.5	U		5	U	
METHYLENE CHLORIDE		1	U		1	U		1	U		10	U	
STYRENE		0.5	U		0.5	U		0.5	U		5	U	
TETRACHLOROETHENE		0.5	U		0.5	U		0.5	U		5	U	
TOLUENE		0.5	U		0.5	U		0.5	U		5	U	
TOTAL XYLENES		1	U		1	U		1	U		10	U	
TRANS-1,2-DICHLOROETHENE		0.26	J	P	0.5	U		0.5	U		5	U	
TRICHLOROETHENE		0.52	J	P	15.4			135			1730		
TRICHLOROFLUOROMETHANE		1	U		1	U		1	U		10	U	
VINYL CHLORIDE		0.39	J	P	0.5	U		0.5	U		4.1	J	P

Tetra Tech INC **INTERNAL CORRESPONDENCE**

TO:	**R. SOK**	**DATE:**	**JULY 26, 2012**
FROM:	**J. KALINYAK**	**COPIES:**	**DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – VOC / EXPLOSIVES / NITROGUANIDINE**
NSF INDIAN HEAD, CTO 114
SAMPLE DELIVERY GROUP 1205098

SAMPLES: 14 / Soil / VOC / Explosives / Nitroguanidine

S43SB023-0001	S43SB023-0001-D	S43SB023-0607
S43SB024-0001	S43SB024-0607	S43SB024-0607-D
S43SB025-0001	S43SB025-0607	S43SB026-0001
S43SB026-0506	S43SB027-0001	S43SB027-0708
S43SB028-0001	S43SB028-0405	

2 / Aqueous / VOC / Explosives / Nitroguanidine

S43FB04-20120513 S43RB03-20120513

OVERVIEW

The sample set for NSF Indian Head, CTO 114, SDG 1205098, consisted of fourteen (14) soil samples and two (2) aqueous samples consisting of one (1) aqueous field blank sample and one (1) aqueous rinse blank sample. The samples were analyzed for volatile organic compounds (VOC) and explosives, including nitroguanidine, as listed above. Two (2) field duplicate sample pairs were contained within this sample delivery group (SDG): S43SB023-0001-D / S43SB023-0001 and S43SB024-0607-D / S43SB024-0607.

The samples were collected by Tetra Tech on May 11 and 13, 2012 and analyzed by Empirical Laboratory LLC. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using EPA SW-846 Methods 8260B for VOCs, 8330B for explosives, and 8330A/IAAP for nitroguanidine, analysis and reporting protocols.

The data contained in this SDG were validated with regard to the following parameters: data completeness, hold times, GC/MS tuning, initial/continuing calibrations, laboratory method blank results, surrogate spike recoveries, blank spike results, matrix spike/matrix spike duplicate results, internal standard recoveries, field duplicate results, chromatographic resolution, compound identification, compound quantitation, and detection limits. Areas of concern are listed below.

MAJOR

- The relative response factor (RRF) was less than the 0.05 quality control limit for the VOC 1,4-dioxane for the initial calibration on instrument MS-VOA6 on 04/27/12 and instrument MS-VOA4 on 01/13/12 and for all the continuing calibration verifications (CCV) for both instrument MS-VOA6 and MS-VOA4 affecting all samples. All samples had non-detected results for 1,4-dioxane which were qualified rejected, (UR).

MINOR

- Positive results reported below the quantitation limit but above the method detection limit were qualified as estimated, (J).

- The common laboratory VOC contaminants were detected in the method blank, a field blank sample, and a rinse blank sample at the following concentrations.

Analyte	Maximum Conc.	Action Level
Methylene chloride (1)	2.78 µg/kg	27.80 µg/kg
Acetone (2)	7.91 µg/l	79.10 µg/kg
2-Butanone (3)	6.01 µg/l	60.10 µg/kg

(1) Method blank for batch 2E17015 affecting samples S43SB026-0001 and S43SB028-0405.
(2) Rinse blank S43RB03-20120513 affecting all samples.
(3) Field blank S43FB04-20120513 affecting all samples.

An action level of 10X the maximum concentration for the common laboratory contaminants was established to evaluate the sample for blank contamination. Sample aliquot, percent solids, and dilution factors, if applicable, were taken into account when applying the action level. Sample acetone results less than the action level were qualified, (B), due to method blank contamination. Field blank and rinse blank samples were not qualified for the method blank, rinse blank, and field blank contamination.

- Acetone and methylene chloride laboratory contamination were suspected for sample S43SB023-0607 VOC analyte results. The sample S43SB023-0607 positive acetone and methylene chloride results were qualified estimated, (J).

- The matrix spike (MS) and MS duplicate (MSD) percent recoveries (%R) were less than the quality control limit and the MS/MSD relative percent differences (RPD) were greater than the quality control limit for analytes as listed below for spiked sample S43SB028-0405 .

Analytes	**MS %R**	**MSD %R**	**RPD**
Acetone	----	----	45.8
Bromoform	----	----	34.3
2-Butanone	----	----	37.9
Chlorobenzene	64.3	61.5	----
Cyclohexane	61.9	----	----
Dibromochloromethane	----	62.5	33.8
1,2-Dibromomethane	67.3	57.2	34.2
1,2-Dichlorobenzene	53.2	55.6	----
1,4-Dichlorobenzene	52.6	52.5	----
1,3-Dichloropropane	65.3	57.6	30.7
Ethylbenzene	68.0	64.0	----
2-Hexanone	----	40.0	50.8
Isopropylbenzene	61.3	58.7	----
Methyl acetate	----	39.3	35.3
4-Methyl-2-pentanone	----	----	37.2
Styrene	63.5	59.1	----
1,1,2,2-Tetrachloroethane	----	51.2	----
Toluene	66.9	64.3	----
1,2,3-Trichlorobenzene	40.6	43.9	----
1,2,4-Trichlorobenzene	40.3	43.2	----
1,1,2-Trichloroethane	----	58.2	----
Total xylenes	69.3	66.3	----

Action: The sample non-detected chlorobenzene, 1,2-dibromomethane, 1,2-dichlorobenzene, 1,4-dichlorobenzene, 1,3-dichloropropane, ethylbenzene, isopropylbenzene, styrene, toluene, 1,2,3-trichlorobenzene, 1,2,4-trichlorobenzne, and total xylene results were qualified estimated,

(UJ). Only sample analytes with both the MS and MSD %R non-compliances were qualified.

- The explosives and nitroguanidine analysis relative percent differences (RPD) between the two analytical column results were greater than the 40% quality control limit for some sample positive explosives results. The positive explosives results for these samples were qualified estimated, (J). The positive results from the HPLC1 columns were reported. The laboratory indicated matrix interferences for sample explosive and nitroguanidine results which had RPDs for the two column results greater than 100%. These sample results were also qualified estimated, (J), for the matrix interference. The table below lists the samples and analytes qualified as well as the results for both analytical columns.

Sample	Analyte	Ultra C-18	Ultra II Aromax	RPD
S43FB04-20120513	2-amino-4,6-dinitrotoluene	0164 µg/l	0.108 µg/l	41%
S43RB03-20120513	3-nitrotoluene	0.234 µg/l	0.760 µg/l	106%
S43SB028-0001	1,3-dinitrobenzene	0.0320 mg/kg	0.0962 mg/kg	100%
	Nitroguanidine	0.426 mg/kg	1.79 mg/kg	123%

NOTES

The following samples were analyzed for VOC analytes at dilutions, as listed below, resulting in elevated detection limits for the non-detected VOC analytes.

Sample	Dilution
S43SB023-0607	1000X
S43SB024-0607	50X
S43SB024-0607-D	50X
S43SB025-0607	50X
S43SB026-0506	50X
S43SB027-0001	50X
S43SB027-0708	50X – No compounds detected
S43SB028-0001	50X

The VOC CCV percent difference (%D) was greater than the 20% and greater than the 50% quality control limit for 1,4-dioxane for instrument MS-VOA4 on 05/17/12 @ 10:18. The affected sample 1,4-dioxane results were qualified rejected for RRF criteria non-compliances and no further validation action was necessary.

The VOC CCV %D was greater than the 20% and less than the 50% quality control limit for 2-butanone, carbon disulfide, 1,4-dichlorobenzene, and 4-methyl-2-pentanone for instrument MS-VOA4 on 05/22/12 @ 08:54.

Affected Samples:

S43SB023-0001	S43SB023-0001-D	S43SB024-0001
S43SB024-0607	S43SB024-0607-D	S43SB025-0001
S43SB025-0607	S43SB026-0506	S43SB027-0001
S43SB027-0708	S43SB028-0001	

Action: The sample 2-butanone, carbon disulfide, 1,4-dichlorobenzene, and 4-methyl-2-pentanone results were non-detected and were not qualified.

The VOC CCV %D was greater than the 20% and less than the 50% quality control limit for carbon disulfide and 1,1,2,2-tetrachloroethane for instrument MS-VOA4 on 05/24/12 @ 09:39.

Affected Sample: S43SB023-0607

Action: The sample carbon disulfide and 1,1,2,2-tetrachloroethane results were non-detected and were not qualified.

The VOC CCV %D was greater than the 20% and less than the 50% quality control limit for bromomethane and carbon tetrachloride for instrument MS-VOA6 on 05/17/12 @ 09:41.

Affected Samples: S43FB04-20120513 and S43RB03-20120513

Action: The sample bromomethane and carbon tetrachloride results were non-detected and were not qualified.

The laboratory explosives contaminants were detected in the method blank, a field blank sample, and a rinse blank sample at the following concentrations.

Analyte	Maximum Conc.	Action Level
3-Nitrotoluene (1)	1.59 µg/l	7.95 µg/l
Tetryl (1)	1.03 µg/l	5.15 µg/l
2,6-Dinitrotoluene (2)	0.19 µg/l	0.95 µg/l
2-Nitrotoluene (2)	0.56 µg/l	2.80 µg/l
Nitrobenzene (2)	0.174 µg/l	0.870 µg/l
2,6-Dinitrotoluene (3)	0.209 µg/l	1.045 µg/l
2-amino-4,6-dinitrotoluene (3)	0.164 µg/l	0.820 µg/l
2-nitrotoluene (3)	0.504 µg/l	2.520 µg/l

(1) Method blank for batch 2E17010 affecting samples S43FB04-20120513 and S43RB03-20120513.
(2) Rinse blank S43RB03-20120513 affecting all samples.
(3) Field blank S43FB04-20120513 affecting all samples.

An action level of 5X the maximum concentration for the laboratory contaminants was established to evaluate the sample for blank contamination. Sample aliquot, percent solids, and dilution factors, if applicable, were taken into account when applying the action level. Field blank and rinse blank samples were not qualified for the method blank, rinse blank, and field blank contamination. No sample results were qualified for explosives blank contamination

The explosives CCV %D was greater than the 20% and less than the 50% quality control limit for 1,3,5-trinitrobenzene for the HPLC2 Ultra II Aromax column on 05/31/12 @ 15:25.

Affected Samples:

S43SB023-0001	S43SB023-0001-D	S43SB023-0607
S43SB024-0001	S43SB024-0607	S43SB024-0607-D
S43SB025-0001	S43SB025-0607	S43SB028-0001
S43SB028-0405		

Action: The sample 1,3,5-trinitrobenzene results were non-detected for all aforementioned samples except sample S43SB028-0001 and were not qualified as the alternate column was compliant. The sample S43SB028-0001 1,3,5-trinitrobenzene result was not qualified as the positive result was reported from the HPLC1 column.

The laboratory control sample (LCS) and LCS duplicate (LCSD) %Rs were greater than the quality control limit for the explosive HMX for batch 2E147010.

Affected samples: S43FB04-20120513 and S43RB03-20120513

Action: The samples HMX results were non-detected and were not qualified.

The nitroguanidine CCVs were greater than the 15% quality control limit for the HPLC2 Ultra IBD column on 06/04/12 @ 10:14 and @ 10:31.

Affected Sample: 43SB028-0001

Action: The positive sample positive nitroguanidine result was reported from the HPLC1 column. Therefore, no validation action was necessary.

The laboratory explosives surrogate standard recovery and retention time summary forms were missing the retention times for the surrogate 1-chloro-3-nitrobenzene for a number of samples, blanks, CCVs, etc. making it appear that there were quality control limit retention time exceedances. The data validation chemist provided the correct retention times from the raw data for the samples to verify that the sample surrogate standard retention times were within the quality control limits.

Non-detected results were reported to the limit of detection (LOD).

All positive explosive and nitroguanidine results were reported from the HPLC1 column.

EXECUTIVE SUMMARY

Laboratory Performance Issues: VOC sample 1,4-dioxane non-detected results were rejected due to RRF non-compliances. Sample acetone results were qualified for field blank sample contamination. Sample VOC results were qualified for MS/MSD %R non-compliances. Sample S43SB023-0607 acetone and methylene positive results were qualified for a suspected laboratory contamination concern.

Other Factors Affecting Data Quality: Positive results reported below the quantitation limit but above the method detection limit were qualified as estimated (J). Sample positive explosive and nitroguanidine results were qualified for analytical column RPD non-compliances.

The data for these analyses were reviewed with reference to the Region III modifications to U.S. EPA National Functional Guidelines for Organic Data Validation (Sept. 1994), USEPA SW-846 Methods 8260B, 8330A, and 8330B, and the Department of Defense (DoD) document entitled "Quality Systems Manual (QSM) for Environmental Laboratories" (April 2009).

Tetra Tech
Joseph Kalinyak
Chemist/Data Validator

Tetra Tech
Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:
Appendix A - Qualified Analytical Results
Appendix B - Results as reported by the Laboratory
Appendix C - Support Documentation

Appendix A

Qualified Analytical Results

Qualifier Codes:

A = Lab Blank Contamination
B = Field Blank Contamination
C = Calibration Noncompliance (i.e., % RSDs, %Ds, ICVs, CCVs, RRFs, etc.)
C01 = GC/MS Tuning Noncompliance
D = MS/MSD Recovery Noncompliance
E = LCS/LCSD Recovery Noncompliance
F = Lab Duplicate Imprecision
G = Field Duplicate Imprecision
H = Holding Time Exceedance
I = ICP Serial Dilution Noncompliance
J = ICP PDS Recovery Noncompliance; MSA's $r < 0.995$
K = ICP Interference - includes ICS % R Noncompliance
L = Instrument Calibration Range Exceedance
M = Sample Preservation Noncompliance
N = Internal Standard Noncompliance
N01 = Internal Standard Recovery Noncompliance Dioxins
N02 = Recovery Standard Noncompliance Dioxins
N03 = Clean-up Standard Noncompliance Dioxins
O = Poor Instrument Performance (i.e., base-time drifting)
P = Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q = Other problems (can encompass a number of issues; i.e.chromatography,interferences, etc.)
R = Surrogates Recovery Noncompliance
S = Pesticide/PCB Resolution
T = % Breakdown Noncompliance for DDT and Endrin
U = RPD between columns/detectors >40% for positive results determined via GC/HPLC
V = Non-linear calibrations; correlation coefficient $r < 0.995$
W = EMPC result
X = Signal to noise response drop
Y = Percent solids <30%
Z = Uncertainty at 2 standard deviations is greater than sample activity
Z1 = Tentatively Identified Compound considered presumptively present
Z2 = Tentatively Identified Compound column bleed

PROJ_NO: 00771	NSAMPLE	S43FB04-20120513			S43RB03-20120513		
SDG: 1205098	LAB_ID	1205098-16			1205098-15		
FRACTION: OV	SAMP_DATE	5/13/2012			5/13/2012		
MEDIA: WATER	QC_TYPE	NM			NM		
	UNITS	UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0		
	DUP_OF						
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		0.5	U		0.5	U	
1,1,2,2-TETRACHLOROETHANE		0.5	U		0.5	U	
1,1,2-TRICHLOROETHANE		0.5	U		0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		0.5	U		0.5	U	
1,1-DICHLOROETHANE		0.5	U		0.5	U	
1,1-DICHLOROETHENE		0.5	U		0.5	U	
1,2,3-TRICHLOROBENZENE		0.5	U		0.5	U	
1,2,4-TRICHLOROBENZENE		0.5	U		0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE		0.5	U		0.5	U	
1,2-DIBROMOETHANE		0.5	U		0.5	U	
1,2-DICHLOROBENZENE		0.5	U		0.5	U	
1,2-DICHLOROETHANE		0.5	U		0.5	U	
1,2-DICHLOROPROPANE		0.5	U		0.5	U	
1,3-DICHLOROPROPANE		0.5	U		0.5	U	
1,4-DICHLOROBENZENE		0.5	U		0.5	U	
1,4-DIOXANE		10	U		10	U	
2-BUTANONE		6.01	J	P	5.72	J	P
2-HEXANONE		2.5	U		2.5	U	
4-METHYL-2-PENTANONE		2.5	U		2.5	U	
ACETONE		6.79	J	P	7.91	J	P
BENZENE		0.5	U		0.5	U	
BROMODICHLOROMETHANE		0.5	U		0.5	U	
BROMOFORM		0.5	U		0.5	U	
BROMOMETHANE		1	U		1	U	
CARBON DISULFIDE		0.5	U		0.5	U	
CARBON TETRACHLORIDE		0.5	U		0.5	U	
CHLOROBENZENE		0.5	U		0.5	U	
CHLORODIBROMOMETHANE		0.5	U		0.5	U	
CHLOROETHANE		1	U		1	U	
CHLOROFORM		0.5	U		0.5	U	
CHLOROMETHANE		0.5	U		0.5	U	
CIS-1,2-DICHLOROETHENE		0.5	U		0.5	U	
CYCLOHEXANE		0.5	U		0.5	U	
DICHLORODIFLUOROMETHANE		1	U		1	U	
ETHYLBENZENE		0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43FB04-20120513			S43RB03-20120513		
SDG: 1205098	LAB_ID	1205098-16			1205098-15		
FRACTION: OV	SAMP_DATE	5/13/2012			5/13/2012		
MEDIA: WATER	QC_TYPE	NM			NM		
	UNITS	UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0		
	DUP_OF						
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		0.5	U		0.5	U	
METHYL ACETATE		1	U		1	U	
METHYL TERT-BUTYL ETHER		0.5	U		0.5	U	
METHYLENE CHLORIDE		1	U		1	U	
STYRENE		0.5	U		0.5	U	
TETRACHLOROETHENE		0.5	U		0.5	U	
TOLUENE		0.5	U		0.5	U	
TOTAL XYLENES		1	U		1	U	
TRANS-1,2-DICHLOROETHENE		0.5	U		0.5	U	
TRICHLOROETHENE		0.5	U		0.5	U	
TRICHLOROFLUOROMETHANE		1	U		1	U	
VINYL CHLORIDE		0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43FB04-20120513			S43RB03-20120513		
SDG: 1205098	LAB_ID	1205098-16			1205098-15		
FRACTION: EXP	SAMP_DATE	5/13/2012			5/13/2012		
MEDIA: WATER	QC_TYPE	NM			NM		
	UNITS	UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0		
	DUP_OF						
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,3,5-TRINITROBENZENE		0.157	U		0.16	U	
1,3-DINITROBENZENE		0.157	U		0.16	U	
2,4,6-TRINITROTOLUENE		0.157	U		0.16	U	
2,4-DINITROTOLUENE		0.157	U		0.16	U	
2,6-DINITROTOLUENE		0.209	J	P	0.19	J	P
2-AMINO-4,6-DINITROTOLUENE		0.164	J	PU	0.16	U	
2-NITROTOLUENE		0.504			0.546		
3-NITROTOLUENE		0.365			0.234	J	PQU
4-AMINO-2,6-DINITROTOLUENE		0.157	U		0.16	U	
4-NITROTOLUENE		0.157	U		0.16	U	
HMX		0.157	U		0.16	U	
NITROBENZENE		0.157	U		0.174	J	P
NITROGLYCERIN		0.392	U		0.4	U	
NITROGUANIDINE		20	U		20	U	
RDX		0.157	U		0.16	U	
TETRYL		0.157	U		0.16	U	

PROJ_NO: 00771	NSAMPLE	S43SB023-0001			S43SB023-0001-D			S43SB023-0607			S43SB024-0001		
SDG: 1205098	LAB_ID	1205098-10RE1			1205098-11RE1			1205098-12RE2			1205098-07RE1		
FRACTION: OV	SAMP_DATE	5/13/2012			5/13/2012			5/13/2012			5/13/2012		
MEDIA: SOIL	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/KG			UG/KG			UG/KG			UG/KG		
	PCT_SOLIDS	75.6			75.6			84.3			77.4		
	DUP_OF				S43SB023-0001								
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		2.64	U		2.47	U		2510	U		2.3	U	
1,1,2,2-TETRACHLOROETHANE		2.64	U		2.47	U		2510	U		2.3	U	
1,1,2-TRICHLOROETHANE		2.64	U		2.47	U		2510	U		2.3	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		5.28	U		4.93	U		5020	U		4.59	U	
1,1-DICHLOROETHANE		2.64	U		2.47	U		2510	U		2.3	U	
1,1-DICHLOROETHENE		2.64	U		2.47	U		2510	U		2.3	U	
1,2,3-TRICHLOROBENZENE		2.64	U		2.47	U		2510	U		2.3	U	
1,2,4-TRICHLOROBENZENE		2.64	U		2.47	U		2510	U		2.3	U	
1,2-DIBROMO-3-CHLOROPROPANE		5.28	U		4.93	U		5020	U		4.59	U	
1,2-DIBROMOETHANE		2.64	U		2.47	U		2510	U		2.3	U	
1,2-DICHLOROBENZENE		2.64	U		2.47	U		2510	U		2.3	U	
1,2-DICHLOROETHANE		2.64	U		2.47	U		2510	U		2.3	U	
1,2-DICHLOROPROPANE		2.64	U		2.47	U		2510	U		2.3	U	
1,3-DICHLOROPROPANE		2.64	U		2.47	U		2510	U		2.3	U	
1,4-DICHLOROBENZENE		2.64	U		2.47	U		2510	U		2.3	U	
1,4-DIOXANE		106	UR	C	98.7	UR	C	100000	UR	C	91.8	UR	C
2-BUTANONE		5.28	U		4.93	U		5020	U		4.59	U	
2-HEXANONE		2.64	U		2.47	U		2510	U		2.3	U	
4-METHYL-2-PENTANONE		2.64	U		2.47	U		2510	U		2.3	U	
ACETONE		26.1	B	B	19.1	B	B	195000	J	A	20.4	B	B
BENZENE		2.64	U		2.47	U		2510	U		2.3	U	
BROMODICHLOROMETHANE		2.64	U		2.47	U		2510	U		2.3	U	
BROMOFORM		2.64	U		2.47	U		2510	U		2.3	U	
BROMOMETHANE		5.28	U		4.93	U		5020	U		4.59	U	
CARBON DISULFIDE		2.64	U		2.47	U		2510	U		2.3	U	
CARBON TETRACHLORIDE		2.64	U		2.47	U		2510	U		2.3	U	
CHLOROBENZENE		2.64	U		2.47	U		2510	U		2.3	U	
CHLORODIBROMOMETHANE		2.64	U		2.47	U		2510	U		2.3	U	
CHLOROETHANE		5.28	U		4.93	U		5020	U		4.59	U	
CHLOROFORM		2.64	U		2.47	U		2510	U		2.3	U	
CHLOROMETHANE		5.28	U		4.93	U		5020	U		4.59	U	
CIS-1,2-DICHLOROETHENE		2.64	U		2.47	U		2510	U		14.4		
CYCLOHEXANE		2.64	U		2.47	U		2510	U		2.3	U	
DICHLORODIFLUOROMETHANE		5.28	U		4.93	U		5020	U		4.59	U	
ETHYLBENZENE		2.64	U		2.47	U		2510	U		2.3	U	

PROJ_NO: 00771	NSAMPLE	S43SB024-0607			S43SB024-0607-D			S43SB025-0001			S43SB025-0607		
SDG: 1205098	LAB_ID	1205098-08RE1			1205098-09RE1			1205098-05RE1			1205098-06RE1		
FRACTION: OV	SAMP_DATE	5/13/2012			5/13/2012			5/13/2012			5/13/2012		
MEDIA: SOIL	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/KG			UG/KG			UG/KG			UG/KG		
	PCT_SOLIDS	81.9			80.8			77.6			85.2		
	DUP_OF				S43SB024-0607								
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		128	U		128	U		2.17	U		125	U	
1,1,2,2-TETRACHLOROETHANE		128	U		128	U		2.17	U		125	U	
1,1,2-TRICHLOROETHANE		128	U		128	U		2.17	U		125	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		256	U		257	U		4.34	U		250	U	
1,1-DICHLOROETHANE		128	U		128	U		2.17	U		125	U	
1,1-DICHLOROETHENE		128	U		128	U		2.17	U		125	U	
1,2,3-TRICHLOROBENZENE		128	U		128	U		2.17	U		125	U	
1,2,4-TRICHLOROBENZENE		128	U		128	U		2.17	U		125	U	
1,2-DIBROMO-3-CHLOROPROPANE		256	U		257	U		4.34	U		250	U	
1,2-DIBROMOETHANE		128	U		128	U		2.17	U		125	U	
1,2-DICHLOROBENZENE		128	U		128	U		2.17	U		125	U	
1,2-DICHLOROETHANE		128	U		128	U		2.17	U		125	U	
1,2-DICHLOROPROPANE		128	U		128	U		2.17	U		125	U	
1,3-DICHLOROPROPANE		128	U		128	U		2.17	U		125	U	
1,4-DICHLOROBENZENE		128	U		128	U		2.17	U		125	U	
1,4-DIOXANE		5120	UR	C	5130	UR	C	86.8	UR	C	5000	UR	C
2-BUTANONE		256	U		257	U		4.34	U		250	U	
2-HEXANONE		128	U		128	U		2.17	U		125	U	
4-METHYL-2-PENTANONE		128	U		128	U		2.17	U		125	U	
ACETONE		512	U		513	U		8.95	B	B	500	U	
BENZENE		128	U		128	U		2.17	U		125	U	
BROMODICHLOROMETHANE		128	U		128	U		2.17	U		125	U	
BROMOFORM		128	U		128	U		2.17	U		125	U	
BROMOMETHANE		256	U		257	U		4.34	U		250	U	
CARBON DISULFIDE		128	U		128	U		2.17	U		125	U	
CARBON TETRACHLORIDE		128	U		128	U		2.17	U		125	U	
CHLOROBENZENE		128	U		128	U		2.17	U		125	U	
CHLORODIBROMOMETHANE		128	U		128	U		2.17	U		125	U	
CHLOROETHANE		256	U		257	U		4.34	U		250	U	
CHLOROFORM		128	U		128	U		2.17	U		125	U	
CHLOROMETHANE		256	U		257	U		4.34	U		250	U	
CIS-1,2-DICHLOROETHENE		442			397			2.17	U		100	J	P
CYCLOHEXANE		128	U		128	U		2.17	U		125	U	
DICHLORODIFLUOROMETHANE		256	U		257	U		4.34	U		250	U	
ETHYLBENZENE		128	U		128	U		2.17	U		125	U	

PROJ_NO: 00771	NSAMPLE	S43SB026-0001			S43SB026-0506			S43SB027-0001			S43SB027-0708		
SDG: 1205098	LAB_ID	1205098-03			1205098-04RE1			1205098-01RE1			1205098-02RE1		
FRACTION: OV	SAMP_DATE	5/13/2012			5/13/2012			5/13/2012			5/13/2012		
MEDIA: SOIL	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/KG			UG/KG			UG/KG			UG/KG		
	PCT_SOLIDS	78.0			84.7			81.2			85.6		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		3.02	U		117	U		114	U		139	U	
1,1,2,2-TETRACHLOROETHANE		3.02	U		117	U		114	U		139	U	
1,1,2-TRICHLOROETHANE		3.02	U		117	U		114	U		139	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		6.03	U		233	U		229	U		278	U	
1,1-DICHLOROETHANE		3.02	U		117	U		114	U		139	U	
1,1-DICHLOROETHENE		3.02	U		117	U		114	U		139	U	
1,2,3-TRICHLOROBENZENE		3.02	U		117	U		114	U		139	U	
1,2,4-TRICHLOROBENZENE		3.02	U		117	U		114	U		139	U	
1,2-DIBROMO-3-CHLOROPROPANE		6.03	U		233	U		229	U		278	U	
1,2-DIBROMOETHANE		3.02	U		117	U		114	U		139	U	
1,2-DICHLOROBENZENE		3.02	U		117	U		114	U		139	U	
1,2-DICHLOROETHANE		3.02	U		117	U		114	U		139	U	
1,2-DICHLOROPROPANE		3.02	U		117	U		114	U		139	U	
1,3-DICHLOROPROPANE		3.02	U		117	U		114	U		139	U	
1,4-DICHLOROBENZENE		3.02	U		117	U		114	U		139	U	
1,4-DIOXANE		121	UR	C	4670	UR	C	4570	UR	C	5560	UR	C
2-BUTANONE		6.03	U		233	U		229	U		278	U	
2-HEXANONE		3.02	U		117	U		114	U		139	U	
4-METHYL-2-PENTANONE		3.02	U		117	U		114	U		139	U	
ACETONE		14.8	B	B	467	U		457	U		556	U	
BENZENE		3.02	U		117	U		114	U		139	U	
BROMODICHLOROMETHANE		3.02	U		117	U		114	U		139	U	
BROMOFORM		3.02	U		117	U		114	U		139	U	
BROMOMETHANE		6.03	U		233	U		229	U		278	U	
CARBON DISULFIDE		3.02	U		117	U		114	U		139	U	
CARBON TETRACHLORIDE		3.02	U		117	U		114	U		139	U	
CHLOROBENZENE		3.02	U		117	U		114	U		139	U	
CHLORODIBROMOMETHANE		3.02	U		117	U		114	U		139	U	
CHLOROETHANE		6.03	U		233	U		229	U		278	U	
CHLOROFORM		3.02	U		117	U		114	U		139	U	
CHLOROMETHANE		6.03	U		233	U		229	U		278	U	
CIS-1,2-DICHLOROETHENE		23.7			117	U		175	J	P	447		
CYCLOHEXANE		3.02	U		117	U		114	U		139	U	
DICHLORODIFLUOROMETHANE		6.03	U		233	U		229	U		278	U	
ETHYLBENZENE		3.02	U		117	U		114	U		139	U	

PROJ_NO: 00771	NSAMPLE	S43SB028-0001			S43SB028-0405		
SDG: 1205098	LAB_ID	1205098-13RE1			1205098-14		
FRACTION: OV	SAMP_DATE	5/13/2012			5/13/2012		
MEDIA: SOIL	QC_TYPE	NM			NM		
	UNITS	UG/KG			UG/KG		
	PCT_SOLIDS	54.9			79.7		
	DUP_OF						
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		243	U		2.56	U	
1,1,2,2-TETRACHLOROETHANE		243	U		2.56	U	
1,1,2-TRICHLOROETHANE		243	U		2.56	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		486	U		5.12	U	
1,1-DICHLOROETHANE		243	U		2.56	U	
1,1-DICHLOROETHENE		243	U		2.56	U	
1,2,3-TRICHLOROBENZENE		243	U		2.56	UJ	D
1,2,4-TRICHLOROBENZENE		243	U		2.56	UJ	D
1,2-DIBROMO-3-CHLOROPROPANE		486	U		5.12	U	
1,2-DIBROMOETHANE		243	U		2.56	UJ	D
1,2-DICHLOROBENZENE		243	U		2.56	UJ	D
1,2-DICHLOROETHANE		243	U		2.56	U	
1,2-DICHLOROPROPANE		243	U		2.56	U	
1,3-DICHLOROPROPANE		243	U		2.56	UJ	D
1,4-DICHLOROBENZENE		243	U		2.56	UJ	D
1,4-DIOXANE		9720	UR	C	102	UR	C
2-BUTANONE		486	U		5.12	U	
2-HEXANONE		243	U		2.56	U	
4-METHYL-2-PENTANONE		243	U		2.56	U	
ACETONE		972	U		10.2	U	
BENZENE		243	U		2.56	U	
BROMODICHLOROMETHANE		243	U		2.56	U	
BROMOFORM		243	U		2.56	U	
BROMOMETHANE		486	U		5.12	U	
CARBON DISULFIDE		243	U		2.56	U	
CARBON TETRACHLORIDE		243	U		2.56	U	
CHLOROBENZENE		243	U		2.56	UJ	D
CHLORODIBROMOMETHANE		243	U		2.56	U	
CHLOROETHANE		486	U		5.12	U	
CHLOROFORM		243	U		2.56	U	
CHLOROMETHANE		486	U		5.12	U	
CIS-1,2-DICHLOROETHENE		243	U		2.56	U	
CYCLOHEXANE		243	U		2.56	U	
DICHLORODIFLUOROMETHANE		486	U		5.12	U	
ETHYLBENZENE		243	U		2.56	UJ	D

PROJ_NO: 00771	NSAMPLE	S43SB023-0001			S43SB023-0001-D			S43SB023-0607			S43SB024-0001		
SDG: 1205098	LAB_ID	1205098-10RE1			1205098-11RE1			1205098-12RE2			1205098-07RE1		
FRACTION: OV	SAMP_DATE	5/13/2012			5/13/2012			5/13/2012			5/13/2012		
MEDIA: SOIL	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/KG			UG/KG			UG/KG			UG/KG		
	PCT_SOLIDS	75.6			75.6			84.3			77.4		
	DUP_OF				S43SB023-0001								
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		2.64	U		2.47	U		2510	U		2.3	U	
METHYL ACETATE		5.28	U		4.93	U		5020	U		4.59	U	
METHYL TERT-BUTYL ETHER		2.64	U		2.47	U		2510	U		2.3	U	
METHYLENE CHLORIDE		5.28	U		4.93	U		3590	J	AP	4.59	U	
STYRENE		2.64	U		2.47	U		2510	U		2.3	U	
TETRACHLOROETHENE		2.64	U		2.47	U		2510	U		2.3	U	
TOLUENE		2.64	U		2.47	U		2510	U		2.3	U	
TOTAL XYLENES		5.28	U		4.93	U		5020	U		4.59	U	
TRANS-1,2-DICHLOROETHENE		2.64	U		2.47	U		2510	U		2.3	U	
TRICHLOROETHENE		2.64	U		2.47	U		2510	U		2.3	U	
TRICHLOROFLUOROMETHANE		5.28	U		4.93	U		5020	U		4.59	U	
VINYL CHLORIDE		2.64	U		2.47	U		2510	U		2.3	U	

PROJ_NO: 00771	NSAMPLE	S43SB024-0607			S43SB024-0607-D			S43SB025-0001			S43SB025-0607		
SDG: 1205098	LAB_ID	1205098-08RE1			1205098-09RE1			1205098-05RE1			1205098-06RE1		
FRACTION: OV	SAMP_DATE	5/13/2012			5/13/2012			5/13/2012			5/13/2012		
MEDIA: SOIL	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/KG			UG/KG			UG/KG			UG/KG		
	PCT_SOLIDS	81.9			80.8			77.6			85.2		
	DUP_OF				S43SB024-0607								
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		128	U		128	U		2.17	U		125	U	
METHYL ACETATE		256	U		257	U		4.34	U		250	U	
METHYL TERT-BUTYL ETHER		128	U		128	U		2.17	U		125	U	
METHYLENE CHLORIDE		256	U		257	U		4.34	U		250	U	
STYRENE		128	U		128	U		2.17	U		125	U	
TETRACHLOROETHENE		128	U		128	U		2.17	U		125	U	
TOLUENE		128	U		128	U		2.17	U		125	U	
TOTAL XYLENES		256	U		257	U		4.34	U		250	U	
TRANS-1,2-DICHLOROETHENE		128	U		128	U		2.17	U		125	U	
TRICHLOROETHENE		2080			1700			1.91	J	P	2380		
TRICHLOROFLUOROMETHANE		256	U		257	U		4.34	U		250	U	
VINYL CHLORIDE		128	U		128	U		2.17	U		125	U	

PROJ_NO: 00771	NSAMPLE	S43SB026-0001			S43SB026-0506			S43SB027-0001			S43SB027-0708		
SDG: 1205098	LAB_ID	1205098-03			1205098-04RE1			1205098-01RE1			1205098-02RE1		
FRACTION: OV	SAMP_DATE	5/13/2012			5/13/2012			5/13/2012			5/13/2012		
MEDIA: SOIL	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/KG			UG/KG			UG/KG			UG/KG		
	PCT_SOLIDS	78.0			84.7			81.2			85.6		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		3.02	U		117	U		114	U		139	U	
METHYL ACETATE		6.03	U		233	U		229	U		278	U	
METHYL TERT-BUTYL ETHER		3.02	U		117	U		114	U		139	U	
METHYLENE CHLORIDE		6.03	U		233	U		229	U		278	U	
STYRENE		3.02	U		117	U		114	U		139	U	
TETRACHLOROETHENE		3.02	U		117	U		114	U		139	U	
TOLUENE		3.02	U		117	U		114	U		139	U	
TOTAL XYLENES		6.03	U		233	U		229	U		278	U	
TRANS-1,2-DICHLOROETHENE		3.02	U		117	U		114	U		139	U	
TRICHLOROETHENE		69.4			1150			2720			4790		
TRICHLOROFLUOROMETHANE		6.03	U		233	U		229	U		278	U	
VINYL CHLORIDE		2.18	J	P	117	U		114	U		139	U	

PROJ_NO: 00771	NSAMPLE	S43SB028-0001			S43SB028-0405		
SDG: 1205098	LAB_ID	1205098-13RE1			1205098-14		
FRACTION: OV	SAMP_DATE	5/13/2012			5/13/2012		
MEDIA: SOIL	QC_TYPE	NM			NM		
	UNITS	UG/KG			UG/KG		
	PCT_SOLIDS	54.9			79.7		
	DUP_OF						
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		243	U		2.56	UJ	D
METHYL ACETATE		486	U		5.12	U	
METHYL TERT-BUTYL ETHER		243	U		2.56	U	
METHYLENE CHLORIDE		486	U		5.12	U	
STYRENE		243	U		2.56	UJ	D
TETRACHLOROETHENE		243	U		2.56	U	
TOLUENE		243	U		2.56	UJ	D
TOTAL XYLENES		486	U		5.12	UJ	D
TRANS-1,2-DICHLOROETHENE		243	U		2.56	U	
TRICHLOROETHENE		243	U		2.56	U	
TRICHLOROFLUOROMETHANE		486	U		5.12	U	
VINYL CHLORIDE		243	U		2.56	U	

PROJ_NO: 00771	NSAMPLE	S43SB023-0001			S43SB023-0001-D			S43SB023-0607			S43SB024-0001		
SDG: 1205098	LAB_ID	1205098-10			1205098-11			1205098-12			1205098-07		
FRACTION: EXP	SAMP_DATE	5/13/2012			5/13/2012			5/13/2012			5/13/2012		
MEDIA: SOIL	QC_TYPE	NM			NM			NM			NM		
	UNITS	MG/KG			MG/KG			MG/KG			MG/KG		
	PCT_SOLIDS	75.6			75.6			84.3			77.4		
	DUP_OF				S43SB023-0001								
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,3,5-TRINITROBENZENE		0.0392	U		0.0385	U		0.0385	U		0.0385	U	
1,3-DINITROBENZENE		0.0392	U		0.0385	U		0.0385	U		0.0385	U	
2,4,6-TRINITROTOLUENE		0.0392	U		0.0385	U		0.0385	U		0.0385	U	
2,4-DINITROTOLUENE		0.0392	U		0.0385	U		0.0385	U		0.0385	U	
2,6-DINITROTOLUENE		0.0392	U		0.0385	U		0.0385	U		0.0385	U	
2-AMINO-4,6-DINITROTOLUENE		0.0392	U		0.0385	U		0.0385	U		0.0385	U	
2-NITROTOLUENE		0.0392	U		0.0385	U		0.0385	U		0.0385	U	
3-NITROTOLUENE		0.0392	U		0.0385	U		0.0385	U		0.0385	U	
4-AMINO-2,6-DINITROTOLUENE		0.0392	U		0.0385	U		0.0385	U		0.0385	U	
4-NITROTOLUENE		0.0392	U		0.0385	U		0.0385	U		0.0385	U	
HMX		0.0392	U		0.0385	U		0.0385	U		0.0385	U	
NITROBENZENE		0.0392	U		0.0385	U		0.0385	U		0.0385	U	
NITROGLYCERIN		0.196	U		0.192	U		0.192	U		0.192	U	
NITROGUANIDINE		0.182	U		0.2	U		0.19	U		0.211	U	
RDX		0.0392	U		0.0385	U		0.0385	U		0.0385	U	
TETRYL		0.0392	U		0.0385	U		0.0385	U		0.0385	U	

PROJ_NO: 00771	NSAMPLE	S43SB024-0607			S43SB024-0607-D			S43SB025-0001			S43SB025-0607		
SDG: 1205098	LAB_ID	1205098-08			1205098-09			1205098-05			1205098-06		
FRACTION: EXP	SAMP_DATE	5/13/2012			5/13/2012			5/13/2012			5/13/2012		
MEDIA: SOIL	QC_TYPE	NM			NM			NM			NM		
	UNITS	MG/KG			MG/KG			MG/KG			MG/KG		
	PCT_SOLIDS	81.9			80.8			77.6			85.2		
	DUP_OF				S43SB024-0607								
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,3,5-TRINITROBENZENE		0.0385	U		0.04	U		0.0396	U		0.0392	U	
1,3-DINITROBENZENE		0.0385	U		0.04	U		0.0396	U		0.0392	U	
2,4,6-TRINITROTOLUENE		0.0385	U		0.04	U		0.0396	U		0.0392	U	
2,4-DINITROTOLUENE		0.0385	U		0.04	U		0.0396	U		0.0392	U	
2,6-DINITROTOLUENE		0.0385	U		0.04	U		0.0396	U		0.0392	U	
2-AMINO-4,6-DINITROTOLUENE		0.0385	U		0.04	U		0.0396	U		0.0392	U	
2-NITROTOLUENE		0.0385	U		0.04	U		0.0396	U		0.0392	U	
3-NITROTOLUENE		0.0385	U		0.04	U		0.0396	U		0.0392	U	
4-AMINO-2,6-DINITROTOLUENE		0.0385	U		0.04	U		0.0396	U		0.0392	U	
4-NITROTOLUENE		0.0385	U		0.04	U		0.0396	U		0.0392	U	
HMX		0.0385	U		0.04	U		0.0396	U		0.0392	U	
NITROBENZENE		0.0385	U		0.04	U		0.0396	U		0.0392	U	
NITROGLYCERIN		0.192	U		0.2	U		0.198	U		0.196	U	
NITROGUANIDINE		0.19	U		0.182	U		0.182	U		0.19	U	
RDX		0.0385	U		0.04	U		0.0396	U		0.0392	U	
TETRYL		0.0385	U		0.04	U		0.0396	U		0.0392	U	

PROJ_NO: 00771	NSAMPLE	S43SB026-0001			S43SB026-0506			S43SB027-0001			S43SB027-0708		
SDG: 1205098	LAB_ID	1205098-03			1205098-04			1205098-01			1205098-02		
FRACTION: EXP	SAMP_DATE	5/13/2012			5/13/2012			5/13/2012			5/13/2012		
MEDIA: SOIL	QC_TYPE	NM			NM			NM			NM		
	UNITS	MG/KG			MG/KG			MG/KG			MG/KG		
	PCT_SOLIDS	78.0			84.7			81.2			85.6		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,3,5-TRINITROBENZENE		0.04	U		0.0396	U		0.0385	U		0.0388	U	
1,3-DINITROBENZENE		0.04	U		0.0396	U		0.0385	U		0.0277	J	P
2,4,6-TRINITROTOLUENE		0.04	U		0.0396	U		0.0385	U		0.0388	U	
2,4-DINITROTOLUENE		0.04	U		0.0396	U		0.0385	U		0.0388	U	
2,6-DINITROTOLUENE		0.04	U		0.0396	U		0.0385	U		0.0388	U	
2-AMINO-4,6-DINITROTOLUENE		0.04	U		0.0396	U		0.0385	U		0.0388	U	
2-NITROTOLUENE		0.04	U		0.0396	U		0.0385	U		0.0388	U	
3-NITROTOLUENE		0.04	U		0.0396	U		0.0385	U		0.0388	U	
4-AMINO-2,6-DINITROTOLUENE		0.04	U		0.0396	U		0.0385	U		0.0388	U	
4-NITROTOLUENE		0.04	U		0.0396	U		0.0385	U		0.0388	U	
HMX		0.04	U		0.0396	U		0.0385	U		0.0388	U	
NITROBENZENE		0.04	U		0.0396	U		0.0385	U		0.0388	U	
NITROGLYCERIN		0.2	U		0.198	U		0.192	U		0.194	U	
NITROGUANIDINE		0.19	U		0.211	U		0.2	U		0.19	U	
RDX		0.04	U		0.0396	U		0.0385	U		0.0388	U	
TETRYL		0.04	U		0.0396	U		0.0385	U		0.0388	U	

PROJ_NO: 00771	NSAMPLE	S43SB028-0001			S43SB028-0405		
SDG: 1205098	LAB_ID	1205098-13			1205098-14		
FRACTION: EXP	SAMP_DATE	5/13/2012			5/13/2012		
MEDIA: SOIL	QC_TYPE	NM			NM		
	UNITS	MG/KG			MG/KG		
	PCT_SOLIDS	54.9			79.7		
	DUP_OF						
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,3,5-TRINITROBENZENE		0.032	J	PQU	0.0388	U	
1,3-DINITROBENZENE		0.0388	U		0.0388	U	
2,4,6-TRINITROTOLUENE		0.0388	U		0.0388	U	
2,4-DINITROTOLUENE		0.0388	U		0.0388	U	
2,6-DINITROTOLUENE		0.0388	U		0.0388	U	
2-AMINO-4,6-DINITROTOLUENE		0.0388	U		0.0388	U	
2-NITROTOLUENE		0.0388	U		0.0388	U	
3-NITROTOLUENE		0.0388	U		0.0388	U	
4-AMINO-2,6-DINITROTOLUENE		0.0388	U		0.0388	U	
4-NITROTOLUENE		0.0388	U		0.0388	U	
HMX		0.0388	U		0.0388	U	
NITROBENZENE		0.0388	U		0.0388	U	
NITROGLYCERIN		0.194	U		0.194	U	
NITROGUANIDINE		0.429	J	QU	0.174	U	
RDX		0.0388	U		0.0388	U	
TETRYL		0.0388	U		0.0388	U	

Tetra Tech **INTERNAL CORRESPONDENCE**

TO:	**R. SOK**	**DATE:**	**July 27, 2012**
FROM:	**MEGAN CARSON**	**COPIES:**	**DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION –SELECT METALS**
NSF INDIAN HEAD, CTO 114
SAMPLE DELIVERY GROUP (SDG) – 1205098

SAMPLES: 14/Soil/

S43SB023-0001	S43SB023-0001-D
S43SB023-0607	S43SB024-0001
S43SB024-0607	S43SB024-0607-D
S43SB025-0001	S43SB025-0607
S43SB026-0001	S43SB026-0506
S43SB027-0001	S43SB027-0708
S43SB028-0001	S43SB028-0405

2/Water/

S43FB04-20120513	S43RB03-20120513

Overview

The sample set for NSF Indian Head, SDG 1205098 consists of fourteen (14) soil environmental samples and two (2) aqueous samples. This SDG contained two field duplicate pairs: S43SB023-0001/S43SB023-0001-D and S43SB024-0607/S43SB024-0607-D.

All samples were analyzed for select metals. The samples were collected by Tetra Tech, Inc. on May 13th, 2012 and analyzed by Empirical Laboratories, LLC under Naval Facilities Engineering Service Center (NFESC) Quality Assurance / Quality Control (QA/QC) criteria. Metals analyses were conducted using SW846 method 6010C. Mercury analyses were conducted using SW846 method 7470.

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 / matrix spike duplicate results, field duplicate precision, laboratory duplicate precision, laboratory control sample (LCS) results, ICP serial dilution results, detection limits and analyte quantitation.

Areas of concern with respect to data quality are listed below.

Major Problems:

- None.

Minor Problems:

- The following contaminants were detected in the laboratory calibration and preparation blanks at the following maximum concentration:

Analyte	Maximum Concentration	Action Level
Antimony [1]	7.15 ug/L	1.78 mg/kg
Chromium [2]	0.15 mg/kg	0.75 mg/kg
Iron [2]	5.44 mg/kg	27.2 mg/kg
Zinc [2]	0.28 mg/kg	1.4 mg/kg

[1] Maximum concentration found in a calibration blank affecting samples on 5/31/12 and 6/1/12.
[2] Maximum concentration found in a preparation blank affecting samples in preparation batch 2E17025.

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 were qualified (B) for blank contamination.

- The matrix spike and matrix spike duplicate had a percent recovery < 30% for antimony and percent recoveries > 120% for chromium and zinc. The post digestion spike was acceptable for antimony, chromium, and zinc. All soil samples were affected. Non-detected antimony results were qualified as biased low (UL). Positive chromium and zinc results were either qualified as biased high (K) or estimated (J) due to conflicting directional bias.

- The serial dilution had a percent difference > 10% for iron. All soil samples were affected. Positive results were qualified as estimated (J).

- The continuing calibration analyzed on 5/31/12 at 20:11 had a percent recovery > 110% for manganese. Samples S43SB023-0001, S43SB024-0001, S43SB024-0607, S43SB024-0607-D, S43SB025-0001, S43SB025-0607, S43SB026-0001, S43SB026-0506, S43SB027-0001, and S43SB027-0708 were affected. Positive results were qualified as biased high (K).

- The continuing calibration analyzed on 5/31/12 at 21:20 had a percent recovery > 110% for manganese and percent recoveries < 90% for barium, thallium, and zinc. All samples were affected (except S43SB023-0607 barium result). Positive manganese results were qualified as biased high (K). Positive barium, thallium, and zinc results were either qualified as biased low (L) or estimated (J) due to conflicting directional bias. Non-detected thallium results were qualified biased low (UL).

- The continuing calibrations analyzed on 6/1/12 at 08:53 and 10:02 had a percent recovery > 110% for barium. Sample S43SB023-0607 was affected. The positive barium result was qualified as biased high (K).

- The CRDL standards analyzed on 5/31/12 and 6/1/12 had percent recoveries > 110% for aluminum, antimony, and copper and percent recoveries < 90% for lead and selenium. All samples were affected. Positive selenium results < 2X CRDL were qualified as estimated (J) due to conflicting directional bias. Non-detected selenium results were qualified as biased low (UL). No other validation action was warranted as sample results were either > 2X CRDL or non-detected.

- The interfering analyte aluminum was present in all soil samples at concentrations comparable to the concentrations of aluminum in the interference check sample (ICS) solution. Several analytes namely, arsenic, lead, manganese, nickel, selenium, and zinc were present in the ICS solution at a concentration that exceeded the instrument detection limit (IDL). Interference effects exist for arsenic and selenium in the affected samples. Positive selenium results were qualified as estimated (J) due to conflicting directional bias and non-detected results were qualified as biased low (UL). The positive arsenic result for sample S43SB026-0001 was qualified as biased low (L).

- The interfering analyte iron was present in all soil samples at concentrations comparable to the concentrations of iron in the interference check sample (ICS) solution. Several analytes namely, arsenic, lead, manganese, nickel, selenium, and zinc were present in the ICS solution at a concentration that exceeded the instrument detection limit (IDL). Interference effects exist for arsenic and selenium in the affected samples. Positive selenium results were qualified as biased low (L) and non-detected results were qualified as biased low (UL). The positive arsenic result all samples (except for sample S43SB028-0001) were qualified as biased low (L).

- Field duplicate pair S43SB023-0001/S43SB023-0001-D had relative percent differences > 50% for lead and zinc and a difference > 4X CRDL for cadmium. Positive results for the sample pair were qualified as estimated (J). No additional validation action was taken as the other field duplicate pair was within quality control limits.

- Positive results less than Limit of Quantitation (LOQ) and greater than the method detection limit (MDL) were qualified as estimated (J).

Notes

No batch QC was provided for the water results.

Executive Summary

Laboratory Performance: Antimony was qualified for lab blank contamination. Continuing calibration non-compliances resulted in the qualification of sample results. CRDL standard non-compliances resulted in the qualification of sample results. Interferent standard non-compliances resulted in the qualification of sample results.

Other Factors Affecting Data Quality: Field duplicate non-compliances for manganese resulted in the qualification of sample results. Serial dilution non-compliances resulted in the qualification of sample results. Matrix spike non-compliances resulted in the qualification of sample results.

The data for these analyses were reviewed with reference to Region III modifications to the "National Functional Guidelines for Inorganic Data Validation", April 1993, and the Department of Defense (DoD) document entitled "Quality Systems Manual (QSM) for Environmental Laboratories "(April, 2009).

The text of this report has been formulated to address only those problem areas affecting data quality.

Megan Carson

Tetra Tech
Megan Carson
Chemist/Data Validator

Tetra Tech
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

APPENDIX A

QUALIFIED ANALYTICAL RESULTS

Qualifier Codes:

A	=	Lab Blank Contamination
B	=	Field Blank Contamination
C	=	Calibration Noncompliance (i.e., % RSDs, %Ds, ICVs, CCVs, RRFs, etc.)
C01	=	GC/MS Tuning Noncompliance
D	=	MS/MSD Recovery Noncompliance
E	=	LCS/LCSD Recovery Noncompliance
F	=	Lab Duplicate Imprecision
G	=	Field Duplicate Imprecision
H	=	Holding Time Exceedance
I	=	ICP Serial Dilution Noncompliance
J	=	ICP PDS Recovery Noncompliance; MSA's $r < 0.995$
K	=	ICP Interference - includes ICS % R Noncompliance
L	=	Instrument Calibration Range Exceedance
M	=	Sample Preservation Noncompliance
N	=	Internal Standard Noncompliance
N01	=	Internal Standard Recovery Noncompliance Dioxins
N02	=	Recovery Standard Noncompliance Dioxins
N03	=	Clean-up Standard Noncompliance Dioxins
O	=	Poor Instrument Performance (i.e., base-time drifting)
P	=	Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q	=	Other problems (can encompass a number of issues; i.e.chromatography,interferences, etc.)
R	=	Surrogates Recovery Noncompliance
S	=	Pesticide/PCB Resolution
T	=	% Breakdown Noncompliance for DDT and Endrin
U	=	RPD between columns/detectors >40% for positive results determined via GC/HPLC
V	=	Non-linear calibrations; correlation coefficient $r < 0.995$
W	=	EMPC result
X	=	Signal to noise response drop
Y	=	Percent solids <30%
Z	=	Uncertainty at 2 sigma deviation is less than sample activity
Z1	=	Tentatively Identified Compound considered presumptively present
Z2	=	Tentatively Identified Compound column bleed

PROJ_NO: 00771	NSAMPLE	S43SB023-0001			S43SB023-0001-D			S43SB023-0607			S43SB024-0001		
SDG: 1205098	LAB_ID	1205098-10			1205098-11			1205098-12			1205098-07		
FRACTION: M	SAMP_DATE	5/13/2012			5/13/2012			5/13/2012			5/13/2012		
MEDIA: SOIL	QC_TYPE	NM			NM			NM			NM		
	UNITS	MG/KG			MG/KG			MG/KG			MG/KG		
	PCT_SOLIDS	75.6			75.6			84.3			77.4		
	DUP_OF				S43SB023-0001								
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM		20200			20000			11200			17400		
ANTIMONY		0.532	UL	D	0.513	UL	D	0.296	B	A	0.492	UL	D
ARSENIC		2.69	L	K	4.28	L	K	1.88	L	K	1.95	L	K
BARIUM		76	L	C	80.2	L	C	408	K	C	60.9	L	C
BERYLLIUM		0.815			0.859			0.704			0.691		
CADMIUM		0.459	J	G	2.13	J	G	0.118	U		0.471		
CHROMIUM		21.3	K	D	24.4	K	D	16.4	K	D	19.1	K	D
COBALT		3.64			4.38			6.28			3.34		
COPPER		21.1			32.7			15.1			16.6		
IRON		25900	J	I	32100	J	I	12300	J	I	18500	J	I
LEAD		14.8	J	G	28.2	J	G	9.2			12.3		
MANGANESE		26.8	K	C	36.6	K	C	17.8	K	C	14.7	K	C
MERCURY		0.0259	J	P	0.0207	J	P	0.03	U		0.034	U	
NICKEL		9.2			9.72			14.5			7.66		
SELENIUM		0.54	J	CKP	0.565	J	CKP	0.295	UL	CK	0.331	J	CKP
SILVER		0.133	U		0.086	J	P	0.118	U		0.0673	J	P
THALLIUM		0.266	UL	C	0.257	UL	C	0.295	UL	C	0.369	UL	C
VANADIUM		32			33.8			25.4			29.5		
ZINC		47.1	J	CDG	110	J	CDG	23.5	J	CD	33.5	J	CD

PROJ_NO: 00771	NSAMPLE	S43SB024-0607			S43SB024-0607-D			S43SB025-0001			S43SB025-0607		
SDG: 1205098	LAB_ID	1205098-08			1205098-09			1205098-05			1205098-06		
FRACTION: M	SAMP_DATE	5/13/2012			5/13/2012			5/13/2012			5/13/2012		
MEDIA: SOIL	QC_TYPE	NM			NM			NM			NM		
	UNITS	MG/KG			MG/KG			MG/KG			MG/KG		
	PCT_SOLIDS	81.9			80.8			77.6			85.2		
	DUP_OF				S43SB024-0607								
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM		8860			8640			15700			8390		
ANTIMONY		0.319	B	A	0.371	B	A	0.496	UL	D	0.335	B	A
ARSENIC		1.41	L	K	2.08	L	K	2.27	L	K	1.45	L	K
BARIUM		33.5	L	C	31.6	L	C	56.1	L	C	53.7	L	C
BERYLLIUM		0.557			0.552			0.572			0.507		
CADMIUM		0.122	U		0.121	U		0.072	J	P	0.119	U	
CHROMIUM		14.3	K	D	13.4	K	D	18.3	K	D	13.3	K	D
COBALT		4.58			3.81			2.94			3.69		
COPPER		10.8			10.2			14.9			11.3		
IRON		13700	J	I	12200	J	I	15400	J	I	10400	J	I
LEAD		7.8			7.85			11			7.79		
MANGANESE		17.3	K	C	19.6	K	C	17.2	K	C	20.4	K	C
MERCURY		0.029	U		0.037	U		0.035	U		0.032	U	
NICKEL		8.23			7.63			7.1			8.06		
SELENIUM		0.253	J	CKP	0.353	J	CKP	0.396	J	CKP	0.227	J	CKP
SILVER		0.122	U		0.121	U		0.0848	J	P	0.119	U	
THALLIUM		0.304	UL	C	0.303	UL	C	0.31	UL	C	0.298	UL	C
VANADIUM		17			19.8			32.7			22.4		
ZINC		24.4	J	CD	21.4	J	CD	19.4	J	CD	20.8	J	CD

PROJ_NO: 00771	NSAMPLE	S43SB026-0001			S43SB026-0506			S43SB027-0001			S43SB027-0708		
SDG: 1205098	LAB_ID	1205098-03			1205098-04			1205098-01			1205098-02		
FRACTION: M	SAMP_DATE	5/13/2012			5/13/2012			5/13/2012			5/13/2012		
MEDIA: SOIL	QC_TYPE	NM			NM			NM			NM		
	UNITS	MG/KG			MG/KG			MG/KG			MG/KG		
	PCT_SOLIDS	78.0			84.7			81.2			85.6		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM		16000			9620			13100			7170		
ANTIMONY		0.309	B	A	0.326	B	A	0.342	B	A	0.357	B	A
ARSENIC		1.6	L	K	2.34	L	K	2.68	L	K	1.15	L	K
BARIUM		70.3	L	C	177	L	C	233	L	C	14.9	L	C
BERYLLIUM		0.524			0.462			0.534			0.435		
CADMIUM		0.0996	J	P	0.124	U		0.0774	J	P	0.121	U	
CHROMIUM		19.5	K	D	14.3	K	D	17.1	K	D	10.7	K	D
COBALT		3.76			4.38			4.74			3.73		
COPPER		12.3			11.9			10.6			10.4		
IRON		12700	J	I	14400	J	I	12500	J	I	14600	J	I
LEAD		10.4			8.96			9.69			6.63		
MANGANESE		28.2	K	C	18.3	K	C	22.2	K	C	11.5	K	C
MERCURY		0.033	U		0.035	U		0.033	U		0.03	U	
NICKEL		8.25			8.22			9.14			6.12		
SELENIUM		0.31	J	CKP	0.358	J	CKP	0.256	J	CKP	0.279	J	CKP
SILVER		0.121	U		0.124	U		0.129	U		0.121	U	
THALLIUM		0.242	UL	C	0.247	UL	C	0.258	UL	C	0.303	UL	C
VANADIUM		32.4			20.2			34.6			13.3		
ZINC		19.7	J	CD	21.2	J	CD	23.8	J	CD	16.5	J	CD

PROJ_NO: 00771	NSAMPLE	S43SB028-0001			S43SB028-0405		
SDG: 1205098	LAB_ID	1205098-13			1205098-14		
FRACTION: M	SAMP_DATE	5/13/2012			5/13/2012		
MEDIA: SOIL	QC_TYPE	NM			NM		
	UNITS	MG/KG			MG/KG		
	PCT_SOLIDS	54.9			79.7		
	DUP_OF						
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM		17600			10400		
ANTIMONY		0.548	B	A	0.531	UL	D
ARSENIC		12.3			2.53	L	K
BARIUM		132	L	C	43.5	L	C
BERYLLIUM		0.883			0.742		
CADMIUM		12.2			0.0771	J	P
CHROMIUM		30.3	K	D	18.5	K	D
COBALT		11.7			4.38		
COPPER		57.4			14.4		
IRON		23900	J	I	17300	J	I
LEAD		74			10.9		
MANGANESE		391	K	C	106	K	C
MERCURY		0.12			0.0221	J	P
NICKEL		24.3			7.26		
SELENIUM		0.801	J	CKP	0.327	J	CKP
SILVER		0.262	J	P	0.133	U	
THALLIUM		0.664	J	CP	0.266	UL	C
VANADIUM		44.6			34		
ZINC		402	J	CD	31	J	CD

PROJ_NO: 00771	NSAMPLE	S43FB04-20120513			S43RB03-20120513		
SDG: 1205098	LAB_ID	1205098-16			1205098-15		
FRACTION: M	SAMP_DATE	5/13/2012			5/13/2012		
MEDIA: WATER	QC_TYPE	NM			NM		
	UNITS	UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0		
	DUP_OF						
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM		25	U		25	U	
ANTIMONY		1.36	J	CP	1.55	J	CP
ARSENIC		1.5	U		1.5	U	
BARIUM		2.5	U		2.5	U	
BERYLLIUM		0.5	U		0.5	U	
CADMIUM		0.5	U		0.5	U	
CHROMIUM		1	U		1	U	
COBALT		2.5	U		2.5	U	
COPPER		2	U		2	U	
IRON		15	U		16.7	J	P
LEAD		0.75	UL	C	0.75	UL	C
MANGANESE		1.5	U		1.5	U	
MERCURY		0.2	U		0.2	U	
NICKEL		1.5	U		1.5	U	
SELENIUM		1.25	UL	C	1.25	UL	C
SILVER		0.5	U		0.5	U	
THALLIUM		1	U		1	U	
VANADIUM		2.5	U		2.5	U	
ZINC		2.5	U		2.5	U	

Tetra Tech INC **INTERNAL CORRESPONDENCE**

TO:	**R. SOK**	**DATE:**	**JUNE 25, 2012**
FROM:	**J. KALINYAK**	**COPIES:**	**DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – VOC**
NSF INDIAN HEAD, CTO 114
SAMPLE DELIVERY GROUP 1206014

SAMPLES: 14 / Soil / VOC

S43FB05-20120603	S43MW09D-Grab	S43MW09S-Grab
S43MW12-Grab	S43RB04-20120603	S43TB05-20120601
S43TW36-2024	S43TW36-3034	S43TW37-2024
S43TW37-2024-D	S43TW37-3135	S43TW38-1822
S43TW38-2832	S43TW39-0812	

OVERVIEW

The sample set for NSF Indian Head, CTO 114, SDG 1206014, consisted of fourteen (14) aqueous samples, including one (1) field blank sample, one (1) rinse blank sample, and one (1) trip blank sample. The samples were analyzed for volatile organic compounds (VOC), as listed above. One (1) field duplicate sample pair was contained within this sample delivery group (SDG): S43TW37-2024-D / S43TW37-2024.

The samples were collected by Tetra Tech on June 1, 2, and 3, 2012 and analyzed by Empirical Laboratory LLC. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using EPA SW-846 Methods 8260B for VOCs, analysis and reporting protocols.

The data contained in this SDG were validated with regard to the following parameters: data completeness, hold times, GC/MS tuning, initial/continuing calibrations, laboratory method blank results, surrogate spike recoveries, blank spike results, matrix spike/matrix spike duplicate results, internal standard recoveries, field duplicate results, chromatographic resolution, compound identification, compound quantitation, and detection limits. Areas of concern are listed below.

MAJOR

- The relative response factor (RRF) was less than the 0.05 quality control limit for the VOC 1,4-dioxane for the initial calibration on instrument MS-VOA6 on 04/27/12 and for all the continuing calibration verifications (CCV) for the instrument MS-VOA6 affecting all samples. All samples had non-detected results for 1,4-dioxane which were qualified rejected, (UR).

MINOR

- Positive results reported below the quantitation limit but above the method detection limit were qualified as estimated, (J).

- The VOC CCV percent difference (%D) was greater than the 20% and less than the 50% quality control limit for 4-methyl-2-pentanone and vinyl chloride for instrument MS-VOA6 on 06/05/12 @ 08:18.
  Affected Samples: All samples
  Action: The sample non-detected 4-methyl-2-pentanone and vinyl chloride results were not qualified. The sample positive vinyl chloride results were qualified estimated, (J).

- The common laboratory VOC contaminants were detected in the rinse blank sample at the following concentrations.

Analyte	Maximum Conc.	Action Level
Acetone [1]	5.87 µg/L	58.70 µg/L
2-Butanone [1]	8.71 µg/L	87.10 µg/L

[1] Rinse blank S43RB04-20120603 affecting all samples.

An action level of 10X the maximum concentration for the common laboratory contaminants was established to evaluate the sample for blank contamination. Sample aliquot, percent solids, and dilution factors, if applicable, were taken into account when applying the action level. Sample results less than the action level were qualified, (B), due to blank contamination. The trip blank and rinse blank samples were not qualified for blank contamination.

NOTES

Non-detected results were reported to the limit of detection (LOD).

EXECUTIVE SUMMARY

Laboratory Performance Issues: VOC sample 1,4-dioxane non-detected results were rejected due to RRF criteria non-compliances. Sample positive vinyl chloride results were qualified estimated due to a CCV %D non-compliance. Sample acetone and 2-butanone results were qualified for rinse blank sample contamination.

Other Factors Affecting Data Quality: Positive results reported below the quantitation limit but above the method detection limit were qualified as estimated (J).

The data for these analyses were reviewed with reference to the Region III modifications to U.S. EPA National Functional Guidelines for Organic Data Validation (Sept. 1994), USEPA SW-846 Methods 8260B and the Department of Defense (DoD) document entitled "Quality Systems Manual (QSM) for Environmental Laboratories" (April 2009).

Tetra Tech
Joseph Kalinyak
Chemist/Data Validator

Tetra Tech
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

Appendix A

Qualified Analytical Results

Qualifier Codes:

A = Lab Blank Contamination
B = Field Blank Contamination
C = Calibration Noncompliance (i.e., % RSDs, %Ds, ICVs, CCVs, RRFs, etc.)
C01 = GC/MS Tuning Noncompliance
D = MS/MSD Recovery Noncompliance
E = LCS/LCSD Recovery Noncompliance
F = Lab Duplicate Imprecision
G = Field Duplicate Imprecision
H = Holding Time Exceedance
I = ICP Serial Dilution Noncompliance
J = ICP PDS Recovery Noncompliance; MSA's $r < 0.995$
K = ICP Interference - includes ICS % R Noncompliance
L = Instrument Calibration Range Exceedance
M = Sample Preservation Noncompliance
N = Internal Standard Noncompliance
N01 = Internal Standard Recovery Noncompliance Dioxins
N02 = Recovery Standard Noncompliance Dioxins
N03 = Clean-up Standard Noncompliance Dioxins
O = Poor Instrument Performance (i.e., base-time drifting)
P = Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q = Other problems (can encompass a number of issues; i.e.chromatography,interferences, etc.)
R = Surrogates Recovery Noncompliance
S = Pesticide/PCB Resolution
T = % Breakdown Noncompliance for DDT and Endrin
U = RPD between columns/detectors >40% for positive results determined via GC/HPLC
V = Non-linear calibrations; correlation coefficient $r < 0.995$
W = EMPC result
X = Signal to noise response drop
Y = Percent solids <30%
Z = Uncertainty at 2 standard deviations is greater than sample activity
Z1 = Tentatively Identified Compound considered presumptively present
Z2 = Tentatively Identified Compound column bleed

PROJ_NO: 00771	NSAMPLE	S43FB05-20120603			S43MW09D-Grab			S43MW09S-Grab			S43MW12-Grab		
SDG: 1206014	LAB_ID	1206014-14			1206014-10			1206014-09			1206014-12		
FRACTION: OV	SAMP_DATE	6/3/2012			6/2/2012			6/2/2012			6/3/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2,2-TETRACHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.42	J	P
1,2,3-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2,4-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DIBROMOETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,3-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,4-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,4-DIOXANE		10	UR	C	10	UR	C	10	UR	C	10	UR	C
2-BUTANONE		5	U		5	U		5	U		5	U	
2-HEXANONE		2.5	U		2.5	U		2.5	U		2.5	U	
4-METHYL-2-PENTANONE		2.5	U		2.5	U		2.5	U		2.5	U	
ACETONE		5	U		5.61	B	B	5	U		5	U	
BENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
BROMODICHLOROMETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
BROMOFORM		0.5	U		0.5	U		0.5	U		0.5	U	
BROMOMETHANE		1	U		1	U		1	U		1	U	
CARBON DISULFIDE		0.5	U		0.53	J	P	0.5	U		0.5	U	
CARBON TETRACHLORIDE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLORODIBROMOMETHANE		0.97	J	P	0.5	U		0.5	U		0.5	U	
CHLOROETHANE		1	U		1	U		1	U		1	U	
CHLOROFORM		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROMETHANE		0.5	U		0.5	U		0.48	J	P	0.5	U	
CIS-1,2-DICHLOROETHENE		0.5	U		0.5	U		0.66	J	P	4.2		
CYCLOHEXANE		0.5	U		0.5	U		0.5	U		0.5	U	
DICHLORODIFLUOROMETHANE		1	U		1	U		1	U		1	U	
ETHYLBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43RB04-20120603			S43TB05-20120601			S43TW36-2024			S43TW36-3034		
SDG: 1206014	LAB_ID	1206014-13			1206014-01			1206014-03			1206014-02		
FRACTION: OV	SAMP_DATE	6/3/2012			6/1/2012			6/1/2012			6/1/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2,2-TETRACHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2,3-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2,4-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DIBROMOETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,3-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,4-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,4-DIOXANE		10	UR	C	10	UR	C	10	UR	C	10	UR	C
2-BUTANONE		5.87	J	P	5	U		5	U		5	U	
2-HEXANONE		2.5	U		2.5	U		2.5	U		2.5	U	
4-METHYL-2-PENTANONE		2.5	U		2.5	U		2.5	U		2.5	U	
ACETONE		8.71	J	P	5	U		5	U		5	U	
BENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
BROMODICHLOROMETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
BROMOFORM		0.5	U		0.5	U		0.5	U		0.5	U	
BROMOMETHANE		1	U		1	U		1	U		1	U	
CARBON DISULFIDE		0.5	U		0.5	U		0.5	U		0.83	J	P
CARBON TETRACHLORIDE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLORODIBROMOMETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROETHANE		1	U		1	U		1	U		1	U	
CHLOROFORM		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROMETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
CIS-1,2-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		4.38		
CYCLOHEXANE		0.5	U		0.5	U		0.5	U		0.5	U	
DICHLORODIFLUOROMETHANE		1	U		1	U		1	U		1	U	
ETHYLBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43TW37-2024			S43TW37-2024-D			S43TW37-3135			S43TW38-1822		
SDG: 1206014	LAB_ID	1206014-04			1206014-05			1206014-06			1206014-07		
FRACTION: OV	SAMP_DATE	6/1/2012			6/1/2012			6/1/2012			6/2/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF				S43TW37-2024								
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2,2-TETRACHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2,3-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2,4-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DIBROMOETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,3-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,4-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,4-DIOXANE		10	UR	C	10	UR	C	10	UR	C	10	UR	C
2-BUTANONE		5	U		5	U		5	U		5	U	
2-HEXANONE		2.5	U		2.5	U		2.5	U		2.5	U	
4-METHYL-2-PENTANONE		2.5	U		2.5	U		2.5	U		2.5	U	
ACETONE		5	U		5	U		5	U		5	U	
BENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
BROMODICHLOROMETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
BROMOFORM		0.5	U		0.5	U		0.5	U		0.5	U	
BROMOMETHANE		1	U		1	U		1	U		1	U	
CARBON DISULFIDE		0.28	J	P	0.5	U		0.95	J	P	0.5	U	
CARBON TETRACHLORIDE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLORODIBROMOMETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROETHANE		1	U		1	U		1	U		1	U	
CHLOROFORM		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROMETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
CIS-1,2-DICHLOROETHENE		4.18			4.2			23.3			3.06		
CYCLOHEXANE		0.5	U		0.5	U		0.5	U		0.5	U	
DICHLORODIFLUOROMETHANE		1	U		1	U		1	U		1	U	
ETHYLBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43TW38-2832			S43TW39-0812		
SDG: 1206014	LAB_ID	1206014-08			1206014-11		
FRACTION: OV	SAMP_DATE	6/2/2012			6/2/2012		
MEDIA: WATER	QC_TYPE	NM			NM		
	UNITS	UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0		
	DUP_OF						
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		0.5	U		0.5	U	
1,1,2,2-TETRACHLOROETHANE		0.5	U		0.5	U	
1,1,2-TRICHLOROETHANE		0.5	U		0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		0.5	U		0.5	U	
1,1-DICHLOROETHANE		0.5	U		0.5	U	
1,1-DICHLOROETHENE		0.5	U		0.5	U	
1,2,3-TRICHLOROBENZENE		0.5	U		0.5	U	
1,2,4-TRICHLOROBENZENE		0.5	U		0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE		0.5	U		0.5	U	
1,2-DIBROMOETHANE		0.5	U		0.5	U	
1,2-DICHLOROBENZENE		0.5	U		0.5	U	
1,2-DICHLOROETHANE		0.5	U		0.5	U	
1,2-DICHLOROPROPANE		0.5	U		0.5	U	
1,3-DICHLOROPROPANE		0.5	U		0.5	U	
1,4-DICHLOROBENZENE		0.5	U		0.5	U	
1,4-DIOXANE		10	UR	C	10	UR	C
2-BUTANONE		5	U		3.38	B	B
2-HEXANONE		2.5	U		2.5	U	
4-METHYL-2-PENTANONE		2.5	U		2.5	U	
ACETONE		5	U		26.4	B	B
BENZENE		0.5	U		0.5	U	
BROMODICHLOROMETHANE		0.5	U		0.5	U	
BROMOFORM		0.5	U		0.5	U	
BROMOMETHANE		1	U		1	U	
CARBON DISULFIDE		0.5	U		0.88	J	P
CARBON TETRACHLORIDE		0.5	U		0.5	U	
CHLOROBENZENE		0.5	U		0.5	U	
CHLORODIBROMOMETHANE		0.5	U		0.5	U	
CHLOROETHANE		1	U		1	U	
CHLOROFORM		0.5	U		0.5	U	
CHLOROMETHANE		0.46	J	P	0.92	J	P
CIS-1,2-DICHLOROETHENE		2.45			8.64		
CYCLOHEXANE		0.5	U		0.5	U	
DICHLORODIFLUOROMETHANE		1	U		1	U	
ETHYLBENZENE		0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43FB05-20120603			S43MW09D-Grab			S43MW09S-Grab			S43MW12-Grab		
SDG: 1206014	LAB_ID	1206014-14			1206014-10			1206014-09			1206014-12		
FRACTION: OV	SAMP_DATE	6/3/2012			6/2/2012			6/2/2012			6/3/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
METHYL ACETATE		1	U		1	U		1	U		1	U	
METHYL TERT-BUTYL ETHER		0.5	U		0.5	U		0.5	U		0.5	U	
METHYLENE CHLORIDE		1	U		1	U		1	U		1	U	
STYRENE		0.5	U		0.5	U		0.5	U		0.5	U	
TETRACHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
TOLUENE		0.5	U		0.5	U		0.5	U		0.5	U	
TOTAL XYLENES		1	U		1	U		1	U		1	U	
TRANS-1,2-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.58	J	P
TRICHLOROETHENE		0.5	U		0.45	J	P	1.84			24.4		
TRICHLOROFLUOROMETHANE		1	U		1	U		1	U		1	U	
VINYL CHLORIDE		0.5	U		0.5	U		0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43RB04-20120603			S43TB05-20120601			S43TW36-2024			S43TW36-3034		
SDG: 1206014	LAB_ID	1206014-13			1206014-01			1206014-03			1206014-02		
FRACTION: OV	SAMP_DATE	6/3/2012			6/1/2012			6/1/2012			6/1/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
METHYL ACETATE		1	U		1	U		1	U		1	U	
METHYL TERT-BUTYL ETHER		0.5	U		0.5	U		0.5	U		0.5	U	
METHYLENE CHLORIDE		1	U		1	U		1	U		1	U	
STYRENE		0.5	U		0.5	U		0.5	U		0.5	U	
TETRACHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
TOLUENE		0.5	U		0.5	U		0.5	U		0.5	U	
TOTAL XYLENES		1	U		1	U		1	U		1	U	
TRANS-1,2-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.51	J	P
TRICHLOROETHENE		0.5	U		0.5	U		0.51	J	P	0.31	J	P
TRICHLOROFLUOROMETHANE		1	U		1	U		1	U		1	U	
VINYL CHLORIDE		0.5	U		0.5	U		0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43TW37-2024			S43TW37-2024-D			S43TW37-3135			S43TW38-1822		
SDG: 1206014	LAB_ID	1206014-04			1206014-05			1206014-06			1206014-07		
FRACTION: OV	SAMP_DATE	6/1/2012			6/1/2012			6/1/2012			6/2/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF				S43TW37-2024								
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
METHYL ACETATE		1	U		1	U		1	U		1	U	
METHYL TERT-BUTYL ETHER		0.5	U		0.5	U		0.5	U		0.5	U	
METHYLENE CHLORIDE		1	U		1	U		1	U		1	U	
STYRENE		0.5	U		0.5	U		0.5	U		0.5	U	
TETRACHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
TOLUENE		0.5	U		0.5	U		0.5	U		0.5	U	
TOTAL XYLENES		1	U		1	U		1	U		1	U	
TRANS-1,2-DICHLOROETHENE		0.5	U		0.5	U		0.8	J	P	0.5	U	
TRICHLOROETHENE		24.6			24.3			29			0.94	J	P
TRICHLOROFLUOROMETHANE		1	U		1	U		1	U		1	U	
VINYL CHLORIDE		0.5	J	CP	0.47	J	CP	20.6	J	C	0.73	J	CP

PROJ_NO: 00771	NSAMPLE	S43TW38-2832			S43TW39-0812		
SDG: 1206014	LAB_ID	1206014-08			1206014-11		
FRACTION: OV	SAMP_DATE	6/2/2012			6/2/2012		
MEDIA: WATER	QC_TYPE	NM			NM		
	UNITS	UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0		
	DUP_OF						
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		0.5	U		0.5	U	
METHYL ACETATE		1	U		1	U	
METHYL TERT-BUTYL ETHER		0.5	U		0.5	U	
METHYLENE CHLORIDE		1	U		1	U	
STYRENE		0.5	U		0.5	U	
TETRACHLOROETHENE		0.5	U		0.5	U	
TOLUENE		0.5	U		0.5	U	
TOTAL XYLENES		1	U		1	U	
TRANS-1,2-DICHLOROETHENE		0.46	J	P	0.5	U	
TRICHLOROETHENE		4.63			17.9		
TRICHLOROFLUOROMETHANE		1	U		1	U	
VINYL CHLORIDE		0.5	U		0.36	J	CP

Tetra Tech INC **INTERNAL CORRESPONDENCE**

TO:	**R. SOK**	**DATE:**	**JUNE 29, 2012**
FROM:	**J. KALINYAK**	**COPIES:**	**DV FILE**
SUBJECT:	**ORGANIC DATA VALIDATION – VOC NSF INDIAN HEAD, CTO 114 SAMPLE DELIVERY GROUP 1206114**		
SAMPLES:	7 / Soil / VOC		

S43TB06-20120618	S43TW40-3236	S43TW41-1822
S43TW41-1822-D	S43TW41-3337	S43TW42-1822
S43TW42-3337		

OVERVIEW

The sample set for NSF Indian Head, CTO 114, SDG 1206114, consisted of seven (7) aqueous samples, including one (1) trip blank sample. The samples were analyzed for volatile organic compounds (VOC), as listed above. One (1) field duplicate sample pair was contained within this sample delivery group (SDG): S43TW41-1822-D / S43TW41-1822.

The samples were collected by Tetra Tech on June 18, 2012 and analyzed by Empirical Laboratory LLC. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using EPA SW-846 Methods 8260B for VOCs, analysis and reporting protocols.

The data contained in this SDG were validated with regard to the following parameters: data completeness, hold times, GC/MS tuning, initial/continuing calibrations, laboratory method blank results, surrogate spike recoveries, blank spike results, internal standard recoveries, field duplicate results, chromatographic resolution, compound identification, compound quantitation, and detection limits. Areas of concern are listed below.

MAJOR

- The relative response factor (RRF) was less than the 0.05 quality control limit for the VOC 1,4-dioxane for the initial calibration on instrument MS-VOA6 on 04/27/12 and for all the continuing calibration verifications (CCV) for the instrument MS-VOA6 affecting all samples. All samples had non-detected results for 1,4-dioxane which were qualified rejected, (UR).

MINOR

- Positive results reported below the quantitation limit but above the method detection limit were qualified as estimated, (J).

- The VOC CCV percent difference (%D) was greater than the 20% and less than the 50% quality control limit for bromomethane, 2-butanone, 2-hexanone, carbon tetrachloride, 4-methyl-2-pentanone, 1,2,3-trichlorobenzene, and 1,2,4-trichlorobenzene for instrument MS-VOA6 on 06/19/12 @ 08:02.
  Affected Samples: All samples
  Action: The sample non-detected aforementioned analytes were not qualified. The sample positive 2-butanone result for sample S43TW41-3337 was qualified estimated, (J).

NOTES

Non-detected results were reported to the limit of detection (LOD).

EXECUTIVE SUMMARY

Laboratory Performance Issues: VOC sample 1,4-dioxane non-detected results were rejected due to RRF criteria non-compliances. A sample S43TW41-3337 positive 2-butanone result was qualified estimated due to a CCV %D non-compliance.

Other Factors Affecting Data Quality: Positive results reported below the quantitation limit but above the method detection limit were qualified as estimated (J).

The data for these analyses were reviewed with reference to the Region III modifications to U.S. EPA National Functional Guidelines for Organic Data Validation (Sept. 1994), USEPA SW-846 Methods 8260B and the Department of Defense (DoD) document entitled "Quality Systems Manual (QSM) for Environmental Laboratories" (April 2009).

Tetra Tech
Joseph Kalinyak
Chemist/Data Validator

Tetra Tech
Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:
Appendix A - Qualified Analytical Results
Appendix B - Results as reported by the Laboratory
Appendix C - Support Documentation

Appendix A

Qualified Analytical Results

DATA QUALIFICATION CODE (QUAL CODE)

Qualifier Codes:

A	=	Lab Blank Contamination
B	=	Field Blank Contamination
C	=	Calibration Noncompliance (i.e., % RSDs, %Ds, ICVs, CCVs, RRFs, etc.)
C01	=	GC/MS Tuning Noncompliance
D	=	MS/MSD Recovery Noncompliance
E	=	LCS/LCSD Recovery Noncompliance
F	=	Lab Duplicate Imprecision
G	=	Field Duplicate Imprecision
H	=	Holding Time Exceedance
I	=	ICP Serial Dilution Noncompliance
J	=	ICP PDS Recovery Noncompliance; MSA's $r < 0.995$
K	=	ICP Interference - includes ICS % R Noncompliance
L	=	Instrument Calibration Range Exceedance
M	=	Sample Preservation Noncompliance
N	=	Internal Standard Noncompliance
N01	=	Internal Standard Recovery Noncompliance Dioxins
N02	=	Recovery Standard Noncompliance Dioxins
N03	=	Clean-up Standard Noncompliance Dioxins
O	=	Poor Instrument Performance (i.e., base-time drifting)
P	=	Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q	=	Other problems (can encompass a number of issues; i.e.chromatography,interferences, etc.)
R	=	Surrogates Recovery Noncompliance
S	=	Pesticide/PCB Resolution
T	=	% Breakdown Noncompliance for DDT and Endrin
U	=	RPD between columns/detectors >40% for positive results determined via GC/HPLC
V	=	Non-linear calibrations; correlation coefficient $r < 0.995$
W	=	EMPC result
X	=	Signal to noise response drop
Y	=	Percent solids <30%
Z	=	Uncertainty at 2 sigma deviation is less than sample activity
Z1	=	Tentatively Identified Compound considered presumptively present
Z2	=	Tentatively Identified Compound column bleed

PROJ_NO: 00771	NSAMPLE	S43TB06-20120618			S43TW40-3236			S43TW41-1822			S43TW41-1822-D		
SDG: 1206114	LAB_ID	1206114-01			1206114-07			1206114-02			1206114-03		
FRACTION: OV	SAMP_DATE	6/18/2012			6/18/2012			6/18/2012			6/18/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF										S43TW41-1822		
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2,2-TETRACHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1-DICHLOROETHANE		0.5	U		0.5	U		0.74	J	P	0.72	J	P
1,1-DICHLOROETHENE		0.5	U		0.5	U		0.25	J	P	0.28	J	P
1,2,3-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2,4-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DIBROMOETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,3-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,4-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,4-DIOXANE		10	UR	C	10	UR	C	10	UR	C	10	UR	C
2-BUTANONE		5	U		5	U		5	U		5	U	
2-HEXANONE		2.5	U		2.5	U		2.5	U		2.5	U	
4-METHYL-2-PENTANONE		2.5	U		2.5	U		2.5	U		2.5	U	
ACETONE		5	U		8.63	J	P	5	U		5	U	
BENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
BROMODICHLOROMETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
BROMOFORM		0.5	U		0.5	U		0.5	U		0.5	U	
BROMOMETHANE		1	U		1	U		1	U		1	U	
CARBON DISULFIDE		0.5	U		0.5	U		0.5	U		0.5	U	
CARBON TETRACHLORIDE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLORODIBROMOMETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROETHANE		1	U		1	U		1	U		1	U	
CHLOROFORM		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROMETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
CIS-1,2-DICHLOROETHENE		0.5	U		0.5	U		13.4			13.6		
CYCLOHEXANE		0.5	U		0.5	U		0.5	U		0.5	U	
DICHLORODIFLUOROMETHANE		1	U		1	U		1	U		1	U	
ETHYLBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43TW41-3337			S43TW42-1822			S43TW42-3337		
SDG: 1206114	LAB_ID	1206114-04			1206114-05			1206114-06		
FRACTION: OV	SAMP_DATE	6/18/2012			6/18/2012			6/18/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0		
	DUP_OF									
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U	
1,1,2,2-TETRACHLOROETHANE		0.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		0.5	U		0.5	U		0.5	U	
1,1-DICHLOROETHANE		0.5	U		0.5	U		0.5	U	
1,1-DICHLOROETHENE		0.5	U		0.76	J	P	0.5	U	
1,2,3-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U	
1,2,4-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE		0.5	U		0.5	U		0.5	U	
1,2-DIBROMOETHANE		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROETHANE		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U	
1,3-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U	
1,4-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U	
1,4-DIOXANE		10	UR	C	10	UR	C	10	UR	C
2-BUTANONE		3.49	J	CP	5	U		5	U	
2-HEXANONE		2.5	U		2.5	U		2.5	U	
4-METHYL-2-PENTANONE		2.5	U		2.5	U		2.5	U	
ACETONE		23.8			14.3			19.8		
BENZENE		0.5	U		0.5	U		0.5	U	
BROMODICHLOROMETHANE		0.5	U		0.5	U		0.5	U	
BROMOFORM		0.5	U		0.5	U		0.5	U	
BROMOMETHANE		1	U		1	U		1	U	
CARBON DISULFIDE		0.5	U		0.5	U		0.5	U	
CARBON TETRACHLORIDE		0.5	U		0.5	U		0.5	U	
CHLOROBENZENE		0.5	U		0.5	U		0.5	U	
CHLORODIBROMOMETHANE		0.5	U		0.5	U		0.5	U	
CHLOROETHANE		1	U		1	U		1	U	
CHLOROFORM		0.5	U		0.13	J	P	0.5	U	
CHLOROMETHANE		0.5	U		0.5	U		0.5	U	
CIS-1,2-DICHLOROETHENE		0.5	U		30.7			10.7		
CYCLOHEXANE		0.5	U		0.5	U		0.5	U	
DICHLORODIFLUOROMETHANE		1	U		1	U		1	U	
ETHYLBENZENE		0.5	U		0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43TB06-20120618			S43TW40-3236			S43TW41-1822			S43TW41-1822-D		
SDG: 1206114	LAB_ID	1206114-01			1206114-07			1206114-02			1206114-03		
FRACTION: OV	SAMP_DATE	6/18/2012			6/18/2012			6/18/2012			6/18/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF										S43TW41-1822		
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
METHYL ACETATE		1	U		1	U		1	U		1	U	
METHYL TERT-BUTYL ETHER		0.5	U		0.5	U		0.5	U		0.5	U	
METHYLENE CHLORIDE		1	U		1	U		1	U		1	U	
STYRENE		0.5	U		0.5	U		0.5	U		0.5	U	
TETRACHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
TOLUENE		0.5	U		0.5	U		0.5	U		0.5	U	
TOTAL XYLENES		1	U		1	U		1	U		1	U	
TRANS-1,2-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
TRICHLOROETHENE		0.5	U		0.5	U		22.2			22.5		
TRICHLOROFLUOROMETHANE		1	U		1	U		1	U		1	U	
VINYL CHLORIDE		0.5	U		0.5	U		2.88			2.81		

PROJ_NO: 00771	NSAMPLE	S43TW41-3337			S43TW42-1822			S43TW42-3337		
SDG: 1206114	LAB_ID	1206114-04			1206114-05			1206114-06		
FRACTION: OV	SAMP_DATE	6/18/2012			6/18/2012			6/18/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0		
	DUP_OF									
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		0.5	U		0.5	U		0.5	U	
METHYL ACETATE		1	U		1	U		1	U	
METHYL TERT-BUTYL ETHER		0.5	U		0.5	U		0.5	U	
METHYLENE CHLORIDE		1.55	J	P	1.33	J	P	1.4	J	P
STYRENE		0.5	U		0.5	U		0.5	U	
TETRACHLOROETHENE		0.5	U		0.5	U		0.5	U	
TOLUENE		0.5	U		0.5	U		0.5	U	
TOTAL XYLENES		1	U		1	U		1	U	
TRANS-1,2-DICHLOROETHENE		0.5	U		0.64	J	P	0.42	J	P
TRICHLOROETHENE		0.5	U		137			8.75		
TRICHLOROFLUOROMETHANE		1	U		1	U		1	U	
VINYL CHLORIDE		0.5	U		2.37			6.25		

Tetra Tech INC **INTERNAL CORRESPONDENCE**

TO:	**R. SOK**	**DATE:**	**JULY 2, 2012**
FROM:	**J. KALINYAK**	**COPIES:**	**DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – VOC**
NSF INDIAN HEAD, CTO 114
SAMPLE DELIVERY GROUP 1206131

SAMPLES: 7 / Soil / VOC

S43TB07-20120619	S43TW40-2226	S43TW43-1519
S43TW44-1317	S43TW45-2024	S43TW49-1721
S43TW49-1721-D		

OVERVIEW

The sample set for NSF Indian Head, CTO 114, SDG 1206131, consisted of seven (7) aqueous samples, including one (1) trip blank sample. The samples were analyzed for volatile organic compounds (VOC), as listed above. One (1) field duplicate sample pair was contained within this sample delivery group (SDG): S43TW49-1721-D / S43TW49-1721.

The samples were collected by Tetra Tech on June 19, 2012 and analyzed by Empirical Laboratory LLC. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using EPA SW-846 Methods 8260B for VOCs, analysis and reporting protocols.

The data contained in this SDG were validated with regard to the following parameters: data completeness, hold times, GC/MS tuning, initial/continuing calibrations, laboratory method blank results, surrogate spike recoveries, blank spike results, matrix spike/matrix spike duplicate results, internal standard recoveries, field duplicate results, chromatographic resolution, compound identification, compound quantitation, and detection limits. Areas of concern are listed below.

MAJOR

- The relative response factor (RRF) was less than the 0.05 quality control limit for the VOC 1,4-dioxane for the initial calibration on instrument MS-VOA6 on 04/27/12 and for all the continuing calibration verifications (CCV) for the instrument MS-VOA6 affecting all samples. All samples had non-detected results for 1,4-dioxane which were qualified rejected, (UR).

MINOR

- Positive results reported below the quantitation limit but above the method detection limit were qualified as estimated, (J).

- The percent recovery (%R) was less than the quality control limit for trichloroethene for the matrix spike (MS) and MS duplicate (MSD) for spiked sample S43TW45-2024. The sample S43TW45-2024 positive trichloroethene result was qualified estimated, (J).

NOTES

Non-detected results were reported to the limit of detection (LOD).

Sample S43TW45-2024 was analyzed at a 5X dilution only resulting in elevated results for non-detected VOCs.

A laboratory VOC contaminant was detected in the method blank at the following maximum concentration affecting all samples.

Analytes	Maximum Conc. µg/l	Action Level µg/l
1,2,3-Trichlorobenzene [1]	0.270	1.350

[1] Method blank MB 2F20008 affecting all samples.

An action level of five times the maximum level for the laboratory contaminant 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. No sample results were qualified for method blank contamination.

The VOC CCV percent difference (%D) was greater than the 20% and less than the 50% quality control limit for bromomethane, chloromethane, 4-methyl-2-pentanone, 1,2,3-trichlorobenzene, and 1,2,4-trichlorobenzene for instrument MS-VOA6 on 06/20/12 @ 08:33.

Affected Samples: All samples

Action: All sample aforementioned analyte results were non-detected and were not qualified.

EXECUTIVE SUMMARY

Laboratory Performance Issues: VOC sample 1,4-dioxane non-detected results were rejected due to RRF criteria non-compliances.

Other Factors Affecting Data Quality: Positive results reported below the quantitation limit but above the method detection limit were qualified as estimated (J). A sample S43TW45-2024 positive trichloroethene result was qualified due to a MS/MSD %R non-compliance.

The data for these analyses were reviewed with reference to the Region III modifications to U.S. EPA National Functional Guidelines for Organic Data Validation (Sept. 1994), USEPA SW-846 Methods 8260B and the Department of Defense (DoD) document entitled "Quality Systems Manual (QSM) for Environmental Laboratories" (April 2009).

Tetra Tech
Joseph Kalinyak
Chemist/Data Validator

Tetra Tech
Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:
Appendix A - Qualified Analytical Results
Appendix B - Results as reported by the Laboratory
Appendix C - Support Documentation

Appendix A

Qualified Analytical Results

DATA QUALIFICATION CODE (QUAL CODE)

Qualifier Codes:

A	=	Lab Blank Contamination
B	=	Field Blank Contamination
C	=	Calibration Noncompliance (i.e., % RSDs, %Ds, ICVs, CCVs, RRFs, etc.)
C01	=	GC/MS Tuning Noncompliance
D	=	MS/MSD Recovery Noncompliance
E	=	LCS/LCSD Recovery Noncompliance
F	=	Lab Duplicate Imprecision
G	=	Field Duplicate Imprecision
H	=	Holding Time Exceedance
I	=	ICP Serial Dilution Noncompliance
J	=	ICP PDS Recovery Noncompliance; MSA's $r < 0.995$
K	=	ICP Interference - includes ICS % R Noncompliance
L	=	Instrument Calibration Range Exceedance
M	=	Sample Preservation Noncompliance
N	=	Internal Standard Noncompliance
N01	=	Internal Standard Recovery Noncompliance Dioxins
N02	=	Recovery Standard Noncompliance Dioxins
N03	=	Clean-up Standard Noncompliance Dioxins
O	=	Poor Instrument Performance (i.e., base-time drifting)
P	=	Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q	=	Other problems (can encompass a number of issues; i.e.chromatography,interferences, etc.)
R	=	Surrogates Recovery Noncompliance
S	=	Pesticide/PCB Resolution
T	=	% Breakdown Noncompliance for DDT and Endrin
U	=	RPD between columns/detectors >40% for positive results determined via GC/HPLC
V	=	Non-linear calibrations; correlation coefficient $r < 0.995$
W	=	EMPC result
X	=	Signal to noise response drop
Y	=	Percent solids <30%
Z	=	Uncertainty at 2 sigma deviation is less than sample activity
Z1	=	Tentatively Identified Compound considered presumptively present
Z2	=	Tentatively Identified Compound column bleed

PROJ_NO: 00771	NSAMPLE	S43TB07-20120619			S43TW40-2226			S43TW43-1519			S43TW44-1317		
SDG: 1206131	LAB_ID	1206131-01			1206131-03			1206131-02			1206131-04		
FRACTION: OV	SAMP_DATE	6/19/2012			6/19/2012			6/19/2012			6/19/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		0.5	U		0.5	U		0.96	J	P	2.54		
1,1,2,2-TETRACHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1-DICHLOROETHANE		0.5	U		0.5	U		8.89			3.37		
1,1-DICHLOROETHENE		0.5	U		0.5	U		3.27			4.97		
1,2,3-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2,4-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DIBROMOETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,3-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,4-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,4-DIOXANE		10	UR	C	10	UR	C	10	UR	C	10	UR	C
2-BUTANONE		5	U		5	U		5	U		5	U	
2-HEXANONE		2.5	U		2.5	U		2.5	U		2.5	U	
4-METHYL-2-PENTANONE		2.5	U		2.5	U		2.5	U		2.5	U	
ACETONE		5	U		5	U		5	U		5	U	
BENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
BROMODICHLOROMETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
BROMOFORM		0.5	U		0.5	U		0.5	U		0.5	U	
BROMOMETHANE		1	U		1	U		1	U		1	U	
CARBON DISULFIDE		0.5	U		0.5	U		0.5	U		0.5	U	
CARBON TETRACHLORIDE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLORODIBROMOMETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROETHANE		1	U		1	U		1	U		1	U	
CHLOROFORM		0.5	U		0.5	U		0.15	J	P	0.25	J	P
CHLOROMETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
CIS-1,2-DICHLOROETHENE		0.5	U		1.57			0.5	U		0.87	J	P
CYCLOHEXANE		0.5	U		0.5	U		0.5	U		0.5	U	
DICHLORODIFLUOROMETHANE		1	U		1	U		1	U		1	U	
ETHYLBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43TW45-2024			S43TW49-1721			S43TW49-1721-D		
SDG: 1206131	LAB_ID	1206131-05			1206131-06			1206131-07		
FRACTION: OV	SAMP_DATE	6/19/2012			6/19/2012			6/19/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0		
	DUP_OF							S43TW49-1721		
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		1.95	J	P	2.01			1.93		
1,1,2,2-TETRACHLOROETHANE		2.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROETHANE		2.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		2.5	U		0.5	U		0.5	U	
1,1-DICHLOROETHANE		1.55	J	P	23.3			23		
1,1-DICHLOROETHENE		2.5	U		5.74			5.66		
1,2,3-TRICHLOROBENZENE		2.5	U		0.5	U		0.5	U	
1,2,4-TRICHLOROBENZENE		2.5	U		0.5	U		0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE		2.5	U		0.5	U		0.5	U	
1,2-DIBROMOETHANE		2.5	U		0.5	U		0.5	U	
1,2-DICHLOROBENZENE		2.5	U		0.5	U		0.5	U	
1,2-DICHLOROETHANE		2.5	U		0.62	J	P	0.62	J	P
1,2-DICHLOROPROPANE		2.5	U		0.5	U		0.5	U	
1,3-DICHLOROPROPANE		2.5	U		0.5	U		0.5	U	
1,4-DICHLOROBENZENE		2.5	U		0.5	U		0.5	U	
1,4-DIOXANE		50	UR	C	10	UR	C	10	UR	C
2-BUTANONE		25	U		5	U		5	U	
2-HEXANONE		12.5	U		2.5	U		2.5	U	
4-METHYL-2-PENTANONE		12.5	U		2.5	U		2.5	U	
ACETONE		25	U		5	U		5	U	
BENZENE		2.5	U		0.5	U		0.5	U	
BROMODICHLOROMETHANE		2.5	U		0.5	U		0.5	U	
BROMOFORM		2.5	U		0.5	U		0.5	U	
BROMOMETHANE		5	U		1	U		1	U	
CARBON DISULFIDE		3	J	P	0.5	U		0.5	U	
CARBON TETRACHLORIDE		2.5	U		0.5	U		0.5	U	
CHLOROBENZENE		2.5	U		0.5	U		0.5	U	
CHLORODIBROMOMETHANE		2.5	U		0.5	U		0.5	U	
CHLOROETHANE		5	U		1	U		1	U	
CHLOROFORM		2.5	U		0.5	U		0.5	U	
CHLOROMETHANE		2.5	U		0.5	U		0.5	U	
CIS-1,2-DICHLOROETHENE		2.5	U		0.5	U		0.5	U	
CYCLOHEXANE		2.5	U		0.5	U		0.5	U	
DICHLORODIFLUOROMETHANE		5	U		1	U		1	U	
ETHYLBENZENE		2.5	U		0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43TB07-20120619			S43TW40-2226			S43TW43-1519			S43TW44-1317		
SDG: 1206131	LAB_ID	1206131-01			1206131-03			1206131-02			1206131-04		
FRACTION: OV	SAMP_DATE	6/19/2012			6/19/2012			6/19/2012			6/19/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
METHYL ACETATE		1	U		1	U		1	U		1	U	
METHYL TERT-BUTYL ETHER		0.5	U		0.5	U		0.5	U		0.5	U	
METHYLENE CHLORIDE		1	U		1	U		1	U		1	U	
STYRENE		0.5	U		0.5	U		0.5	U		0.5	U	
TETRACHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
TOLUENE		0.5	U		0.5	U		0.5	U		0.5	U	
TOTAL XYLENES		1	U		1	U		1	U		1	U	
TRANS-1,2-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
TRICHLOROETHENE		0.5	U		102			1.11			8.14		
TRICHLOROFLUOROMETHANE		1	U		1	U		1	U		1	U	
VINYL CHLORIDE		0.5	U		0.5	U		0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43TW45-2024			S43TW49-1721			S43TW49-1721-D		
SDG: 1206131	LAB_ID	1206131-05			1206131-06			1206131-07		
FRACTION: OV	SAMP_DATE	6/19/2012			6/19/2012			6/19/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0		
	DUP_OF							S43TW49-1721		
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		2.5	U		0.5	U		0.5	U	
METHYL ACETATE		5	U		1	U		1	U	
METHYL TERT-BUTYL ETHER		2.5	U		0.5	U		0.5	U	
METHYLENE CHLORIDE		5	U		1	U		1	U	
STYRENE		2.5	U		0.5	U		0.5	U	
TETRACHLOROETHENE		2.5	U		0.5	U		0.5	U	
TOLUENE		2.5	U		0.5	U		0.5	U	
TOTAL XYLENES		5	U		1	U		1	U	
TRANS-1,2-DICHLOROETHENE		2.5	U		0.5	U		0.5	U	
TRICHLOROETHENE		731	J	D	1.53			1.43		
TRICHLOROFLUOROMETHANE		5	U		1	U		1	U	
VINYL CHLORIDE		2.5	U		0.5	U		0.5	U	

Tetra Tech INC **INTERNAL CORRESPONDENCE**

TO:	**R. SOK**	**DATE:**	**JULY 2, 2012**
FROM:	**J. KALINYAK**	**COPIES:**	**DV FILE**
SUBJECT:	**ORGANIC DATA VALIDATION – VOC NSF INDIAN HEAD, CTO 114 SAMPLE DELIVERY GROUP 1206141**		
SAMPLES:	4 / Soil / VOC		

S43SP01-01 S43TB08-20120620 S43TW48-4044
S43TW50-1822

OVERVIEW

The sample set for NSF Indian Head, CTO 114, SDG 1206141, consisted of four (4) aqueous samples, including one (1) trip blank sample. The samples were analyzed for volatile organic compounds (VOC), as listed above. No field duplicate samples were contained within this sample delivery group (SDG).

The samples were collected by Tetra Tech on June 20, 2012 and analyzed by Empirical Laboratory LLC. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using EPA SW-846 Methods 8260B for VOCs, analysis and reporting protocols.

The data contained in this SDG were validated with regard to the following parameters: data completeness, hold times, GC/MS tuning, initial/continuing calibrations, laboratory method blank results, surrogate spike recoveries, blank spike results, internal standard recoveries, field duplicate results, chromatographic resolution, compound identification, compound quantitation, and detection limits. Areas of concern are listed below.

MAJOR

- The relative response factor (RRF) was less than the 0.05 quality control limit for the VOC 1,4-dioxane for the initial calibration on instrument MS-VOA6 on 04/27/12 and for all the continuing calibration verifications (CCV) for the instrument MS-VOA6 affecting all samples. All samples had non-detected results for 1,4-dioxane which were qualified rejected, (UR).

MINOR

- Positive results reported below the quantitation limit but above the method detection limit were qualified as estimated, (J).

- The percent recovery (%R) was less than the quality control limit for 1,2,3-trichlorobenzene, and 1,2,4-trichlorobenzene for the laboratory control sample (LCS) and the LCS/LCS duplicate %R relative percent difference (RPD) was greater than the quality control limit, for batch 2F21016 affecting all of the samples. The sample non-detected results for 1,2,3-trichlorobenzene, and 1,2,4-trichlorobenzene were qualified estimated, (UJ).

NOTES

Non-detected results were reported to the limit of detection (LOD).

Sample S43SP01-01 was analyzed at a 2X dilution resulting in elevated results for non-detected analytes.

The VOC CCV percent difference (%D) was greater than the 20% and less than the 50% quality control limit for bromomethane, 1,4-dioxane, 1,2,3-trichlorobenzene, and 1,2,4-trichlorobenzene for instrument MS-VOA6 on 06/21/12 @ 08:46.

Affected Samples: All samples

Action: All sample aforementioned analyte results were non-detected. The bromomethane, 1,2,3-trichlorobenzene, and 1,2,4-trichlorobenzene non-detected results were not qualified. The 1,4-dioxane sample results were rejected for RRF criteria non-compliances and no further validation action was necessary.

The LCS %R was greater than the quality control limit for 1,1,2,2-tetrachloroethane for batch 2F21016 affecting all of the samples. Additionally the bromomethane and chloromethane LCS/LCSD RPD results were greater than the quality control limit for the batch 2F21016. No validation action was taken for the non-detected sample results for these issues.

EXECUTIVE SUMMARY

Laboratory Performance Issues: VOC sample 1,4-dioxane non-detected results were rejected due to RRF criteria non-compliances. Sample1,2,3-trichlorobenzene, and 1,2,4-trichlorobenzene non-detected results were qualified for LCS %R and LCS/LCSD RPD non-compliances.

Other Factors Affecting Data Quality: Positive results reported below the quantitation limit but above the method detection limit were qualified as estimated (J).

The data for these analyses were reviewed with reference to the Region III modifications to U.S. EPA National Functional Guidelines for Organic Data Validation (Sept. 1994), USEPA SW-846 Methods 8260B and the Department of Defense (DoD) document entitled "Quality Systems Manual (QSM) for Environmental Laboratories" (April 2009).

Tetra Tech
Joseph Kalinyak
Chemist/Data Validator

Tetra Tech
Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:
Appendix A - Qualified Analytical Results
Appendix B - Results as reported by the Laboratory
Appendix C - Support Documentation

Appendix A

Qualified Analytical Results

DATA QUALIFICATION CODE (QUAL CODE)

Qualifier Codes:

A	=	Lab Blank Contamination
B	=	Field Blank Contamination
C	=	Calibration Noncompliance (i.e., % RSDs, %Ds, ICVs, CCVs, RRFs, etc.)
C01	=	GC/MS Tuning Noncompliance
D	=	MS/MSD Recovery Noncompliance
E	=	LCS/LCSD Recovery Noncompliance
F	=	Lab Duplicate Imprecision
G	=	Field Duplicate Imprecision
H	=	Holding Time Exceedance
I	=	ICP Serial Dilution Noncompliance
J	=	ICP PDS Recovery Noncompliance; MSA's $r < 0.995$
K	=	ICP Interference - includes ICS % R Noncompliance
L	=	Instrument Calibration Range Exceedance
M	=	Sample Preservation Noncompliance
N	=	Internal Standard Noncompliance
N01	=	Internal Standard Recovery Noncompliance Dioxins
N02	=	Recovery Standard Noncompliance Dioxins
N03	=	Clean-up Standard Noncompliance Dioxins
O	=	Poor Instrument Performance (i.e., base-time drifting)
P	=	Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q	=	Other problems (can encompass a number of issues; i.e.chromatography,interferences, etc.)
R	=	Surrogates Recovery Noncompliance
S	=	Pesticide/PCB Resolution
T	=	% Breakdown Noncompliance for DDT and Endrin
U	=	RPD between columns/detectors >40% for positive results determined via GC/HPLC
V	=	Non-linear calibrations; correlation coefficient $r < 0.995$
W	=	EMPC result
X	=	Signal to noise response drop
Y	=	Percent solids <30%
Z	=	Uncertainty at 2 sigma deviation is less than sample activity
Z1	=	Tentatively Identified Compound considered presumptively present
Z2	=	Tentatively Identified Compound column bleed

PROJ_NO: 00771	NSAMPLE	S43SP01-01			S43TB08-20120620			S43TW48-4044			S43TW50-1822		
SDG: 1206141	LAB_ID	1206141-04			1206141-01			1206141-03			1206141-02		
FRACTION: OV	SAMP_DATE	6/20/2012			6/20/2012			6/20/2012			6/20/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		2.36			0.5	U		0.5	U		0.5	U	
1,1,2,2-TETRACHLOROETHANE		1	U		0.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROETHANE		1	U		0.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		1	U		0.5	U		0.5	U		0.5	U	
1,1-DICHLOROETHANE		1	U		0.5	U		0.5	U		0.5	U	
1,1-DICHLOROETHENE		1	U		0.5	U		0.5	U		0.5	U	
1,2,3-TRICHLOROBENZENE		1	UJ	E	0.5	UJ	E	0.5	UJ	E	0.5	UJ	E
1,2,4-TRICHLOROBENZENE		1	UJ	E	0.5	UJ	E	0.5	UJ	E	0.5	UJ	E
1,2-DIBROMO-3-CHLOROPROPANE		1	U		0.5	U		0.5	U		0.5	U	
1,2-DIBROMOETHANE		1	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROBENZENE		1	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROETHANE		1	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROPROPANE		1	U		0.5	U		0.5	U		0.5	U	
1,3-DICHLOROPROPANE		1	U		0.5	U		0.5	U		0.5	U	
1,4-DICHLOROBENZENE		1	U		0.5	U		0.5	U		0.5	U	
1,4-DIOXANE		20	UR	C	10	UR	C	10	UR	C	10	UR	C
2-BUTANONE		10	U		5	U		5	U		5	U	
2-HEXANONE		5	U		2.5	U		2.5	U		2.5	U	
4-METHYL-2-PENTANONE		5	U		2.5	U		2.5	U		2.5	U	
ACETONE		10	U		5	U		4.45	J	P	5	U	
BENZENE		1	U		0.5	U		0.5	U		0.5	U	
BROMODICHLOROMETHANE		1	U		0.5	U		0.5	U		0.5	U	
BROMOFORM		1	U		0.5	U		0.5	U		0.5	U	
BROMOMETHANE		2	U		1	U		1	U		1	U	
CARBON DISULFIDE		1	U		0.5	U		0.5	U		0.5	U	
CARBON TETRACHLORIDE		1	U		0.5	U		0.5	U		0.5	U	
CHLOROBENZENE		1	U		0.5	U		0.5	U		0.5	U	
CHLORODIBROMOMETHANE		1	U		0.5	U		0.5	U		0.5	U	
CHLOROETHANE		2	U		1	U		1	U		1	U	
CHLOROFORM		1	U		0.5	U		0.5	U		0.5	U	
CHLOROMETHANE		1	U		0.5	U		0.5	U		0.5	U	
CIS-1,2-DICHLOROETHENE		3.62			0.5	U		0.5	U		0.5	U	
CYCLOHEXANE		1	U		0.5	U		0.5	U		0.5	U	
DICHLORODIFLUOROMETHANE		2	U		1	U		1	U		1	U	
ETHYLBENZENE		1	U		0.5	U		0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43SP01-01			S43TB08-20120620			S43TW48-4044			S43TW50-1822		
SDG: 1206141	LAB_ID	1206141-04			1206141-01			1206141-03			1206141-02		
FRACTION: OV	SAMP_DATE	6/20/2012			6/20/2012			6/20/2012			6/20/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		1	U		0.5	U		0.5	U		0.5	U	
METHYL ACETATE		2	U		1	U		1	U		1	U	
METHYL TERT-BUTYL ETHER		1	U		0.5	U		0.5	U		0.5	U	
METHYLENE CHLORIDE		2	U		1	U		1	U		1	U	
STYRENE		1	U		0.5	U		0.5	U		0.5	U	
TETRACHLOROETHENE		0.24	J	P	0.5	U		0.5	U		0.5	U	
TOLUENE		1	U		0.5	U		0.5	U		0.5	U	
TOTAL XYLENES		2	U		1	U		1	U		1	U	
TRANS-1,2-DICHLOROETHENE		1	U		0.5	U		0.5	U		0.5	U	
TRICHLOROETHENE		354			0.5	U		0.5	U		0.5	U	
TRICHLOROFLUOROMETHANE		2	U		1	U		1	U		1	U	
VINYL CHLORIDE		1	U		0.5	U		0.5	U		0.5	U	

Tetra Tech INC **INTERNAL CORRESPONDENCE**

TO:	**R. SOK**	**DATE:**	**JULY 2, 2012**
FROM:	**J. KALINYAK**	**COPIES:**	**DV FILE**
SUBJECT:	**ORGANIC DATA VALIDATION – VOC NSF INDIAN HEAD, CTO 114 SAMPLE DELIVERY GROUP 1206151**		
SAMPLES:	13 / Aqueous / VOC		

S43FB06-20120622	S43RB05-20120622	S43SP02-01
S43TB09-20120621	S43TW47-1014	S43TW51-1721
S43TW52-1014	S43TW53-1317	S43TW53-2428
S43TW53-2428-D	S43TW54-1721	S43TW55-1822
S43TW56-1620		

OVERVIEW

The sample set for NSF Indian Head, CTO 114, SDG 1206151, consisted of thirteen (13) aqueous samples, including one (1) trip blank sample, one (1) rinse blank sample, and one (1) field blank sample. The samples were analyzed for volatile organic compounds (VOC), as listed above. One (1) field duplicate sample pair was contained within this sample delivery group (SDG); S43TW53-2428-D / S43TW53-2428.

The samples were collected by Tetra Tech on June 21, 2012 and analyzed by Empirical Laboratory LLC. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using EPA SW-846 Methods 8260B for VOCs, analysis and reporting protocols.

The data contained in this SDG were validated with regard to the following parameters: data completeness, hold times, GC/MS tuning, initial/continuing calibrations, laboratory method blank results, surrogate spike recoveries, blank spike results, internal standard recoveries, field duplicate results, chromatographic resolution, compound identification, compound quantitation, and detection limits. Areas of concern are listed below.

MAJOR

- The relative response factor (RRF) was less than the 0.05 criteria for the VOC 1,4-dioxane for the initial calibration on instrument MS-VOA6 on 04/27/12 and for the continuing calibration verification (CCV) RRF for the instrument MS-VOA6 affecting all samples. All samples had non-detected results for 1,4-dioxane which were qualified rejected, (UR).

MINOR

- Positive results reported below the quantitation limit but above the method detection limit were qualified as estimated, (J).

- The trip blank sample S43TB09-20120621 was stated to have "... observable headspace". As a result of the sample headspace described, all sample S43TB09-20120621 non-detected results were qualified estimated, (UJ), with the exception of the non-detected 1,4-dioxane result which was rejected due to and RRF criteria non-compliance.

- The common laboratory VOC contaminants were detected in the rinse blank sample S43RB05-20120622 at the following concentrations.

Analyte	Maximum Conc. µg/l	Action Level µg/l
Acetone	10.0	100.0
2-Butanone	6.27	62.7

An action level of 10X the maximum concentration for the common laboratory contaminants was established to evaluate the sample for blank contamination. Sample aliquot and dilution factors, if applicable, were taken into account when applying the action level. Sample acetone results less than the action level were qualified, (B), due to method blank contamination.

NOTES

Non-detected results were reported to the limit of detection (LOD).

The VOC CCV percent difference (%D) was greater than the 20% and less than the 50% quality control limit for 4-methyl-2-pentanone for instrument MS-VOA6 on 06/25/12 @ 07:50.
Affected Samples: All samples
Action: All sample 4-methyl-2-pentanone results were non-detected and were not qualified.

EXECUTIVE SUMMARY

Laboratory Performance Issues: VOC sample 1,4-dioxane non-detected results were rejected due to RRF criteria non-compliances. Sample acetone results were qualified due to rinse blank contamination.

Other Factors Affecting Data Quality: Positive results reported below the quantitation limit but above the method detection limit were qualified as estimated (J). Sample trip blank sample non-detected results were qualified due to headspace in the sample as described by the laboratory.

The data for these analyses were reviewed with reference to the Region III modifications to U.S. EPA National Functional Guidelines for Organic Data Validation (Sept. 1994), USEPA SW-846 Methods 8260B and the Department of Defense (DoD) document entitled "Quality Systems Manual (QSM) for Environmental Laboratories" (April 2009).

Tetra Tech
Joseph Kalinyak
Chemist/Data Validator

Tetra Tech
Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:
Appendix A - Qualified Analytical Results
Appendix B - Results as reported by the Laboratory
Appendix C - Support Documentation

Appendix A

Qualified Analytical Results

DATA QUALIFICATION CODE (QUAL CODE)

Qualifier Codes:

A	=	Lab Blank Contamination
B	=	Field Blank Contamination
C	=	Calibration Noncompliance (i.e., % RSDs, %Ds, ICVs, CCVs, RRFs, etc.)
C01	=	GC/MS Tuning Noncompliance
D	=	MS/MSD Recovery Noncompliance
E	=	LCS/LCSD Recovery Noncompliance
F	=	Lab Duplicate Imprecision
G	=	Field Duplicate Imprecision
H	=	Holding Time Exceedance
I	=	ICP Serial Dilution Noncompliance
J	=	ICP PDS Recovery Noncompliance; MSA's $r < 0.995$
K	=	ICP Interference - includes ICS % R Noncompliance
L	=	Instrument Calibration Range Exceedance
M	=	Sample Preservation Noncompliance
N	=	Internal Standard Noncompliance
N01	=	Internal Standard Recovery Noncompliance Dioxins
N02	=	Recovery Standard Noncompliance Dioxins
N03	=	Clean-up Standard Noncompliance Dioxins
O	=	Poor Instrument Performance (i.e., base-time drifting)
P	=	Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q	=	Other problems (can encompass a number of issues; i.e.chromatography,interferences, etc.)
R	=	Surrogates Recovery Noncompliance
S	=	Pesticide/PCB Resolution
T	=	% Breakdown Noncompliance for DDT and Endrin
U	=	RPD between columns/detectors >40% for positive results determined via GC/HPLC
V	=	Non-linear calibrations; correlation coefficient $r < 0.995$
W	=	EMPC result
X	=	Signal to noise response drop
Y	=	Percent solids <30%
Z	=	Uncertainty at 2 sigma deviation is less than sample activity
Z1	=	Tentatively Identified Compound considered presumptively present
Z2	=	Tentatively Identified Compound column bleed

PROJ_NO: 00771	NSAMPLE	S43FB06-20120622			S43RB05-20120622			S43SP02-01			S43TB09-20120621		
SDG: 1206151	LAB_ID	1206151-14			1206151-10			1206151-06			1206151-01		
FRACTION: OV	SAMP_DATE	6/22/2012			6/22/2012			6/21/2012			6/21/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	UJ	Q
1,1,2,2-TETRACHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	UJ	Q
1,1,2-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	UJ	Q
1,1,2-TRICHLOROTRIFLUOROETHANE		0.5	U		0.5	U		0.5	U		0.5	UJ	Q
1,1-DICHLOROETHANE		0.5	U		0.5	U		0.49	J	P	0.5	UJ	Q
1,1-DICHLOROETHENE		0.5	U		0.5	U		4.43			0.5	UJ	Q
1,2,3-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	UJ	Q
1,2,4-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	UJ	Q
1,2-DIBROMO-3-CHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	UJ	Q
1,2-DIBROMOETHANE		0.5	U		0.5	U		0.5	U		0.5	UJ	Q
1,2-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	UJ	Q
1,2-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	UJ	Q
1,2-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	UJ	Q
1,3-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	UJ	Q
1,4-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	UJ	Q
1,4-DIOXANE		10	UR	C	10	UR	C	10	UR	C	10	UR	C
2-BUTANONE		5	U		6.27	J	P	5	U		5	UJ	Q
2-HEXANONE		2.5	U		2.5	U		2.5	U		2.5	UJ	Q
4-METHYL-2-PENTANONE		2.5	U		2.5	U		2.5	U		2.5	UJ	Q
ACETONE		5	U		10			25.8	B	B	5	UJ	Q
BENZENE		0.5	U		0.5	U		0.5	U		0.5	UJ	Q
BROMODICHLOROMETHANE		0.5	U		0.5	U		0.5	U		0.5	UJ	Q
BROMOFORM		0.5	U		0.5	U		0.5	U		0.5	UJ	Q
BROMOMETHANE		1	U		1	U		1	U		1	UJ	Q
CARBON DISULFIDE		0.5	U		0.5	U		0.5	U		0.5	UJ	Q
CARBON TETRACHLORIDE		0.5	U		0.5	U		0.5	U		0.5	UJ	Q
CHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	UJ	Q
CHLORODIBROMOMETHANE		0.5	U		0.5	U		0.5	U		0.5	UJ	Q
CHLOROETHANE		1	U		1	U		1	U		1	UJ	Q
CHLOROFORM		0.5	U		0.5	U		0.5	U		0.5	UJ	Q
CHLOROMETHANE		0.5	U		0.5	U		0.5	U		0.5	UJ	Q
CIS-1,2-DICHLOROETHENE		0.5	U		0.5	U		195			0.5	UJ	Q
CYCLOHEXANE		0.5	U		0.5	U		0.5	U		0.5	UJ	Q
DICHLORODIFLUOROMETHANE		1	U		1	U		1	U		1	UJ	Q
ETHYLBENZENE		0.5	U		0.5	U		0.5	U		0.5	UJ	Q

PROJ_NO: 00771	NSAMPLE	S43TW47-1014			S43TW51-1721			S43TW52-1014			S43TW53-1317		
SDG: 1206151	LAB_ID	1206151-02			1206151-04			1206151-05			1206151-09		
FRACTION: OV	SAMP_DATE	6/21/2012			6/21/2012			6/21/2012			6/22/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		0.88	J	P	0.5	U		0.5	U		0.5	U	
1,1,2,2-TETRACHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1-DICHLOROETHANE		5.84			0.5	U		0.5	U		0.55	J	P
1,1-DICHLOROETHENE		3.47			0.5	U		0.5	U		0.5	U	
1,2,3-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2,4-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DIBROMOETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,3-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,4-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,4-DIOXANE		10	UR	C	10	UR	C	10	UR	C	10	UR	C
2-BUTANONE		5	U		5	U		5	U		5	U	
2-HEXANONE		2.5	U		2.5	U		2.5	U		2.5	U	
4-METHYL-2-PENTANONE		2.5	U		2.5	U		2.5	U		2.5	U	
ACETONE		31.4	B	B	5	U		19.7	B	B	12.2	B	B
BENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
BROMODICHLOROMETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
BROMOFORM		0.5	U		0.5	U		0.5	U		0.5	U	
BROMOMETHANE		1	U		1	U		1	U		1	U	
CARBON DISULFIDE		0.69	J	P	0.5	U		0.5	U		0.5	U	
CARBON TETRACHLORIDE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLORODIBROMOMETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROETHANE		1	U		1	U		1	U		1	U	
CHLOROFORM		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROMETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
CIS-1,2-DICHLOROETHENE		1.32			0.5	U		0.5	U		12.4		
CYCLOHEXANE		0.5	U		0.5	U		0.5	U		0.5	U	
DICHLORODIFLUOROMETHANE		1	U		1	U		1	U		1	U	
ETHYLBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43TW53-2428			S43TW53-2428-D			S43TW54-1721			S43TW55-1822		
SDG: 1206151	LAB_ID	1206151-07			1206151-08			1206151-11			1206151-13		
FRACTION: OV	SAMP_DATE	6/22/2012			6/22/2012			6/22/2012			6/22/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF				S43TW53-2428								
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2,2-TETRACHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2,3-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2,4-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DIBROMOETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,3-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,4-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,4-DIOXANE		10	UR	C	10	UR	C	10	UR	C	10	UR	C
2-BUTANONE		5	U		5	U		5	U		5	U	
2-HEXANONE		2.5	U		2.5	U		2.5	U		2.5	U	
4-METHYL-2-PENTANONE		2.5	U		2.5	U		2.5	U		2.5	U	
ACETONE		5	U		5	U		5	U		5	U	
BENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
BROMODICHLOROMETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
BROMOFORM		0.5	U		0.5	U		0.5	U		0.5	U	
BROMOMETHANE		1	U		1	U		1	U		1	U	
CARBON DISULFIDE		0.5	U		0.5	U		0.5	U		0.5	U	
CARBON TETRACHLORIDE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLORODIBROMOMETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROETHANE		1	U		1	U		1	U		1	U	
CHLOROFORM		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROMETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
CIS-1,2-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
CYCLOHEXANE		0.5	U		0.5	U		0.5	U		0.5	U	
DICHLORODIFLUOROMETHANE		1	U		1	U		1	U		1	U	
ETHYLBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43TW56-1620
SDG: 1206151	LAB_ID	1206151-12
FRACTION: OV	SAMP_DATE	6/22/2012
MEDIA: WATER	QC_TYPE	NM
	UNITS	UG/L
	PCT_SOLIDS	0.0
	DUP_OF	

PARAMETER	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE	0.5	U	
1,1,2,2-TETRACHLOROETHANE	0.5	U	
1,1,2-TRICHLOROETHANE	0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE	0.5	U	
1,1-DICHLOROETHANE	0.5	U	
1,1-DICHLOROETHENE	0.5	U	
1,2,3-TRICHLOROBENZENE	0.5	U	
1,2,4-TRICHLOROBENZENE	0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE	0.5	U	
1,2-DIBROMOETHANE	0.5	U	
1,2-DICHLOROBENZENE	0.5	U	
1,2-DICHLOROETHANE	0.5	U	
1,2-DICHLOROPROPANE	0.5	U	
1,3-DICHLOROPROPANE	0.5	U	
1,4-DICHLOROBENZENE	0.5	U	
1,4-DIOXANE	10	UR	C
2-BUTANONE	5	U	
2-HEXANONE	2.5	U	
4-METHYL-2-PENTANONE	2.5	U	
ACETONE	5	U	
BENZENE	0.5	U	
BROMODICHLOROMETHANE	0.5	U	
BROMOFORM	0.5	U	
BROMOMETHANE	1	U	
CARBON DISULFIDE	0.5	U	
CARBON TETRACHLORIDE	0.5	U	
CHLOROBENZENE	0.5	U	
CHLORODIBROMOMETHANE	0.5	U	
CHLOROETHANE	1	U	
CHLOROFORM	0.5	U	
CHLOROMETHANE	0.5	U	
CIS-1,2-DICHLOROETHENE	0.5	U	
CYCLOHEXANE	0.5	U	
DICHLORODIFLUOROMETHANE	1	U	
ETHYLBENZENE	0.5	U	

PROJ_NO: 00771	NSAMPLE	S43FB06-20120622			S43RB05-20120622			S43SP02-01			S43TB09-20120621		
SDG: 1206151	LAB_ID	1206151-14			1206151-10			1206151-06			1206151-01		
FRACTION: OV	SAMP_DATE	6/22/2012			6/22/2012			6/21/2012			6/21/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		0.5	U		0.5	U		0.5	U		0.5	UJ	Q
METHYL ACETATE		1	U		1	U		1	U		1	UJ	Q
METHYL TERT-BUTYL ETHER		0.5	U		0.5	U		0.5	U		0.5	UJ	Q
METHYLENE CHLORIDE		1	U		1	U		0.65	J	P	1	UJ	Q
STYRENE		0.5	U		0.5	U		0.5	U		0.5	UJ	Q
TETRACHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	UJ	Q
TOLUENE		0.5	U		0.5	U		0.5	U		0.5	UJ	Q
TOTAL XYLENES		1	U		1	U		1	U		1	UJ	Q
TRANS-1,2-DICHLOROETHENE		0.5	U		0.5	U		1.09			0.5	UJ	Q
TRICHLOROETHENE		0.5	U		0.5	U		28.7			0.5	UJ	Q
TRICHLOROFLUOROMETHANE		1	U		1	U		1	U		1	UJ	Q
VINYL CHLORIDE		0.5	U		0.5	U		1.16			0.5	UJ	Q

PROJ_NO: 00771	NSAMPLE	S43TW47-1014			S43TW51-1721			S43TW52-1014			S43TW53-1317		
SDG: 1206151	LAB_ID	1206151-02			1206151-04			1206151-05			1206151-09		
FRACTION: OV	SAMP_DATE	6/21/2012			6/21/2012			6/21/2012			6/22/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
METHYL ACETATE		1	U		1	U		1	U		1	U	
METHYL TERT-BUTYL ETHER		0.5	U		0.5	U		0.5	U		0.5	U	
METHYLENE CHLORIDE		0.63	J	P	1	U		0.53	J	P	1	U	
STYRENE		0.5	U		0.5	U		0.5	U		0.5	U	
TETRACHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
TOLUENE		0.5	U		0.5	U		0.5	U		0.5	U	
TOTAL XYLENES		1	U		1	U		1	U		1	U	
TRANS-1,2-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
TRICHLOROETHENE		1.58			0.5	U		0.5	U		1		
TRICHLOROFLUOROMETHANE		1	U		1	U		1	U		1	U	
VINYL CHLORIDE		0.5	U		0.5	U		0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43TW53-2428			S43TW53-2428-D			S43TW54-1721			S43TW55-1822		
SDG: 1206151	LAB_ID	1206151-07			1206151-08			1206151-11			1206151-13		
FRACTION: OV	SAMP_DATE	6/22/2012			6/22/2012			6/22/2012			6/22/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF				S43TW53-2428								
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
METHYL ACETATE		1	U		1	U		1	U		1	U	
METHYL TERT-BUTYL ETHER		0.5	U		0.5	U		0.5	U		0.5	U	
METHYLENE CHLORIDE		1	U		1	U		1	U		1	U	
STYRENE		0.5	U		0.5	U		0.5	U		0.5	U	
TETRACHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
TOLUENE		0.5	U		0.5	U		0.5	U		0.5	U	
TOTAL XYLENES		1	U		1	U		1	U		1	U	
TRANS-1,2-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
TRICHLOROETHENE		0.5	U		0.5	U		1.79			0.5	U	
TRICHLOROFLUOROMETHANE		1	U		1	U		1	U		1	U	
VINYL CHLORIDE		0.5	U		0.5	U		0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43TW56-1620
SDG: 1206151	LAB_ID	1206151-12
FRACTION: OV	SAMP_DATE	6/22/2012
MEDIA: WATER	QC_TYPE	NM
	UNITS	UG/L
	PCT_SOLIDS	0.0
	DUP_OF	

PARAMETER	RESULT	VQL	QLCD
ISOPROPYLBENZENE	0.5	U	
METHYL ACETATE	1	U	
METHYL TERT-BUTYL ETHER	0.5	U	
METHYLENE CHLORIDE	1	U	
STYRENE	0.5	U	
TETRACHLOROETHENE	0.5	U	
TOLUENE	0.5	U	
TOTAL XYLENES	1	U	
TRANS-1,2-DICHLOROETHENE	0.5	U	
TRICHLOROETHENE	0.5	U	
TRICHLOROFLUOROMETHANE	1	U	
VINYL CHLORIDE	0.5	U	

Tetra Tech INC **INTERNAL CORRESPONDENCE**

TO:	**R. SOK**	**DATE:**	**JULY 27, 2012**
FROM:	**J. KALINYAK**	**COPIES:**	**DV FILE**
SUBJECT:	**ORGANIC DATA VALIDATION – VOC NSF INDIAN HEAD, CTO 114 SAMPLE DELIVERY GROUP 1207073**		
SAMPLES:	3 / Aqueous / VOC		

S43TB10-20120709 S43TW57-1923 S43TW57-2933

OVERVIEW

The sample set for NSF Indian Head, CTO 114, SDG 1207073, consisted of three (3) aqueous samples, including one (1) trip blank sample. The samples were analyzed for volatile organic compounds (VOC), as listed above. No field duplicate sample pairs were contained within this sample delivery group (SDG).

The samples were collected by Tetra Tech on July 7, 12, and 13, 2012 and analyzed by Empirical Laboratory LLC. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using EPA SW-846 Method 8260B for VOCs, analysis and reporting protocols.

The data contained in this SDG were validated with regard to the following parameters: data completeness, hold times, GC/MS tuning, initial/continuing calibrations, laboratory method blank results, surrogate spike recoveries, blank spike results, internal standard recoveries, field duplicate results, chromatographic resolution, compound identification, compound quantitation, and detection limits. Areas of concern are listed below.

MAJOR

- The relative response factor (RRF) was less than the 0.05 criteria for the VOC 1,4-dioxane for the initial calibration on instrument MS-VOA3 on 07/05/12 and for the continuing calibration verification (CCV) RRF for the instrument MS-VOA3 affecting all samples. All samples had non-detected results for 1,4-dioxane which were qualified rejected, (UR).

MINOR

- Positive results reported below the quantitation limit but above the method detection limit were qualified as estimated, (J).

- The trip blank sample S43TB10-20120709 was stated to have "... observable headspace". As a result of the sample headspace described, all sample S43TB10-20120709 positive and non-detected results were qualified estimated, (J) and (UJ), respectively, with the exception of the non-detected 1,4-dioxane result which was rejected due to an RRF criteria non-compliance.

- The common laboratory VOC contaminants were detected in the trip blank sample S43TB10-20120709 at the following concentrations.

Analyte	Maximum Conc. µg/l	Action Level µg/l
Methylene chloride	0.5	5.0

An action level of 10X the maximum concentration for the common laboratory contaminant methylene chloride was established to evaluate the samples for trip blank contamination. Sample aliquot and dilution factors, if applicable, were taken into account when applying the action level. Sample S43TW57-1923 methylene chloride results less than the action level were qualified, (B), due to method blank contamination.

NOTES

Non-detected results were reported to the limit of detection (LOD).

Samples were diluted as listed below resulting in elevated levels for non-detected analytes.

Sample	Dilution
S43TW57-1923	5X
S43TW57-1923	10X

The VOC CCV percent difference (%D) was greater than the 20% and less than the 50% quality control limit for bromodichloromethane, carbon tetrachloride, chloromethane, dichlorodifluoromethane, 1,2-dichloroethane, 1,2-dichloropropane, methyl acetate, and 4-methyl-2-pentanone for instrument MS-VOA3 on 07/16/12 @ 10:49.

Affected Samples: All samples

Action: All sample aforementioned analytes were non-detected and were not qualified.

EXECUTIVE SUMMARY

Laboratory Performance Issues: VOC sample 1,4-dioxane non-detected results were rejected due to RRF criteria non-compliances. Sample S43TW57-1923 methylene chloride result was qualified due to trip blank contamination.

Other Factors Affecting Data Quality: Positive results reported below the quantitation limit but above the method detection limit were qualified as estimated (J). Sample trip blank sample non-detected results were qualified due to headspace in the sample as described by the laboratory.

The data for these analyses were reviewed with reference to the Region III modifications to U.S. EPA National Functional Guidelines for Organic Data Validation (Sept. 1994), USEPA SW-846 Methods 8260B and the Department of Defense (DoD) document entitled "Quality Systems Manual (QSM) for Environmental Laboratories" (April 2009).

Tetra Tech
Joseph Kalinyak
Chemist/Data Validator

Tetra Tech
Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:
Appendix A - Qualified Analytical Results
Appendix B - Results as reported by the Laboratory
Appendix C - Support Documentation

APPENDIX A

QUALIFIED ANALYTICAL RESULTS

DATA QUALIFICATION CODE (QUAL CODE)

Qualifier Codes:

A	=	Lab Blank Contamination
B	=	Field Blank Contamination
C	=	Calibration Noncompliance (i.e., % RSDs, %Ds, ICVs, CCVs, RRFs, etc.)
C01	=	GC/MS Tuning Noncompliance
D	=	MS/MSD Recovery Noncompliance
E	=	LCS/LCSD Recovery Noncompliance
F	=	Lab Duplicate Imprecision
G	=	Field Duplicate Imprecision
H	=	Holding Time Exceedance
I	=	ICP Serial Dilution Noncompliance
J	=	ICP PDS Recovery Noncompliance; MSA's $r < 0.995$
K	=	ICP Interference - includes ICS % R Noncompliance
L	=	Instrument Calibration Range Exceedance
M	=	Sample Preservation Noncompliance
N	=	Internal Standard Noncompliance
N01	=	Internal Standard Recovery Noncompliance Dioxins
N02	=	Recovery Standard Noncompliance Dioxins
N03	=	Clean-up Standard Noncompliance Dioxins
O	=	Poor Instrument Performance (i.e., base-time drifting)
P	=	Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q	=	Other problems (can encompass a number of issues; i.e.chromatography,interferences, etc.)
R	=	Surrogates Recovery Noncompliance
S	=	Pesticide/PCB Resolution
T	=	% Breakdown Noncompliance for DDT and Endrin
U	=	RPD between columns/detectors >40% for positive results determined via GC/HPLC
V	=	Non-linear calibrations; correlation coefficient $r < 0.995$
W	=	EMPC result
X	=	Signal to noise response drop
Y	=	Percent solids <30%
Z	=	Uncertainty at 2 sigma deviation is less than sample activity
Z1	=	Tentatively Identified Compound considered presumptively present
Z2	=	Tentatively Identified Compound column bleed

PROJ_NO: 00771	NSAMPLE	S43TB10-20120709			S43TW57-1923			S43TW57-2933		
SDG: 1207073	LAB_ID	1207073-01			1207073-02			1207073-03		
FRACTION: OV	SAMP_DATE	7/9/2012			7/12/2012			7/13/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0		
	DUP_OF									
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		0.5	UJ	Q	5	U		2.5	U	
1,1,2,2-TETRACHLOROETHANE		0.5	UJ	Q	5	U		2.5	U	
1,1,2-TRICHLOROETHANE		0.5	UJ	Q	5	U		2.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		0.5	UJ	Q	5	U		2.5	U	
1,1-DICHLOROETHANE		0.5	UJ	Q	5	U		2.5	U	
1,1-DICHLOROETHENE		0.5	UJ	Q	5	U		2.5	U	
1,2,3-TRICHLOROBENZENE		0.5	UJ	Q	5	U		2.5	U	
1,2,4-TRICHLOROBENZENE		0.5	UJ	Q	5	U		2.5	U	
1,2-DIBROMO-3-CHLOROPROPANE		0.5	UJ	Q	5	U		2.5	U	
1,2-DIBROMOETHANE		0.5	UJ	Q	5	U		2.5	U	
1,2-DICHLOROBENZENE		0.5	UJ	Q	5	U		2.5	U	
1,2-DICHLOROETHANE		0.5	UJ	Q	5	U		2.5	U	
1,2-DICHLOROPROPANE		0.5	UJ	Q	5	U		2.5	U	
1,3-DICHLOROPROPANE		0.5	UJ	Q	5	U		2.5	U	
1,4-DICHLOROBENZENE		0.5	UJ	Q	5	U		2.5	U	
1,4-DIOXANE		10	UR	C	100	UR	C	50	UR	C
2-BUTANONE		5	UJ	Q	50	U		25	U	
2-HEXANONE		2.5	UJ	Q	25	U		12.5	U	
4-METHYL-2-PENTANONE		2.5	UJ	Q	25	U		12.5	U	
ACETONE		5	UJ	Q	50	U		25	U	
BENZENE		0.5	UJ	Q	5	U		2.5	U	
BROMODICHLOROMETHANE		0.5	UJ	Q	5	U		2.5	U	
BROMOFORM		0.5	UJ	Q	5	U		2.5	U	
BROMOMETHANE		1	UJ	Q	10	U		5	U	
CARBON DISULFIDE		0.5	UJ	Q	5	U		2.5	U	
CARBON TETRACHLORIDE		0.5	UJ	Q	5	U		2.5	U	
CHLOROBENZENE		0.5	UJ	Q	5	U		2.5	U	
CHLORODIBROMOMETHANE		0.5	UJ	Q	5	U		2.5	U	
CHLOROETHANE		1	UJ	Q	10	U		5	U	
CHLOROFORM		0.5	UJ	Q	5	U		2.5	U	
CHLOROMETHANE		0.5	UJ	Q	5	U		2.5	U	
CIS-1,2-DICHLOROETHENE		0.5	UJ	Q	87.7			205		
CYCLOHEXANE		0.5	UJ	Q	5	U		2.5	U	
DICHLORODIFLUOROMETHANE		1	UJ	Q	10	U		5	U	
ETHYLBENZENE		0.5	UJ	Q	5	U		2.5	U	

PROJ_NO: 00771	NSAMPLE	S43TB10-20120709			S43TW57-1923			S43TW57-2933		
SDG: 1207073	LAB_ID	1207073-01			1207073-02			1207073-03		
FRACTION: OV	SAMP_DATE	7/9/2012			7/12/2012			7/13/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0		
	DUP_OF									
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		0.5	UJ	Q	5	U		2.5	U	
METHYL ACETATE		1	UJ	Q	10	U		5	U	
METHYL TERT-BUTYL ETHER		0.5	UJ	Q	5	U		2.5	U	
METHYLENE CHLORIDE		0.5	J	PQ	5.1	B	B	5	U	
STYRENE		0.5	UJ	Q	5	U		2.5	U	
TETRACHLOROETHENE		0.5	UJ	Q	5	U		2.5	U	
TOLUENE		0.5	UJ	Q	5	U		2.5	U	
TOTAL XYLENES		1	UJ	Q	10	U		5	U	
TRANS-1,2-DICHLOROETHENE		0.5	UJ	Q	5	U		3.75	J	P
TRICHLOROETHENE		0.5	UJ	Q	766			259		
TRICHLOROFLUOROMETHANE		1	UJ	Q	10	U		5	U	
VINYL CHLORIDE		0.5	UJ	Q	5	U		47.9		

Tetra Tech INC **INTERNAL CORRESPONDENCE**

TO:	**R. SOK**	**DATE:**	**SEPTEMBER 24, 2012**
FROM:	**J. KALINYAK**	**COPIES:**	**DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – VOC / EXPLOSIVES / NITROGUANIDINE**
NSF INDIAN HEAD, CTO 114
SAMPLE DELIVERY GROUP 1207112

SAMPLES: 7 / Aqueous / VOC

S43MW2001	S43MW2201	S43MW2301
S43MW2401	S43MW2501	S43MW2601
S43TB11-20120718		

6 / Aqueous / Explosives / Nitroguanidine

S43MW2001	S43MW2201	S43MW2301
S43MW2401	S43MW2501	S43MW2601

OVERVIEW

The sample set for NSF Indian Head, CTO 114, SDG 1207112, consisted of seven (7) aqueous samples including one (1) aqueous trip blank sample. All samples were analyzed for volatile organic compounds (VOC) and six (6) of the samples were analyzed for explosives, including nitroguanidine, as listed above. No field duplicate sample pairs were contained within this sample delivery group (SDG).

The samples were collected by Tetra Tech on July 18, 19, and 20, 2012 and analyzed by Empirical Laboratory LLC. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using EPA SW-846 Methods 8260B for VOCs, 8330B for explosives, and 8330A/IAAP for nitroguanidine, analysis and reporting protocols.

The data contained in this SDG were validated with regard to the following parameters: data completeness, hold times, GC/MS tuning, initial/continuing calibrations, laboratory method blank results, surrogate spike recoveries, blank spike results, internal standard recoveries, field duplicate results, chromatographic resolution, compound identification, compound quantitation, and detection limits. Areas of concern are listed below.

MAJOR

- The relative response factor (RRF) was less than the 0.05 criteria for the VOC 1,4-dioxane for the initial calibration on instrument MS-VOA4 on 04/13/12 and for all the continuing calibration verifications (CCV) for instrument MS-VOA4 affecting all samples. All samples had non-detected results for 1,4-dioxane which were qualified rejected, (UR).

MINOR

- Positive results reported below the quantitation limit but above the method detection limit were qualified as estimated, (J).

- The VOC CCV percent difference (%D) was greater than the 20% and less than the 50% quality control limit for 2-butanone, 4-methyl-2-pentanone, and 1,4-dioxane for instrument MS-VOA4 on 07/26/12 @ 10:03.

  Affected Samples:

S43MW2001	S43MW2201	S43MW2301
S43MW2401	S43MW2501	S43MW2601
S43TB11-20120718		

  Action: The affected sample 1,4-dioxane results were qualified rejected for RRF criteria non-compliances and no further validation action was necessary. The positive sample S43MW2401 2-butanone result was qualified estimated, (J). The remaining sample 2-butanone and 4-methyl-2-pentanone non-detected results were not qualified.

- Field blank explosive contaminants were detected in the field blank sample S43FB07-20120722 (from SDG 1207127) at the following concentrations. The field blank sample S43FB07-20120722 was applied to all relevant SDGs.

Analyte	Maximum Conc. µg/l	Action Level µg/l
2-Amino-4,6-dinitrotoluene	0.227	1.135
2-Nitrotoluene	1.65	8.25
Nitrobenzene	0.45	2.25
Nitroglycerin	0.37	1.85
RDX	0.217	1.085

  An action level of 5X the maximum concentration for the laboratory contaminants were established to evaluate the samples for blank contamination. Sample aliquot and dilution factors, if applicable, were taken into account when applying the action level. Samples explosive results less than the action level were qualified, (B), due to the field blank sample contamination.

- The explosives and nitroguanidine analysis relative percent differences (RPD) between the two analytical column results were greater than the 40% quality control limit for some sample positive explosives results. The positive explosives results for these samples were qualified estimated, (J), and reported from the HPLC1 column except when the RPD exceeded 100%. In cases when the positive column result RPDs exceeded 100%, the laboratory indicated matrix interferences and reported the lower of the two column positive results (also qualified estimated, (J)). The table below lists the samples, analytes qualified, and RPDs.

Sample	Analyte	RPD
S43MW2401	1,3-Dinitrobenzene	152%
	4-Nitrotoluene	160%
	Tetryl	94%
S43MW2501	1,3-Dinitrobenzene	105%
	3-Nitrotoluene	99%
	4-Nitrotoluene	134%

NOTES

The sample S43MW2001 was analyzed for VOC analytes at a 10X dilution, as listed below, resulting in elevated detection limits for the non-detected VOC analytes.

The laboratory explosives surrogate standard recovery and retention time (RT) summary forms were missing the retention times for the surrogate 1-chloro-3-nitrobenzene for the column 2 for a number of samples, blanks, CCVs, etc. making it appear that there were quality control limit retention time exceedances. The data validation chemist added the correct retention times from the raw data to the RT

summary forms for the affected samples. All sample surrogate standard retention times were within the quality control limits.

Non-detected results were reported to the limit of detection (LOD).

EXECUTIVE SUMMARY

Laboratory Performance Issues: VOC sample 1,4-dioxane non-detected results were rejected due to RRF non-compliances. Sample VOC results were qualified for CCV %D non-compliances.

Other Factors Affecting Data Quality: Positive results reported below the quantitation limit but above the method detection limit were qualified as estimated (J). Sample explosive analyte results were qualified for field blank sample contamination. Sample positive explosive results were qualified for analytical column RPD non-compliances.

The data for these analyses were reviewed with reference to the Region III modifications to U.S. EPA National Functional Guidelines for Organic Data Validation (Sept. 1994), USEPA SW-846 Methods 8260B, 8330A, and 8330B, and the Department of Defense (DoD) document entitled "Quality Systems Manual (QSM) for Environmental Laboratories" (April 2009).

Tetra Tech
Joseph Kalinyak
Chemist/Data Validator

Tetra Tech
Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:
Appendix A - Qualified Analytical Results
Appendix B - Results as reported by the Laboratory
Appendix C - Support Documentation

Appendix A

Qualified Analytical Results

DATA QUALIFICATION CODE (QUAL CODE)

Qualifier Codes:

A	=	Lab Blank Contamination
B	=	Field Blank Contamination
C	=	Calibration Noncompliance (i.e., % RSDs, %Ds, ICVs, CCVs, RRFs, etc.)
C01	=	GC/MS Tuning Noncompliance
D	=	MS/MSD Recovery Noncompliance
E	=	LCS/LCSD Recovery Noncompliance
F	=	Lab Duplicate Imprecision
G	=	Field Duplicate Imprecision
H	=	Holding Time Exceedance
I	=	ICP Serial Dilution Noncompliance
J	=	ICP PDS Recovery Noncompliance; MSA's $r < 0.995$
K	=	ICP Interference - includes ICS % R Noncompliance
L	=	Instrument Calibration Range Exceedance
M	=	Sample Preservation Noncompliance
N	=	Internal Standard Noncompliance
N01	=	Internal Standard Recovery Noncompliance Dioxins
N02	=	Recovery Standard Noncompliance Dioxins
N03	=	Clean-up Standard Noncompliance Dioxins
O	=	Poor Instrument Performance (i.e., base-time drifting)
P	=	Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q	=	Other problems (can encompass a number of issues; i.e.chromatography,interferences, etc.)
R	=	Surrogates Recovery Noncompliance
S	=	Pesticide/PCB Resolution
T	=	% Breakdown Noncompliance for DDT and Endrin
U	=	RPD between columns/detectors >40% for positive results determined via GC/HPLC
V	=	Non-linear calibrations; correlation coefficient $r < 0.995$
W	=	EMPC result
X	=	Signal to noise response drop
Y	=	Percent solids <30%
Z	=	Uncertainty at 2 sigma deviation is less than sample activity
Z1	=	Tentatively Identified Compound considered presumptively present
Z2	=	Tentatively Identified Compound column bleed

PROJ_NO: 00771	NSAMPLE	S43MW2001			S43MW2201			S43MW2301			S43MW2401		
SDG: 1207112	LAB_ID	1207112-04			1207112-06			1207112-12			1207112-08		
FRACTION: OV	SAMP_DATE	7/19/2012			7/19/2012			7/20/2012			7/20/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		11.1			0.37	J	P	0.5	U		3.67		
1,1,2,2-TETRACHLOROETHANE		5	U		0.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROETHANE		5	U		0.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		5	U		0.5	U		0.5	U		0.5	U	
1,1-DICHLOROETHANE		5	U		3.49			0.4	J	P	39.6		
1,1-DICHLOROETHENE		5	U		2.04			0.5	U		8.6		
1,2,3-TRICHLOROBENZENE		5	U		0.5	U		0.5	U		0.5	U	
1,2,4-TRICHLOROBENZENE		5	U		0.5	U		0.5	U		0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE		5	U		0.5	U		0.5	U		0.5	U	
1,2-DIBROMOETHANE		5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROBENZENE		5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROETHANE		5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROPROPANE		5	U		0.5	U		0.5	U		0.5	U	
1,3-DICHLOROPROPANE		5	U		0.5	U		0.5	U		0.5	U	
1,4-DICHLOROBENZENE		5	U		0.5	U		0.5	U		0.5	U	
1,4-DIOXANE		100	UR	C	10	UR	C	10	UR	C	10	UR	C
2-BUTANONE		50	U		5	U		5	U		4.04	J	CP
2-HEXANONE		25	U		2.5	U		2.5	U		2.5	U	
4-METHYL-2-PENTANONE		25	U		2.5	U		2.5	U		2.5	U	
ACETONE		50	U		5	U		5	U		7.56	J	P
BENZENE		5	U		0.5	U		0.5	U		0.5	U	
BROMODICHLOROMETHANE		5	U		0.5	U		0.5	U		0.5	U	
BROMOFORM		5	U		0.5	U		0.5	U		0.5	U	
BROMOMETHANE		10	U		1	U		1	U		1	U	
CARBON DISULFIDE		5	U		0.5	U		0.5	U		0.5	U	
CARBON TETRACHLORIDE		5	U		0.5	U		0.5	U		0.5	U	
CHLOROBENZENE		5	U		0.5	U		0.5	U		0.5	U	
CHLORODIBROMOMETHANE		5	U		0.5	U		0.5	U		0.5	U	
CHLOROETHANE		10	U		1	U		1	U		1	U	
CHLOROFORM		5	U		0.5	U		0.5	U		0.5	U	
CHLOROMETHANE		5	U		0.5	U		0.5	U		0.5	U	
CIS-1,2-DICHLOROETHENE		2.5	J	P	0.5	U		0.5	U		0.5	U	
CYCLOHEXANE		5	U		0.5	U		0.5	U		0.5	U	
DICHLORODIFLUOROMETHANE		10	U		1	U		1	U		1	U	
ETHYLBENZENE		5	U		0.5	U		0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43MW2501			S43MW2601			S43TB11-20120718		
SDG: 1207112	LAB_ID	1207112-10			1207112-02			1207112-01		
FRACTION: OV	SAMP_DATE	7/20/2012			7/18/2012			7/18/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0		
	DUP_OF									
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U	
1,1,2,2-TETRACHLOROETHANE		0.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		0.5	U		0.5	U		0.5	U	
1,1-DICHLOROETHANE		0.76	J	P	0.5	U		0.5	U	
1,1-DICHLOROETHENE		0.8	J	P	0.5	U		0.5	U	
1,2,3-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U	
1,2,4-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE		0.5	U		0.5	U		0.5	U	
1,2-DIBROMOETHANE		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROETHANE		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U	
1,3-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U	
1,4-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U	
1,4-DIOXANE		10	UR	C	10	UR	C	10	UR	C
2-BUTANONE		5	U		5	U		5	U	
2-HEXANONE		2.5	U		2.5	U		2.5	U	
4-METHYL-2-PENTANONE		2.5	U		2.5	U		2.5	U	
ACETONE		5	U		5	U		5	U	
BENZENE		0.5	U		0.5	U		0.5	U	
BROMODICHLOROMETHANE		0.5	U		0.5	U		0.5	U	
BROMOFORM		0.5	U		0.5	U		0.5	U	
BROMOMETHANE		1	U		1	U		1	U	
CARBON DISULFIDE		0.5	U		0.5	U		0.5	U	
CARBON TETRACHLORIDE		0.5	U		0.5	U		0.5	U	
CHLOROBENZENE		0.5	U		0.5	U		0.5	U	
CHLORODIBROMOMETHANE		0.5	U		0.5	U		0.5	U	
CHLOROETHANE		1	U		1	U		1	U	
CHLOROFORM		0.5	U		0.5	U		0.5	U	
CHLOROMETHANE		0.5	U		0.5	U		0.5	U	
CIS-1,2-DICHLOROETHENE		1			0.5	U		0.5	U	
CYCLOHEXANE		0.5	U		0.5	U		0.5	U	
DICHLORODIFLUOROMETHANE		1	U		1	U		1	U	
ETHYLBENZENE		0.5	U		0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43MW2001			S43MW2201			S43MW2301			S43MW2401		
SDG: 1207112	LAB_ID	1207112-04			1207112-06			1207112-12			1207112-08		
FRACTION: OV	SAMP_DATE	7/19/2012			7/19/2012			7/20/2012			7/20/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		5	U		0.5	U		0.5	U		0.5	U	
METHYL ACETATE		10	U		1	U		1	U		1	U	
METHYL TERT-BUTYL ETHER		5	U		0.5	U		0.5	U		0.5	U	
METHYLENE CHLORIDE		10	U		1	U		1	U		1	U	
STYRENE		5	U		0.5	U		0.5	U		0.5	U	
TETRACHLOROETHENE		5	U		0.5	U		0.5	U		0.5	U	
TOLUENE		5	U		0.5	U		0.5	U		0.5	U	
TOTAL XYLENES		10	U		1	U		1	U		1	U	
TRANS-1,2-DICHLOROETHENE		5	U		0.5	U		0.5	U		0.5	U	
TRICHLOROETHENE		1390			0.54	J	P	1.59			0.5	U	
TRICHLOROFLUOROMETHANE		10	U		1	U		1	U		1	U	
VINYL CHLORIDE		5	U		0.5	U		0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43MW2501			S43MW2601			S43TB11-20120718		
SDG: 1207112	LAB_ID	1207112-10			1207112-02			1207112-01		
FRACTION: OV	SAMP_DATE	7/20/2012			7/18/2012			7/18/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0		
	DUP_OF									
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		0.5	U		0.5	U		0.5	U	
METHYL ACETATE		1	U		1	U		1	U	
METHYL TERT-BUTYL ETHER		0.5	U		0.5	U		0.5	U	
METHYLENE CHLORIDE		1	U		1	U		1	U	
STYRENE		0.5	U		0.5	U		0.5	U	
TETRACHLOROETHENE		0.5	U		0.5	U		0.5	U	
TOLUENE		0.5	U		0.5	U		0.5	U	
TOTAL XYLENES		1	U		1	U		1	U	
TRANS-1,2-DICHLOROETHENE		0.5	U		0.5	U		0.5	U	
TRICHLOROETHENE		9.22			0.51	J	P	0.5	U	
TRICHLOROFLUOROMETHANE		1	U		1	U		1	U	
VINYL CHLORIDE		0.5	U		0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43MW2001			S43MW2201			S43MW2301			S43MW2401		
SDG: 1207112	LAB_ID	1207112-04			1207112-06			1207112-12			1207112-08		
FRACTION: EXP	SAMP_DATE	7/19/2012			7/19/2012			7/20/2012			7/20/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,3,5-TRINITROBENZENE		0.151	U		0.16	U		0.16	U		0.16	U	
1,3-DINITROBENZENE		0.151	U		0.16	U		0.16	U		0.212	J	PQU
2,4,6-TRINITROTOLUENE		0.151	U		0.16	U		0.16	U		0.16	U	
2,4-DINITROTOLUENE		0.151	U		0.16	U		0.16	U		0.16	U	
2,6-DINITROTOLUENE		0.151	U		0.16	U		0.16	U		0.16	U	
2-AMINO-4,6-DINITROTOLUENE		0.151	U		0.16	U		0.16	U		0.118	B	B
2-NITROTOLUENE		0.0797	B	B	0.16	U		0.16	U		0.371	B	B
3-NITROTOLUENE		0.151	U		0.16	U		0.16	U		0.642		
4-AMINO-2,6-DINITROTOLUENE		0.151	U		0.16	U		0.16	U		0.473		
4-NITROTOLUENE		0.137	J	P	0.179	J	P	0.16	U		0.115	J	PQU
HMX		0.151	U		0.965			0.16	U		0.16	U	
NITROBENZENE		0.151	U		0.16	U		0.16	U		0.865	B	B
NITROGLYCERIN		0.377	U		0.4	U		0.4	U		0.307	B	B
NITROGUANIDINE		10	U		10	U		10	U		10	U	
RDX		0.151	U		0.16	U		0.223	B	B	0.16	U	
TETRYL		0.151	U		0.16	U		0.16	U		0.198	J	PU

PROJ_NO: 00771	NSAMPLE	S43MW2501			S43MW2601		
SDG: 1207112	LAB_ID	1207112-10			1207112-02		
FRACTION: EXP	SAMP_DATE	7/20/2012			7/18/2012		
MEDIA: WATER	QC_TYPE	NM			NM		
	UNITS	UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0		
	DUP_OF						
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,3,5-TRINITROBENZENE		0.178	U		0.157	U	
1,3-DINITROBENZENE		0.186	J	PQU	0.157	U	
2,4,6-TRINITROTOLUENE		0.178	U		0.157	U	
2,4-DINITROTOLUENE		0.178	U		0.157	U	
2,6-DINITROTOLUENE		0.178	U		0.157	U	
2-AMINO-4,6-DINITROTOLUENE		0.178	U		0.157	U	
2-NITROTOLUENE		0.353	B	B	0.157	U	
3-NITROTOLUENE		0.301	J	PU	0.157	U	
4-AMINO-2,6-DINITROTOLUENE		0.178	U		0.157	U	
4-NITROTOLUENE		0.114	J	PQU	0.157	U	
HMX		0.178	U		0.157	U	
NITROBENZENE		0.178	U		0.157	U	
NITROGLYCERIN		0.295	B	B	0.392	U	
NITROGUANIDINE		10	U		10	U	
RDX		0.178	U		0.157	U	
TETRYL		0.178	U		0.157	U	

Tetra Tech **INTERNAL CORRESPONDENCE**

TO:	**R. SOK**	**DATE:**	**SEPTEMBER 24, 2012**
FROM:	**TERRI L. SOLOMON**	**COPIES:**	**DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION – TOTAL AND DISSOLVED METALS**
NSF INDIAN HEAD – CTO 114
SAMPLE DELIVERY GROUP (SDG) – 1207112

SAMPLES: 12/Aqueous

S43MW2001	S43MW2201	S43MW2301
S43MW2401	S43MW2501	S43MW2601
S43MW2001-F	S43MW2201-F	S43MW2301-F
S43MW2401-F	S43MW2501-F	S43MW2601-F

Overview

The sample set for NSF Indian Head – CTO 114, SDG 1207112, consists of twelve (12) aqueous environmental samples no field duplicate pairs were included within this SDG.

All samples were analyzed for select total and dissolved (designated –F) metals. The samples were collected by Tetra Tech on July 18, 19 and 20, 2012 and analyzed by Empirical Laboratories, LLC under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. Metals analyses were conducted using SW-846 methods 6010C. Mercury analyses were conducted using SW-846 method 7470A.

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 time, initial and continuing calibration data, laboratory method / preparation blank analyses, ICP Interference data, laboratory control sample results, 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 limit of quantitation (LOQ) but above the detection limit (DL) were qualified as estimated, "J".

- The contract required detection limit (CRDL) percent recovery on 07/27/2012 for lead was < 90% quality control limit affecting sample S43MW2501. The nondetected result reported for lead was qualified as biased low, "UL".

- The CRDL percent recoveries on 07/30/2012 for chromium, arsenic and selenium were > 110% quality control limit affecting samples S43MW2001-F, S43MW2201-F, S43MW2301-F, S43MW2401-F, S43MW2501-F and S43MW2601-F. The positive results < 2X CRDL for

chromium, arsenic and selenium in the affected samples were qualified as either biased high, "K", or estimated, "J", as a result of conflicting noncompliances.

- The following contaminant was detected in the laboratory preparation blanks at the following maximum concentration:

Analyte	Maximum Concentration	Action Level
Aluminum[1]	22.6 ug/L	113 ug/L

[1] Maximum concentration present in a preparation blank (batch 2G27005) affecting samples S43MW2001-F, S43MW2201-F, S43MW2301-F, S43MW2401-F, S43MW2501-F and S43MW2601-F.

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 and greater than the LOD were qualified "B" as a result of laboratory blank contamination.

Notes

Nondetected inorganic results are reported to the limit of detection (LOD).

The CRDL percent recovery on 07/24/2012 for iron was > 110% quality control limit affecting samples S43MW2001, S43MW2201, S43MW2301, S43MW2401, S43MW2501 and S43MW2601. No validation actions were warranted as all sample results were > 2X CRDL.

The CRDL percent recoveries on 07/30/2012 for aluminum, iron and lead were > 110% quality control limit affecting samples S43MW2001-F, S43MW2201-F, S43MW2301-F, S43MW2401-F, S43MW2501-F and S43MW2601-F. No validation actions were warranted as all sample results were either > 2X CRDL, nondetects or were qualified as a result of blank contamination.

The laboratory control sample (LCS) percent recovery for aluminum (batch 2G27005) was > 120% quality control limit affecting samples S43MW2001-F, S43MW2201-F, S43MW2301-F, S43MW2401-F, S43MW2501-F and S43MW2601-F. No validation actions were warranted as all sample results were qualified as a result of blank contamination.

Executive Summary

Laboratory Performance: Several CRDL recoveries were outside the quality control limits. Aluminum was present in a laboratory preparation blank.

Other Factors Affecting Data Quality: Positive results reported below the LOQ but above the DL were qualified as estimated.

The data for these analyses were reviewed with reference to Region III modifications to the "National Functional Guidelines for Inorganic Data Validation", April 1993 and the Department of Defense (DoD) document entitled "Quality Systems Manual (QSM) for Environmental Laboratories " (April 2009).

The text of this report has been formulated to address only those problem areas affecting data quality.

Tetra Tech
Terri L. Solomon
Environmental Scientist

Tetra Tech
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

APPENDIX A
QUALIFIED ANALYTICAL RESULTS

Qualifier Codes:

A = Lab Blank Contamination
B = Field Blank Contamination
C = Calibration Noncompliance (i.e., % RSDs, %Ds, ICVs, CCVs, RRFs, etc.)
C01 = GC/MS Tuning Noncompliance
D = MS/MSD Recovery Noncompliance
E = LCS/LCSD Recovery Noncompliance
F = Lab Duplicate Imprecision
G = Field Duplicate Imprecision
H = Holding Time Exceedance
I = ICP Serial Dilution Noncompliance
J = ICP PDS Recovery Noncompliance; MSA's $r < 0.995$
K = ICP Interference - includes ICS % R Noncompliance
L = Instrument Calibration Range Exceedance
M = Sample Preservation Noncompliance
N = Internal Standard Noncompliance
N01 = Internal Standard Recovery Noncompliance Dioxins
N02 = Recovery Standard Noncompliance Dioxins
N03 = Clean-up Standard Noncompliance Dioxins
O = Poor Instrument Performance (i.e., base-time drifting)
P = Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q = Other problems (can encompass a number of issues; i.e.chromatography,interferences, etc.)
R = Surrogates Recovery Noncompliance
S = Pesticide/PCB Resolution
T = % Breakdown Noncompliance for DDT and Endrin
U = RPD between columns/detectors >40% for positive results determined via GC/HPLC
V = Non-linear calibrations; correlation coefficient $r < 0.995$
W = EMPC result
X = Signal to noise response drop
Y = Percent solids <30%
Z = Uncertainty at 2 sigma deviations is greater than sample activity
Z1 = Tentatively Identified Compound considered presumptively present
Z2 = Tentatively Identified Compound column bleed

PROJ_NO: 00771	NSAMPLE	S43MW2001			S43MW2201			S43MW2301			S43MW2401		
SDG: 1207112	LAB_ID	1207112-04			1207112-06			1207112-12			1207112-08		
FRACTION: M	SAMP_DATE	7/19/2012			7/19/2012			7/20/2012			7/20/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM		122			57.9			47.7	J	P	127		
ANTIMONY		2	U		2	U		2	U		2	U	
ARSENIC		1.5	U		1.5	U		1.5	U		1.5	U	
BARIUM		84.5			170			47.9			48.9		
BERYLLIUM		0.709	J	P	1.61			0.479	J	P	0.5	U	
CADMIUM		0.368	J	P	0.29	J	P	0.5	U		0.5	U	
CHROMIUM		1	U		1	U		1	U		4.45		
COBALT		19.9			73.2			4.31			1.95	J	P
COPPER		2	U		1.35	J	P	2	U		8.18		
IRON		1180			827			1660			115		
LEAD		0.75	U		0.75	U		0.75	U		0.75	U	
MANGANESE		234			511			160			79.5		
MERCURY		0.16	U		0.16	U		0.16	U		0.16	U	
NICKEL		22.5			42.5			9.21			1.6	J	P
SELENIUM		1.25	U		1.25	U		1.25	U		1.25	U	
SILVER		0.5	U		0.5	U		0.5	U		0.5	U	
THALLIUM		1	U		1	U		1	U		1	U	
VANADIUM		2.5	U		1.56	J	P	2.5	U		2.5	U	
ZINC		35.6			57			12.1			7.21		

PROJ_NO: 00771	NSAMPLE	S43MW2501			S43MW2601		
SDG: 1207112	LAB_ID	1207112-10			1207112-02		
FRACTION: M	SAMP_DATE	7/20/2012			7/18/2012		
MEDIA: WATER	QC_TYPE	NM			NM		
	UNITS	UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0		
	DUP_OF						
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM		39.3	J	P	49.1	J	P
ANTIMONY		2	U		2	U	
ARSENIC		1.5	U		1.5	U	
BARIUM		92.9			45.1		
BERYLLIUM		0.5	U		0.42	J	P
CADMIUM		0.5	U		0.5	U	
CHROMIUM		1	U		1.53	J	P
COBALT		2.35	J	P	4.85		
COPPER		1.37	J	P	2	U	
IRON		1510			209		
LEAD		0.75	UL		0.75	U	
MANGANESE		184			32.7		
MERCURY		0.16	U		0.16	U	
NICKEL		3.09			7.88		
SELENIUM		1.25	U		1.25	U	
SILVER		0.5	U		0.5	U	
THALLIUM		1	U		1	U	
VANADIUM		2.5	U		2.5	U	
ZINC		4.86	J	P	13.2		

PROJ_NO: 00771	NSAMPLE	S43MW2001-F			S43MW2201-F			S43MW2301-F			S43MW2401-F		
SDG: 1207112	LAB_ID	1207112-05			1207112-07			1207112-13			1207112-09		
FRACTION: MF	SAMP_DATE	7/19/2012			7/19/2012			7/20/2012			7/20/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM		49.9	B	A	73.2	B	A	30.8	B	A	67.7	B	A
ANTIMONY		2	U		2	U		2	U		2	U	
ARSENIC		1.5	U		1.5	U		1.5	U		1.14	J	CP
BARIUM		78.7			160			42.8			48.7		
BERYLLIUM		0.629	J	P	1.51			0.426	J	P	0.5	U	
CADMIUM		0.348	J	P	0.257	J	P	0.5	U		0.5	U	
CHROMIUM		1	U		1	U		1	U		4.5	K	C
COBALT		19.7			71.8			3.85			2	J	P
COPPER		2	U		1.49	J	P	2	U		8.61		
IRON		1020			821			1410			66		
LEAD		0.75	U		0.75	U		0.75	U		0.75	U	
MANGANESE		223			499			142			83.3		
MERCURY		0.16	U		0.16	U		0.16	U		0.16	U	
NICKEL		20.6			39.5			8.32			2.03	J	P
SELENIUM		1.25	U		1.25	U		1.25	U		0.855	J	CP
SILVER		0.5	U		0.5	U		0.5	U		0.5	U	
THALLIUM		1	U		1	U		1	U		1	U	
VANADIUM		2.5	U		1.35	J	P	2.5	U		2.5	U	
ZINC		34.8			59.8			12.5			11.4		

PROJ_NO: 00771	NSAMPLE	S43MW2501-F			S43MW2601-F		
SDG: 1207112	LAB_ID	1207112-11			1207112-03		
FRACTION: MF	SAMP_DATE	7/20/2012			7/18/2012		
MEDIA: WATER	QC_TYPE	NM			NM		
	UNITS	UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0		
	DUP_OF						
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM		41.7	B	A	54.3	B	A
ANTIMONY		2	U		2	U	
ARSENIC		1.5	U		1.5	U	
BARIUM		85.7			44.5		
BERYLLIUM		0.5	U		0.409	J	P
CADMIUM		0.5	U		0.5	U	
CHROMIUM		1	U		1.4	J	CP
COBALT		2.31	J	P	5.08		
COPPER		1.42	J	P	1.17	J	P
IRON		1580			150		
LEAD		0.75	U		0.75	U	
MANGANESE		179			33.4		
MERCURY		0.16	U		0.16	U	
NICKEL		2.82			7.76		
SELENIUM		1.25	U		1.25	U	
SILVER		0.5	U		0.5	U	
THALLIUM		1	U		1	U	
VANADIUM		2.5	U		2.5	U	
ZINC		5.91			15.7		

Tetra Tech INC **INTERNAL CORRESPONDENCE**

TO:	**R. SOK**	**DATE:**	**SEPTEMBER 12, 2012**
FROM:	**J. KALINYAK**	**COPIES:**	**DV FILE**
SUBJECT:	**ORGANIC DATA VALIDATION – VOC NSF INDIAN HEAD, CTO 114 SAMPLE DELIVERY GROUP 1207125**		
SAMPLES:	1 / Aqueous / VOC S431041VOC		

OVERVIEW

The sample set for NSF Indian Head, CTO 114, SDG 1207125, consisted of one (1) aqueous sample which was analyzed for volatile organic compounds (VOC). No field duplicate sample pairs were contained within this sample delivery group (SDG).

The sample was collected by Tetra Tech on July 22, 2012 and analyzed by Empirical Laboratory LLC. The analysis was conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using EPA SW-846 Method 8260B for VOCs, analysis and reporting protocols.

The data contained in this SDG were validated with regard to the following parameters: data completeness, hold times, GC/MS tuning, initial/continuing calibrations, laboratory method blank results, blank spike results, surrogate spike recoveries, internal standard recoveries, chromatographic resolution, compound identification, compound quantitation, and detection limits. Areas of concern are listed below.

MAJOR

- The relative response factor (RRF) was less than the 0.05 criteria for the VOC 1,4-dioxane for the initial calibration on instrument MS-VOA3 on 07/30/12 and for the continuing calibration verification (CCV) for instrument MS-VOA3 affecting the sample. The sample had a non-detected result for 1,4-dioxane which was qualified rejected, (UR).

MINOR

- Positive results reported below the quantitation limit but above the method detection limit were qualified as estimated, (J).

NOTES

The VOC CCV %Ds were greater than the 20% and less than the 50% quality control limit for acetone and 2-butanone for instrument MS-VOA3 on 07/31/12 @ 07:40.

Affected Sample: S431041VOC
Action: The sample 2-butanone and acetone sample results were non-detected and no validation action was necessary.

Non-detected results were reported to the limit of detection (LOD).

EXECUTIVE SUMMARY

Laboratory Performance Issues: The VOC sample 1,4-dioxane non-detected result was rejected due to RRF non-compliances.

Other Factors Affecting Data Quality: Positive results reported below the quantitation limit but above the method detection limit were qualified as estimated (J).

The data for these analyses were reviewed with reference to the Region III modifications to U.S. EPA National Functional Guidelines for Organic Data Validation (Sept. 1994), USEPA SW-846 Methods 8260B, and the Department of Defense (DoD) document entitled "Quality Systems Manual (QSM) for Environmental Laboratories" (April 2009).

Tetra Tech
Joseph Kalinyak
Chemist/Data Validator

Tetra Tech
Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:
Appendix A - Qualified Analytical Results
Appendix B - Results as reported by the Laboratory
Appendix C - Support Documentation

Appendix A

Qualified Analytical Results

DATA QUALIFICATION CODE (QUAL CODE)

Qualifier Codes:

A = Lab Blank Contamination
B = Field Blank Contamination
C = Calibration Noncompliance (i.e., % RSDs, %Ds, ICVs, CCVs, RRFs, etc.)
C01 = GC/MS Tuning Noncompliance
D = MS/MSD Recovery Noncompliance
E = LCS/LCSD Recovery Noncompliance
F = Lab Duplicate Imprecision
G = Field Duplicate Imprecision
H = Holding Time Exceedance
I = ICP Serial Dilution Noncompliance
J = ICP PDS Recovery Noncompliance; MSA's $r < 0.995$
K = ICP Interference - includes ICS % R Noncompliance
L = Instrument Calibration Range Exceedance
M = Sample Preservation Noncompliance
N = Internal Standard Noncompliance
N01 = Internal Standard Recovery Noncompliance Dioxins
N02 = Recovery Standard Noncompliance Dioxins
N03 = Clean-up Standard Noncompliance Dioxins
O = Poor Instrument Performance (i.e., base-time drifting)
P = Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q = Other problems (can encompass a number of issues; i.e.chromatography,interferences, etc.)
R = Surrogates Recovery Noncompliance
S = Pesticide/PCB Resolution
T = % Breakdown Noncompliance for DDT and Endrin
U = RPD between columns/detectors >40% for positive results determined via GC/HPLC
V = Non-linear calibrations; correlation coefficient $r < 0.995$
W = EMPC result
X = Signal to noise response drop
Y = Percent solids <30%
Z = Uncertainty at 2 sigma deviation is less than sample activity
Z1 = Tentatively Identified Compound considered presumptively present
Z2 = Tentatively Identified Compound column bleed

PROJ_NO: 00771	NSAMPLE	S431041VOC
SDG: 1207125	LAB_ID	1207125-01
FRACTION: OV	SAMP_DATE	7/22/2012
MEDIA: WATER	QC_TYPE	NM
	UNITS	UG/L
	PCT_SOLIDS	0.0
	DUP_OF	

PARAMETER	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE	0.61	J	P
1,1,2,2-TETRACHLOROETHANE	0.5	U	
1,1,2-TRICHLOROETHANE	0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE	0.5	U	
1,1-DICHLOROETHANE	8.28		
1,1-DICHLOROETHENE	0.88	J	P
1,2,3-TRICHLOROBENZENE	0.5	U	
1,2,4-TRICHLOROBENZENE	0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE	0.5	U	
1,2-DIBROMOETHANE	0.5	U	
1,2-DICHLOROBENZENE	0.5	U	
1,2-DICHLOROETHANE	0.5	U	
1,2-DICHLOROPROPANE	0.5	U	
1,3-DICHLOROPROPANE	0.5	U	
1,4-DICHLOROBENZENE	0.5	U	
1,4-DIOXANE	10	UR	C
2-BUTANONE	5	U	
2-HEXANONE	2.5	U	
4-METHYL-2-PENTANONE	2.5	U	
ACETONE	5	U	
BENZENE	0.5	U	
BROMODICHLOROMETHANE	0.5	U	
BROMOFORM	0.5	U	
BROMOMETHANE	1	U	
CARBON DISULFIDE	0.5	U	
CARBON TETRACHLORIDE	0.5	U	
CHLOROBENZENE	0.5	U	
CHLORODIBROMOMETHANE	0.5	U	
CHLOROETHANE	1	U	
CHLOROFORM	0.5	U	
CHLOROMETHANE	0.5	U	
CIS-1,2-DICHLOROETHENE	0.5	U	
CYCLOHEXANE	0.5	U	
DICHLORODIFLUOROMETHANE	1	U	
ETHYLBENZENE	0.5	U	

PROJ_NO: 00771	NSAMPLE	S431041VOC		
SDG: 1207125	LAB_ID	1207125-01		
FRACTION: OV	SAMP_DATE	7/22/2012		
MEDIA: WATER	QC_TYPE	NM		
	UNITS	UG/L		
	PCT_SOLIDS	0.0		
	DUP_OF			
PARAMETER		RESULT	VQL	QLCD
ISOPROPYLBENZENE		0.5	U	
METHYL ACETATE		1	U	
METHYL TERT-BUTYL ETHER		0.5	U	
METHYLENE CHLORIDE		1	U	
STYRENE		0.5	U	
TETRACHLOROETHENE		0.5	U	
TOLUENE		0.5	U	
TOTAL XYLENES		1	U	
TRANS-1,2-DICHLOROETHENE		0.5	U	
TRICHLOROETHENE		0.5	U	
TRICHLOROFLUOROMETHANE		1	U	
VINYL CHLORIDE		0.5	U	

Tetra Tech **INTERNAL CORRESPONDENCE**

TO:	**R. SOK**	**DATE:**	**SEPTEMBER 24, 2012**
FROM:	**TERRI L. SOLOMON**	**COPIES:**	**DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION – TOTAL AND DISSOLVED METALS, TCLP METALS, IGNIGHTABILITY, pH**
NSF INDIAN HEAD – CTO 114
SAMPLE DELIVERY GROUP (SDG) – 1207126

SAMPLES: 17/Groundwater/ Total and Dissolved Metals

S43MW0204	S43MW0204-D	S43MW0502
S43MW0602	S43MW0801	S43MW09D01
S43MW09S01	S43MW1101	S43MW1301
S43MW1401	S43MW17D01	S43MW17S01
S43MW1801	S43MW19D01	S43MW19S01
S43MW19S01-D	S43MW2101	S43MW0204-DF
S43MW0204-F	S43MW0502-F	S43MW0602-F
S43MW0801-F	S43MW09D01-F	S43MW09S01-F
S43MW1101-F	S43MW1301-F	S43MW1401-F
S43MW17D01-F	S43MW17S01-F	S43MW1801-F
S43MW19D01-F	S43MW19S01-DF	S43MW19S01-F
S43MW2101-F		

2/IDW Samples

S43AQIDW01-20120721 S43AQIDW02-20120721

Overview

The sample set for NSF Indian Head – CTO 114, SDG 1207126, consists of seventeen (17) aqueous environmental samples (total and dissolved) and two (2) investigative derived waste samples (S43AQIDW01-20120721 and S43AQIDW02-20120721). Four (4) field duplicate pairs (S43MW0204 / S43MW0204-D, S43MW19S01 / S43MW19S01-D, S43MW0204-F / S43MW0204-FD and S43MW19S01-F / S43MW19S01-FD) were included within this SDG.

All samples, with the exception of S43MW0204, S43MW0204-F, S43MW0204-D, S43MW0204-DF, S43MW1301, S43MW1301-F, S43MW1401, S43MW1401-F, S43AQIDW01-20120721 and S43AQIDW02-20120721 were analyzed for select total and dissolved (designated –F) metals. Samples S43MW0204, S43MW0204-F, S43MW0204-D, S43MW0204-DF, S43MW1301, S43MW1301-F, S43MW1401, S43MW1401-F were analyzed for total and dissolved (designated –F) cobalt. Samples S43AQIDW01-20120721 and S43AQIDW02-20120721 were analyzed for toxicity characteristic leaching procedure (TCLP) metals, ignitability and pH. The samples were collected by Tetra Tech on July 21 and 22, 2012 and analyzed by Empirical Laboratories, LLC under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. Metals analyses were conducted using SW-846 method 6010C. Mercury analyses were conducted using SW-846 method 7470A. Ignitability analyses were conducted using SW-846 method 1010A and pH analyses were conducted using SW-846 method 9040C.

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 time, initial and continuing calibration data, laboratory method / preparation blank analyses, ICP Interference data, laboratory control sample results, matrix spike / matrix spike duplicate results, laboratory duplicate results, ICP serial dilution results, field duplicate results, 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 limit of quantitation (LOQ) but above the detection limit (DL) were qualified as estimated, "J".

- The pH analyses were performed 10 days after sampling for samples S43AQIDW01-20120721 and S43AQIDW02-20120721. The positive results reported for pH were qualified as estimated, "J".

- The contract required detection limit (CRDL) percent recoveries on 07/30/2012 for aluminum, chromium, iron, lead, arsenic and selenium were > 110% quality control limit affecting samples S43MW1101, S43MW1101-F, S43MW19S01, S43MW19S01-F, S43MW19S01-D, S43MW19S01-DF, S43MW17D01, S43MW17D01-F, S43MW19D01 and S43MW19D01-F. The positive results < 2X CRDL for arsenic in the affected samples were qualified as estimated, "J", as a result of conflicting noncompliances. No validation actions were required for aluminum, chromium, iron, lead and selenium as all sample results were either >2X CRDL, nondetects or were qualified as a result of blank contamination.

- The CRDL percent recovery on 08/01/2012 for lead was < 90% quality control limit affecting samples S43MW17S01, S43MW17S01-F, S43MW1801, S43MW1801-F, S43MW0801, S43MW0801-F, S43MW0602, S43MW0602-F, S43MW2101, S43MW2101-F, S43MW19S01, S43MW19S01-F, S43MW0502, S43MW0502-F and S43MW09D01. The positive results < 2X CRDL for lead in the affected samples were qualified as estimated, "J", as a result of conflicting noncompliances. The nondetected results reported for lead were qualified as biased low, "UL".

- The CRDL percent recovery on 07/31/2012 for mercury was < 80% quality control limit affecting all samples. The nondetected results reported for mercury were qualified as biased low, "UL".

- The CRDL percent recovery on 08/02/2012 for silver was < 90% quality control limit affecting samples S43AQIDW01-20120721 and S43AQIDW02-20120721. The nondetected results reported for silver were qualified as biased low, "UL".

- The CRDL percent recovery on 08/02/2012 for silver was < 90% quality control limit affecting sample S43MW09D01-F. The nondetected result reported for silver was qualified as biased low, "UL".

- The following contaminant was detected in the laboratory preparation blanks at the following maximum concentration:

Analyte	Maximum Concentration	Action Level
Aluminum[1]	22.6 ug/L	113 ug/L

[1] Maximum concentration present in a preparation blank (batch 2G27005) affecting samples S43MW1101, S43MW1101-F, S43MW19S01, S43MW19S01-F, S43MW19S01-D, S43MW19S01-DF, S43MW17D01, S43MW17D01-F, S43MW19D01 and S43MW19D01-F.

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 and less than the limit of detection (LOD) were qualified "B" as a result of laboratory blank contamination and raised to the LOD. Positive results less than the blank action level and greater than the LOD were qualified "B" as a result of laboratory blank contamination.

- The laboratory control sample (LCS) percent recovery for aluminum (batch 2G27005) was > 120% quality control limit affecting samples S43MW1101, S43MW1101-F, S43MW19S01, S43MW19S01-F, S43MW19S01-D, S43MW19S01-DF, S43MW17D01, S43MW17D01-F, S43MW19D01 and S43MW19D01-F. The positive results reported for aluminum in the affected samples were qualified as biased high, "K".

- The LCS percent recovery for iron (batch 2G31005) was > 120% quality control limit affecting samples S43MW17S01, S43MW17S01-F, S43MW1801, S43MW1801-F, S43MW0801, S43MW0801-F, S43MW0602, S43MW0602-F, S43MW2101, S43MW2101-F, S43MW09S01, S43MW09S01-F, S43MW0502, S43MW0502-F and S43MW09D01. The positive results reported for iron in the affected samples were qualified as biased high, "K".

- The LCS percent recovery for iron (batch 2G31025) was > 120% quality control limit affecting sample S43MW09D01-F. The positive result reported for iron in the affected sample was qualified as biased high, "K".

Notes

Nondetected inorganic results are reported to the limit of detection (LOD).

The CRDL percent recoveries on 08/01/2012 for silver and thallium were > 110% quality control limit affecting samples S43MW17S01, S43MW17S01-F, S43MW1801, S43MW1801-F, S43MW0801, S43MW0801-F, S43MW0602, S43MW2101, S43MW2101-F, S43MW19S01, S43MW19S01-F, S43MW0502, S43MW0502-F and S43MW09D01. No validation actions were required for silver or thallium as all sample results were nondetects,

The CRDL percent recoveries on 08/02/2012 for arsenic and selenium were > 110% quality control limit affecting samples S43AQIDW01-20120721 and S43AQIDW02-20120721. No validation actions were required for arsenic and selenium as all sample results were nondetects,

The CRDL percent recovery on 08/02/2012 for selenium was > 110% quality control limit affecting samples S43MW1801 and S43MW1801-F. No validation actions were required for selenium as all sample results were nondetects,

The CRDL percent recovery on 08/02/2012 for arsenic was > 110% quality control limit affecting sample S43MW09D01-F. No validation actions were required for arsenic as the sample result was nondetected.

Executive Summary

Laboratory Performance: Several CRDL recoveries were outside the quality control limits. Several LCS percent recoveries were > 120% quality control limit. Aluminum was present in a laboratory preparation blank. The pH analyses were performed 10 days after sampling for samples S43AQIDW01-20120721 and S43AQIDW02-20120721.

Other Factors Affecting Data Quality: Positive results reported below the LOQ but above the DL were qualified as estimated.

The data for these analyses were reviewed with reference to Region III modifications to the "National Functional Guidelines for Inorganic Data Validation", April 1993 and the Department of Defense (DoD) document entitled "Quality Systems Manual (QSM) for Environmental Laboratories " (April 2009).

The text of this report has been formulated to address only those problem areas affecting data quality.

Tetra Tech
Terri L. Solomon
Environmental Scientist

Tetra Tech
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

APPENDIX A
QUALIFIED ANALYTICAL RESULTS

Qualifier Codes:

A = Lab Blank Contamination
B = Field Blank Contamination
C = Calibration Noncompliance (i.e., % RSDs, %Ds, ICVs, CCVs, RRFs, etc.)
C01 = GC/MS Tuning Noncompliance
D = MS/MSD Recovery Noncompliance
E = LCS/LCSD Recovery Noncompliance
F = Lab Duplicate Imprecision
G = Field Duplicate Imprecision
H = Holding Time Exceedance
I = ICP Serial Dilution Noncompliance
J = ICP PDS Recovery Noncompliance; MSA's $r < 0.995$
K = ICP Interference - includes ICS % R Noncompliance
L = Instrument Calibration Range Exceedance
M = Sample Preservation Noncompliance
N = Internal Standard Noncompliance
N01 = Internal Standard Recovery Noncompliance Dioxins
N02 = Recovery Standard Noncompliance Dioxins
N03 = Clean-up Standard Noncompliance Dioxins
O = Poor Instrument Performance (i.e., base-time drifting)
P = Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q = Other problems (can encompass a number of issues; i.e.chromatography,interferences, etc.)
R = Surrogates Recovery Noncompliance
S = Pesticide/PCB Resolution
T = % Breakdown Noncompliance for DDT and Endrin
U = RPD between columns/detectors >40% for positive results determined via GC/HPLC
V = Non-linear calibrations; correlation coefficient $r < 0.995$
W = EMPC result
X = Signal to noise response drop
Y = Percent solids <30%
Z = Uncertainty at 2 sigma deviations is greater than sample activity
Z1 = Tentatively Identified Compound considered presumptively present
Z2 = Tentatively Identified Compound column bleed

PROJ_NO: 00771	NSAMPLE	S43MW0204			S43MW0204-D			S43MW0502			S43MW0602		
SDG: 1207126	LAB_ID	1207126-34			1207126-36			1207126-28			1207126-20		
FRACTION: M	SAMP_DATE	7/22/2012			7/22/2012			7/22/2012			7/21/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF				S43MW0204								
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM								129			1190		
ANTIMONY								2	U		2	U	
ARSENIC								2.11	J	P	6.47		
BARIUM								88.4			167		
BERYLLIUM								0.911	J	P	0.311	J	P
CADMIUM								0.5	U		0.5	U	
CHROMIUM								1	U		3.13		
COBALT		33.6			34.3			50.3			26.4		
COPPER								1.09	J	P	2.87		
IRON								8510	K	E	54900	K	E
LEAD								0.75	UL	C	0.69	J	CP
MANGANESE								298			713		
MERCURY								0.16	UL	C	0.16	UL	C
NICKEL								45.5			15.1		
SELENIUM								1.25	U		1.25	U	
SILVER								0.5	U		0.5	U	
THALLIUM								1	U		1	U	
VANADIUM								1.69	J	P	6.68		
ZINC								57.9			16.4		

PROJ_NO: 00771	NSAMPLE	S43MW0801			S43MW09D01			S43MW09S01			S43MW1101		
SDG: 1207126	LAB_ID	1207126-18			1207126-32			1207126-26			1207126-02		
FRACTION: M	SAMP_DATE	7/21/2012			7/22/2012			7/22/2012			7/21/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM		19.3	J	P	290			358			25	U	
ANTIMONY		2	U		2	U		2	U		2	U	
ARSENIC		1.5	U		5.71			1.5	U		1.56	J	CP
BARIUM		56.3			167			352			51.9		
BERYLLIUM		0.323	J	P	0.5	U		1.91			0.5	U	
CADMIUM		0.5	U		0.5	U		0.5	U		0.5	U	
CHROMIUM		1.43	J	P	0.906	J	P	1	U		1	U	
COBALT		14.2			2.5	U		54.8			2.22	J	P
COPPER		1.04	J	P	1.01	J	P	1.38	J	P	2	U	
IRON		5000	K	E	29800	K	E	7640	K	E	20900		
LEAD		0.75	UL	C	0.75	UL	C	0.75	UL	C	0.75	U	
MANGANESE		206			185			405			497		
MERCURY		0.16	UL	C	0.16	UL	C	0.16	UL	C	0.16	UL	C
NICKEL		8.2			0.761	J	P	40.2			1.5	U	
SELENIUM		1.25	U		1.25	U		1.25	U		1.25	U	
SILVER		0.5	U		0.5	U		0.5	U		0.5	U	
THALLIUM		1	U		1	U		1	U		1	U	
VANADIUM		2.5	U		1.64	J	P	1.38	J	P	1.47	J	P
ZINC		12			2.06	J	P	86.9			1.34	J	P

PROJ_NO: 00771	NSAMPLE	S43MW1301			S43MW1401			S43MW17D01			S43MW17S01		
SDG: 1207126	LAB_ID	1207126-30			1207126-24			1207126-08			1207126-12		
FRACTION: M	SAMP_DATE	7/22/2012			7/22/2012			7/21/2012			7/21/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM								25	B	A	30.5	J	P
ANTIMONY								2	U		2	U	
ARSENIC								2.21	J	CP	2.01	J	P
BARIUM								109			80.9		
BERYLLIUM								0.5	U		0.5	U	
CADMIUM								0.5	U		0.5	U	
CHROMIUM								1	U		1	U	
COBALT		130			36			6.2			15.4		
COPPER								2	U		2	U	
IRON								32900			34900	K	E
LEAD								0.75	U		0.75	UL	C
MANGANESE								498			561		
MERCURY								0.16	UL	C	0.16	UL	C
NICKEL								1.35	J	P	4.47		
SELENIUM								1.25	U		1.25	U	
SILVER								0.5	U		0.5	U	
THALLIUM								1	U		1	U	
VANADIUM								1.49	J	P	1.83	J	P
ZINC								4.06	J	P	13.4		

PROJ_NO: 00771	NSAMPLE	S43MW1801			S43MW19D01			S43MW19S01			S43MW19S01-D		
SDG: 1207126	LAB_ID	1207126-14			1207126-10			1207126-04			1207126-06		
FRACTION: M	SAMP_DATE	7/21/2012			7/21/2012			7/21/2012			7/21/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF										S43MW19S01		
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM		92.7			28	B	A	124	K	E	122	K	E
ANTIMONY		2	U		2	U		2	U		2	U	
ARSENIC		1.5	U		1.2	J	CP	1.5	U		1.5	U	
BARIUM		143			123			248			246		
BERYLLIUM		0.701	J	P	0.5	U		1.95			1.94		
CADMIUM		0.909	J	P	0.5	U		0.652	J	P	0.614	J	P
CHROMIUM		1	U		1	U		1	U		1	U	
COBALT		43.1			2.5	U		124			124		
COPPER		1.1	J	P	2	U		1.4	J	P	1.29	J	P
IRON		192	K	E	27000			6210			5970		
LEAD		0.75	UL	C	0.75	U		0.75	U		0.75	U	
MANGANESE		326			522			1140			1110		
MERCURY		0.16	UL	C	0.16	UL	C	0.16	UL	C	0.16	UL	C
NICKEL		52.9			1.5	U		46.6			45.7		
SELENIUM		1.25	U		1.25	U		1.25	U		1.25	U	
SILVER		0.5	U		0.5	U		0.5	U		0.5	U	
THALLIUM		1	U		1	U		0.799	J	P	0.803	J	P
VANADIUM		1.27	J	P	1.72	J	P	3.12			3.03	J	P
ZINC		71.7			1.32	J	P	92.4			91.1		

PROJ_NO: 00771	NSAMPLE	S43MW2101		
SDG: 1207126	LAB_ID	1207126-22		
FRACTION: M	SAMP_DATE	7/21/2012		
MEDIA: WATER	QC_TYPE	NM		
	UNITS	UG/L		
	PCT_SOLIDS	0.0		
	DUP_OF			
PARAMETER		RESULT	VQL	QLCD
ALUMINUM		70.5		
ANTIMONY		2	U	
ARSENIC		1.5	U	
BARIUM		86.8		
BERYLLIUM		0.422	J	P
CADMIUM		0.5	U	
CHROMIUM		1	U	
COBALT		33		
COPPER		2	U	
IRON		5990	K	E
LEAD		0.75	UL	C
MANGANESE		888		
MERCURY		0.16	UL	C
NICKEL		15.3		
SELENIUM		1.25	U	
SILVER		0.5	U	
THALLIUM		1	U	
VANADIUM		2.95	J	P
ZINC		22.2		

PROJ_NO: 00771	NSAMPLE	S43MW0204-DF			S43MW0204-F			S43MW0502-F			S43MW0602-F		
SDG: 1207126	LAB_ID	1207126-37			1207126-35			1207126-29			1207126-21		
FRACTION: MF	SAMP_DATE	7/22/2012			7/22/2012			7/22/2012			7/21/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF	S43MW0204-F											
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM								15.6	J	P	21	J	P
ANTIMONY								2	U		2	U	
ARSENIC								1.65	J	P	3.61		
BARIUM								86.6			163		
BERYLLIUM								0.838	J	P	0.5	U	
CADMIUM								0.5	U		0.5	U	
CHROMIUM								1	U		1	U	
COBALT		33.7			33.8			48.9			25.9		
COPPER								2	U		2	U	
IRON								8400	K	E	44500	K	E
LEAD								1.5	UL	C	1.5	U	
MANGANESE								294			753		
MERCURY								0.16	UL	C	0.16	UL	C
NICKEL								44.3			14.4		
SELENIUM								1.25	U		1.25	U	
SILVER								0.5	U		0.5	U	
THALLIUM								1	U		1	U	
VANADIUM								2.5	U		2.24	J	P
ZINC								56.3			10.7		

PROJ_NO: 00771	NSAMPLE	S43MW0801-F			S43MW09D01-F			S43MW09S01-F			S43MW1101-F		
SDG: 1207126	LAB_ID	1207126-19			1207126-33			1207126-27			1207126-03		
FRACTION: MF	SAMP_DATE	7/21/2012			7/22/2012			7/22/2012			7/21/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM		25	U		46.5	J	P	357			25	U	
ANTIMONY		2	U		2	U		2	U		2	U	
ARSENIC		1.5	U		5.76			1.5	U		1.49	J	CP
BARIUM		52.2			163			347			54.5		
BERYLLIUM		0.297	J	P	0.5	U		1.9			0.5	U	
CADMIUM		0.5	U		0.5	U		0.5	U		0.5	U	
CHROMIUM		1.25	J	P	1	U		1	U		1	U	
COBALT		12.8			2.5	U		54.2			2.39	J	P
COPPER		2	U		2	U		2.17	J	P	2	U	
IRON		5100	K	E	29000	K	E	7470	K	E	21400		
LEAD		0.75	UL	C	1.5	U		0.75	UL	C	0.75	U	
MANGANESE		192			180			406			503		
MERCURY		0.16	UL	C	0.16	UL	C	0.16	UL	C	0.16	UL	C
NICKEL		7.43			1.5	U		39.7			1.5	U	
SELENIUM		1.25	U		1.25	UL	C	1.25	U		1.25	U	
SILVER		0.5	U		0.5	UL	C	0.5	U		0.5	U	
THALLIUM		1	U		1	U		1	U		1	U	
VANADIUM		2.5	U		2.5	U		1.34	J	P	1.47	J	P
ZINC		11.6			2.14	J	P	88.2			2.5	U	

PROJ_NO: 00771	NSAMPLE	S43MW1301-F			S43MW1401-F			S43MW17D01-F			S43MW17S01-F		
SDG: 1207126	LAB_ID	1207126-31			1207126-25			1207126-09			1207126-13		
FRACTION: MF	SAMP_DATE	7/22/2012			7/22/2012			7/21/2012			7/21/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM								25	B	A	25	U	
ANTIMONY								2	U		2	U	
ARSENIC								2.3	J	CP	2.11	J	P
BARIUM								111			82.9		
BERYLLIUM								0.5	U		0.5	U	
CADMIUM								0.5	U		0.5	U	
CHROMIUM								1	U		1	U	
COBALT		127			34.8			6.24			15.7		
COPPER								2	U		1.2	J	P
IRON								32100			36100	K	E
LEAD								0.75	U		0.75	UL	C
MANGANESE								500			572		
MERCURY								0.16	UL	C	0.16	UL	C
NICKEL								1.55	J	P	4.63		
SELENIUM								1.25	U		1.25	U	
SILVER								0.5	U		0.5	U	
THALLIUM								1	U		1	U	
VANADIUM								1.46	J	P	1.73	J	P
ZINC								5.51			16.2		

PROJ_NO: 00771	NSAMPLE	S43MW1801-F			S43MW19D01-F			S43MW19S01-DF			S43MW19S01-F		
SDG: 1207126	LAB_ID	1207126-15			1207126-11			1207126-07			1207126-05		
FRACTION: MF	SAMP_DATE	7/21/2012			7/21/2012			7/21/2012			7/21/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF							S43MW19S01-F					
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM		79.6			25	B	A	108	B	A	101	B	A
ANTIMONY		2	U		2	U		2	U		2	U	
ARSENIC		1.5	U		1.5	U		1.5	U		1.5	U	
BARIUM		144			117			232			242		
BERYLLIUM		0.734	J	P	0.5	U		1.85			1.86		
CADMIUM		0.942	J	P	0.5	U		0.765	J	P	0.596	J	P
CHROMIUM		1	U		1	U		1	U		1	U	
COBALT		44.2			2.5	U		117			121		
COPPER		1.52	J	P	2	U		1.13	J	P	1.28	J	P
IRON		192	K	E	25700			5800			5930		
LEAD		0.75	UL	C	0.75	U		0.75	U		0.75	U	
MANGANESE		326			502			1060			1090		
MERCURY		0.16	UL	C	0.16	UL	C	0.16	UL	C	0.16	UL	C
NICKEL		54.4			1.5	U		43.3			45.1		
SELENIUM		1.25	U		1.25	U		1.25	U		1.25	U	
SILVER		0.5	U		0.5	U		0.5	U		0.5	U	
THALLIUM		1	U		1	U		0.751	J	P	1	U	
VANADIUM		2.5	U		1.54	J	P	2.82	J	P	2.89	J	P
ZINC		74.4			1.41	J	P	86.2			89.1		

PROJ_NO: 00771	NSAMPLE	S43MW2101-F
SDG: 1207126	LAB_ID	1207126-23
FRACTION: MF	SAMP_DATE	7/21/2012
MEDIA: WATER	QC_TYPE	NM
	UNITS	UG/L
	PCT_SOLIDS	0.0
	DUP_OF	

PARAMETER	RESULT	VQL	QLCD
ALUMINUM	17.3	J	P
ANTIMONY	2	U	
ARSENIC	1.5	U	
BARIUM	88.4		
BERYLLIUM	0.414	J	P
CADMIUM	0.5	U	
CHROMIUM	1	U	
COBALT	33.6		
COPPER	2	U	
IRON	6050	K	E
LEAD	0.75	UL	C
MANGANESE	907		
MERCURY	0.16	U	
NICKEL	15.6		
SELENIUM	1.25	U	
SILVER	0.5	U	
THALLIUM	1	U	
VANADIUM	2.52	J	P
ZINC	22.7		

PROJ_NO: 00771	NSAMPLE	S43AQIDW01-20120721			S43AQIDW02-20120721		
SDG: 1207126	LAB_ID	1207126-16			1207126-17		
FRACTION: TCLPM	SAMP_DATE	7/21/2012			7/21/2012		
MEDIA: WATER	QC_TYPE	NM			NM		
	UNITS	MG/L			MG/L		
	PCT_SOLIDS	100.0			100.0		
	DUP_OF						
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD
ARSENIC		0.06	U		0.06	U	
BARIUM		0.178	J	P	0.0672	J	P
CADMIUM		0.02	U		0.02	U	
CHROMIUM		0.04	U		0.04	U	
LEAD		0.03	U		0.03	U	
MERCURY		0.0016	U		0.0016	U	
SELENIUM		0.05	U		0.05	U	
SILVER		0.02	UL	C	0.02	UL	C

PROJ_NO: 00771	NSAMPLE	S43AQIDW01-20120721						S43AQIDW02-20120721					
SDG: 1207126	LAB_ID	1207126-16						1207126-17					
FRACTION: MISC	SAMP_DATE	7/21/2012						7/21/2012					
MEDIA: WATER	QC_TYPE	NM						NM					
	UNITS	F			S.U.			F			S.U.		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
IGNITABILITY		158	>					158	>				
PH					6.24	J	H				6.34	J	H

Tetra Tech INC **INTERNAL CORRESPONDENCE**

TO:	**R. SOK**	**DATE:**	**SEPTEMBER 24, 2012**
FROM:	**J. KALINYAK**	**COPIES:**	**DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – VOC / EXPLOSIVES / NITROGUANIDINE**
NSF INDIAN HEAD, CTO 114
SAMPLE DELIVERY GROUP 1207126

SAMPLES: 16 / Aqueous / VOC

S43AQIDW01-20120721	S43AQIDW02-20120721	S43MW0502
S43MW0602	S43MW0801	S43MW09D01
S43MW09S01	S43MW1101	S43MW17D01
S43MW17S01	S43MW1801	S43MW19D01
S43MW19S01	S43MW19S01-D	S43MW2101
S43TB12-20120721		

4 / Aqueous / VOC - Trichloroethene only

S43MW0204	S43MW0204-D	S43MW1301
S43MW1401		

13 / Aqueous / Explosives / Nitroguanidine

S43MW0502	S43MW0602	S43MW0801
S43MW09D01	S43MW09S01	S43MW1101
S43MW17D01	S43MW17S01	S43MW1801
S43MW19D01	S43MW19S01	S43MW19S01-D
S43MW2101		

OVERVIEW

The sample set for NSF Indian Head, CTO 114, SDG 1207126, consisted of twenty (20) aqueous samples including one (1) aqueous trip blank sample. Sixteen (16) samples were analyzed for volatile organic compounds (VOC), four (4) samples were analyzed for the VOC trichloroethene only, and thirteen (13) of the samples were analyzed for explosives, including nitroguanidine, as listed above. Two (2) field duplicate sample pairs were contained within this sample delivery group (SDG); S43MW0204-D / S43MW0204 and S43MW19S01-D / S43MW19S01.

The samples were collected by Tetra Tech on July 21, and 22, 2012 and analyzed by Empirical Laboratory LLC. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using EPA SW-846 Methods 8260B for VOCs, 8330B for explosives, and 8330A/IAAP for nitroguanidine, analysis and reporting protocols.

The data contained in this SDG were validated with regard to the following parameters: data completeness, hold times, GC/MS tuning, initial/continuing calibrations, laboratory method blank results, blank spike results, matrix spike/spike duplicate recoveries, surrogate spike recoveries, internal standard recoveries, field duplicate results, chromatographic resolution, compound identification, compound quantitation, and detection limits. Areas of concern are listed below.

MAJOR

- The relative response factor (RRF) was less than the 0.05 criteria for the VOC 1,4-dioxane for the initial calibration on instrument MS-VOA4 on 04/13/12, on instrument MS-VOA3 on 07/05/12 and 07/30/12, and for all the continuing calibration verifications (CCV) for both instrument MS-VOA3 and MS-VOA4 affecting all samples. All samples had non-detected results for 1,4-dioxane which were qualified rejected, (UR).

MINOR

- Positive results reported below the quantitation limit but above the method detection limit were qualified as estimated, (J).

- The VOC CCV percent difference (%D) was greater than the 20% and less than the 50% quality control limit for vinyl chloride for instrument MS-VOA4 on 07/26/12 @ 22:05.
  Affected Samples: S43AQIDW02-20120721 and S43MW09S01
  Action: The sample S43MW09S01 positive vinyl chloride result was qualified estimated, (J). The sample S43AQIDW02-20120721 result was non-detected and was not qualified.

- The VOC CCV %D was greater than the 20% and greater than the 50% quality control limit for dichlorodifluoromethane for instrument MS-VOA3 on 07/27/12 @ 11:09.
  Affected Samples:
  S43MW0801 S43MW2101 S43MW0502
  S43MW09D01 S43MW0602
  Action: The sample non-detected results were qualified estimated, (UJ).

- The surrogate dibromofluoromethane percent recoveries (%Rs) were greater than the quality control limit for the samples listed.
  Affected Samples:
  S43MW09D01 S43MW1401 S43MW0602
  Action: All sample non-detected results were not qualified. The sample positive VOC results were qualified estimated, (J).

- The matrix spike (MS) and MS duplicate (MSD) %Rs were greater than the quality control limit for 3-nitrotoluene for sample S43MW1101. The positive 3-nitrotoluene result for sample S43MW1101 was qualified estimated, (J).

- The explosives surrogate 1-chloro-3-nitrobenzene %Rs for column 2 were greater than the quality control limit for the samples listed.
  Affected Samples:
  S43MW0502 S43MW09D01 S43MW09S01
  S43MW1101 S43MW17D01 S43MW19D01
  S43MW2101
  Actions: The non-detected sample explosives results were not qualified. The sample positive results reported from column 2 as listed below were qualified estimated, (J).

Sample	Qualified positive analyte
S43MW0502	3-nitrotoluene
S43MW09S01	3-nitrotoluene
S43MW1101	3-nitrotoluene
S43MW2101	nitrobenzene

- Field blank explosive contaminants were detected in the field blank sample S43FB07-20120722 (from SDG 1207127) at the following concentrations. The field blank sample S43FB07-20120722 was applied to all relevant SDGs.

Analyte	Maximum Conc. µg/l	Action Level µg/l
2-Amino-4,6-dinitrotoluene	0.227	1.135
2-Nitrotoluene	1.65	8.25
Nitrobenzene	0.45	2.25
Nitroglycerin	0.37	1.85
RDX	0.217	1.085

An action level of 5X the maximum concentration for the laboratory contaminants were established to evaluate the samples for blank contamination. Sample aliquot and dilution factors, if applicable, were taken into account when applying the action level. Samples explosive results less than the action level were qualified, (B), due to the field blank sample contamination.

- The explosives analysis relative percent differences (RPD) between the two analytical column results were greater than the 40% quality control limit for some sample positive explosives results. The positive explosives results for these samples were qualified estimated, (J), and reported from the HPLC1 column except when the RPD exceeded 100%. In cases when the positive column result RPDs exceeded 100%, the laboratory indicated matrix interferences and reported the lower of the two column positive results (also qualified estimated, (J)). The table below lists the samples, analytes qualified, and RPDs.

Sample	Analyte	RPD
S43MW0502	3-Nitrotoluene	110%
S43MW0602	4-Nitrotoluene	77%
S43MW0801	3-Nitrotoluene	160%
S43MW09S01	3-Nitrotoluene	105%
S43MW1101	3-Nitrotoluene	134%
S43MW17D01	4-Nitrotoluene	50%
	HMX	119%
S43MW17S01	4-Nitrotoluene	61%
S43MW19D01	3-Nitrotoluene	78%
	4-Nitrotoluene	166%
S43MW19S01	3-Nitrotoluene	163%
	4-Nitrotoluene	163%
S43MW19S01-D	4-Nitrotoluene	189%

NOTES

The VOC CCV %Ds were greater than the 20% and less than the 50% quality control limit for 2-butanone, 1,4-dioxane, and 4-methyl-2-pentanone for instrument MS-VOA4 on 07/26/12 @ 10:03.

Affected Samples:

S43AQIDW01-20120721	S43MW1101	S43MW17D01
S43MW17S01	S43MW1801	S43MW19D01
S43MW19S01	S43MW19S01-D	S43TB12-20120721

Action: All sample 2-butanone and 4-methyl-2-pentanone sample results were non-detected and no validation action was necessary. All sample 1,4-dioxane result were rejected for a RRF criteria non-compliance and no further action was necessary.

The VOC CCV %Ds were greater than the 20% and less than the 50% quality control limit for carbon tetrachloride, 1,4-dioxane, and 4-methyl-2-pentanone for instrument MS-VOA3 on 07/27/12 @ 11:09.

Affected Samples:

S43MW0801	S43MW2101	S43MW0502
S43MW09D01	S43MW0602	

Action: All sample 2-butanone and 4-methyl-2-pentanone sample results were non-detected and no validation action was necessary. All sample 1,4-dioxane result were rejected for a RRF criteria non-compliance and no further action was necessary.

The VOC CCV %Ds were greater than the 20% and less than the 50% quality control limit for acetone and 4-methyl-2-pentanone for instrument MS-VOA3 on 07/31/12 @ 07:40.

Affected Sample: S43MW0602 50X dilution re-analysis

Action: The sample acetone and 4-methyl-2-pentanone sample results were not reported from this dilution re-analysis and no validation action was necessary.

The laboratory control sample (LCS) and LCS duplicate (LCSD) analyte result relative percent differences (RPDs) were greater than the quality control limit for the 1,4-dioxane for batch 2G27014. No validation action was taken as analyte results are not qualified based on RPD non-compliances alone.

The following samples were analyzed for VOC analytes at dilutions, as listed below, resulting in elevated detection limits for the non-detected VOC analytes.

Sample	Dilution
S43AQIDW01-20120721	2X
S43AQIDW02-20120721	2X
S43MW0602	25X, 50X
S43MW17D01	20X
S43MW17S01	20X
S43MW19D01	2X
S43MW19S01	25X
S43MW19S01-D	25X

The matrix spike (MS) %Rs was greater than the quality control limit for HMX for sample S43MW1101. The HMX result for sample S43MW1101 was non-detected and was not qualified.

The laboratory explosives surrogate standard recovery and retention time (RT) summary forms were missing the retention times for the surrogate 1-chloro-3-nitrobenzene for the column 2 for a number of samples, blanks, CCVs, etc. making it appear that there were quality control limit retention time exceedances. The data validation chemist added the correct retention times from the raw data to the RT summary forms for the affected samples. All sample surrogate standard retention times were within the quality control limits.

The explosives surrogate 1-chloro-3-nitrobenzene %R for column 2 was less than the quality control limit and less than 10% for sample S43MW17S01.

Actions: The sample was re-analyzed out of the sample to extraction 7 day hold time with %Rs for both columns within the quality control limits. However, the initial sample analysis positive explosive results were reported from the column 1 which had a %R for the surrogate within the quality control limits. The sample re-analysis results were not reported/validated and the initial sample results were reported with no qualifications.

The MSD %R and the MS/MSD result were greater than the quality control limit for nitroguanidine for sample S43MW1101. The MS %R for the sample was compliant and no validation action was taken.

Non-detected results were reported to the limit of detection (LOD).

Sample field duplicate explosive results for samples S43MW0104 and S43MW19S01-D were not qualified for analyte RPD criteria exceedances as the differences between the sample results were less than 2X the sample analyte reporting limits (RL) as listed below.

Analyte	S43MW19S01	RL	S43MW19S01-D	RL	Result Delta	2X RL
2-Nitrotoluene	0.0967 µg/l	0.314 µg/l	ND	0.314 µg/l	0.0967 µg/l	less than
3-Nitrotoluene	0.222 µg/l	0.314 µg/l	ND	0.314 µg/l	0.222 µg/l	less than
4-Nitrotoluene	0.303 µg/l	0.314 µg/l	0.0968 µg/l	0.314 µg/l	0.206 µg/l	less than

Method blank explosive analytes were tentatively identified on analytical column 1 but those analytes were not confirmed on column 2. Other method blank explosive analytes were tentatively identified on column 2 but were not confirmed on column 1. None of the tentatively identified explosive method blank analytes were confirmed on the alternate column. Therefore, no explosive analytes tentatively identified on the analytical columns were used to establish action levels to qualify sample results for method blank contamination. The explosive sample raw data for the method blanks, CCVs, and samples for both analytical columns is included in the data package for reference.

EXECUTIVE SUMMARY

Laboratory Performance Issues: VOC sample 1,4-dioxane non-detected results were rejected due to RRF non-compliances. Sample VOC results were qualified for CCV %D, MS/MSD and surrogate %R non-compliances. Sample positive explosive results were qualified for surrogate %R non-compliances.

Other Factors Affecting Data Quality: Positive results reported below the quantitation limit but above the method detection limit were qualified as estimated (J). Sample explosive analyte results were qualified for field blank sample contamination. Sample positive explosive results were qualified for analytical column RPD non-compliances.

The data for these analyses were reviewed with reference to the Region III modifications to U.S. EPA National Functional Guidelines for Organic Data Validation (Sept. 1994), USEPA SW-846 Methods 8260B, 8330A, and 8330B, and the Department of Defense (DoD) document entitled "Quality Systems Manual (QSM) for Environmental Laboratories" (April 2009).

Tetra Tech
Joseph Kalinyak
Chemist/Data Validator

Tetra Tech
Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:
Appendix A - Qualified Analytical Results
Appendix B - Results as reported by the Laboratory
Appendix C - Support Documentation

Appendix A

Qualified Analytical Results

Value Qualifier Key (Val Qual)

J – The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.

UJ – The result is an estimated non-detected quantity. The associated numerical value is the approximate concentration of the analyte in the sample.

U - Value is a non-detect as reported by the laboratory.

UR – Non-detected result is considered rejected, (UR), as a result of technical non-compliances.

DATA QUALIFICATION CODE (QUAL CODE)

Qualifier Codes:

A = Lab Blank Contamination
B = Field Blank Contamination
C = Calibration Noncompliance (i.e., % RSDs, %Ds, ICVs, CCVs, RRFs, etc.)
C01 = GC/MS Tuning Noncompliance
D = MS/MSD Recovery Noncompliance
E = LCS/LCSD Recovery Noncompliance
F = Lab Duplicate Imprecision
G = Field Duplicate Imprecision
H = Holding Time Exceedance
I = ICP Serial Dilution Noncompliance
J = ICP PDS Recovery Noncompliance; MSA's $r < 0.995$
K = ICP Interference - includes ICS % R Noncompliance
L = Instrument Calibration Range Exceedance
M = Sample Preservation Noncompliance
N = Internal Standard Noncompliance
N01 = Internal Standard Recovery Noncompliance Dioxins
N02 = Recovery Standard Noncompliance Dioxins
N03 = Clean-up Standard Noncompliance Dioxins
O = Poor Instrument Performance (i.e., base-time drifting)
P = Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q = Other problems (can encompass a number of issues; i.e.chromatography,interferences, etc.)
R = Surrogates Recovery Noncompliance
S = Pesticide/PCB Resolution
T = % Breakdown Noncompliance for DDT and Endrin
U = RPD between columns/detectors >40% for positive results determined via GC/HPLC
V = Non-linear calibrations; correlation coefficient $r < 0.995$
W = EMPC result
X = Signal to noise response drop
Y = Percent solids <30%
Z = Uncertainty at 2 sigma deviation is less than sample activity
Z1 = Tentatively Identified Compound considered presumptively present
Z2 = Tentatively Identified Compound column bleed

PROJ_NO: 00771	NSAMPLE	S43AQIDW01-20120721			S43AQIDW02-20120721			S43MW0204			S43MW0204-D		
SDG: 1207126	LAB_ID	1207126-16			1207126-17			1207126-34			1207126-36		
FRACTION: OV	SAMP_DATE	7/21/2012			7/21/2012			7/22/2012			7/22/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF										S43MW0204		
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		1	U		1	U							
1,1,2,2-TETRACHLOROETHANE		1	U		1	U							
1,1,2-TRICHLOROETHANE		1	U		1	U							
1,1,2-TRICHLOROTRIFLUOROETHANE		1	U		1	U							
1,1-DICHLOROETHANE		1	U		0.92	J	P						
1,1-DICHLOROETHENE		1.24	J	P	1	U							
1,2,3-TRICHLOROBENZENE		1	U		1	U							
1,2,4-TRICHLOROBENZENE		1	U		1	U							
1,2-DIBROMO-3-CHLOROPROPANE		1	U		1	U							
1,2-DIBROMOETHANE		1	U		1	U							
1,2-DICHLOROBENZENE		1	U		1	U							
1,2-DICHLOROETHANE		1	U		1	U							
1,2-DICHLOROPROPANE		1	U		1	U							
1,3-DICHLOROPROPANE		1	U		1	U							
1,4-DICHLOROBENZENE		1	U		1	U							
1,4-DIOXANE		20	UR	C	20	UR	C						
2-BUTANONE		10	U		10	U							
2-HEXANONE		5	U		5	U							
4-METHYL-2-PENTANONE		5	U		5	U							
ACETONE		10	U		70.7								
BENZENE		1	U		1	U							
BROMODICHLOROMETHANE		1	U		1	U							
BROMOFORM		1	U		1	U							
BROMOMETHANE		2	U		2	U							
CARBON DISULFIDE		1	U		0.86	J	P						
CARBON TETRACHLORIDE		1	U		1	U							
CHLOROBENZENE		1	U		1	U							
CHLORODIBROMOMETHANE		1	U		1	U							
CHLOROETHANE		2	U		2	U							
CHLOROFORM		1	U		1	U							
CHLOROMETHANE		1	U		1	U							
CIS-1,2-DICHLOROETHENE		32.5			3.42								
CYCLOHEXANE		1	U		1	U							
DICHLORODIFLUOROMETHANE		2	U		2	U							
ETHYLBENZENE		1	U		1	U							

PROJ_NO: 00771	NSAMPLE	S43MW0502			S43MW0602			S43MW0602RE1			S43MW0801		
SDG: 1207126	LAB_ID	1207126-28RE1			1207126-20RE2			1207126-20RE1			1207126-18RE1		
FRACTION: OV	SAMP_DATE	7/22/2012			7/21/2012			7/21/2012			7/21/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		0.5	U					12.5	U		0.5	U	
1,1,2,2-TETRACHLOROETHANE		0.5	U					12.5	U		0.5	U	
1,1,2-TRICHLOROETHANE		0.5	U					12.5	U		0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		0.5	U					12.5	U		0.5	U	
1,1-DICHLOROETHANE		0.5	U					12.5	U		0.5	U	
1,1-DICHLOROETHENE		0.5	U					12.5	U		0.5	U	
1,2,3-TRICHLOROBENZENE		0.5	U					12.5	U		0.5	U	
1,2,4-TRICHLOROBENZENE		0.5	U					12.5	U		0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE		0.5	U					12.5	U		0.5	U	
1,2-DIBROMOETHANE		0.5	U					12.5	U		0.5	U	
1,2-DICHLOROBENZENE		0.5	U					12.5	U		0.5	U	
1,2-DICHLOROETHANE		0.5	U					12.5	U		0.5	U	
1,2-DICHLOROPROPANE		0.5	U					12.5	U		0.5	U	
1,3-DICHLOROPROPANE		0.5	U					12.5	U		0.5	U	
1,4-DICHLOROBENZENE		0.5	U					12.5	U		0.5	U	
1,4-DIOXANE		10	UR	C				250	UR	C	10	UR	C
2-BUTANONE		5	U					125	U		5	U	
2-HEXANONE		2.5	U					62.5	U		2.5	U	
4-METHYL-2-PENTANONE		2.5	U					62.5	U		2.5	U	
ACETONE		5	U					125	U		5	U	
BENZENE		0.5	U					12.5	U		0.5	U	
BROMODICHLOROMETHANE		0.5	U					12.5	U		0.5	U	
BROMOFORM		0.5	U					12.5	U		0.5	U	
BROMOMETHANE		1	U					25	U		1	U	
CARBON DISULFIDE		0.5	U					12.5	U		0.5	U	
CARBON TETRACHLORIDE		0.5	U					12.5	U		0.5	U	
CHLOROBENZENE		0.5	U					12.5	U		0.5	U	
CHLORODIBROMOMETHANE		0.5	U					12.5	U		0.5	U	
CHLOROETHANE		1	U					25	U		1	U	
CHLOROFORM		0.5	U					12.5	U		0.5	U	
CHLOROMETHANE		0.5	U					12.5	U		0.5	U	
CIS-1,2-DICHLOROETHENE		0.5	U					153	J	R	0.5	U	
CYCLOHEXANE		0.5	U					12.5	U		0.5	U	
DICHLORODIFLUOROMETHANE		1	UJ	C				25	UJ	C	1	UJ	C
ETHYLBENZENE		0.5	U					12.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43MW09D01			S43MW09S01			S43MW1101			S43MW1301		
SDG: 1207126	LAB_ID	1207126-32RE1			1207126-26			1207126-02			1207126-30RE1		
FRACTION: OV	SAMP_DATE	7/22/2012			7/22/2012			7/21/2012			7/22/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		0.5	U		1	U		0.5	U				
1,1,2,2-TETRACHLOROETHANE		0.5	U		1	U		0.5	U				
1,1,2-TRICHLOROETHANE		0.5	U		1	U		0.5	U				
1,1,2-TRICHLOROTRIFLUOROETHANE		0.5	U		1	U		0.5	U				
1,1-DICHLOROETHANE		0.5	U		1	U		0.5	U				
1,1-DICHLOROETHENE		0.5	U		4.36			0.5	U				
1,2,3-TRICHLOROBENZENE		0.5	U		1	U		0.5	U				
1,2,4-TRICHLOROBENZENE		0.5	U		1	U		0.5	U				
1,2-DIBROMO-3-CHLOROPROPANE		0.5	U		1	U		0.5	U				
1,2-DIBROMOETHANE		0.5	U		1	U		0.5	U				
1,2-DICHLOROBENZENE		0.5	U		1	U		0.5	U				
1,2-DICHLOROETHANE		0.5	U		1	U		0.5	U				
1,2-DICHLOROPROPANE		0.5	U		1	U		0.5	U				
1,3-DICHLOROPROPANE		0.5	U		1	U		0.5	U				
1,4-DICHLOROBENZENE		0.5	U		1	U		0.5	U				
1,4-DIOXANE		10	UR	C	20	UR	C	10	UR	C			
2-BUTANONE		5	U		10	U		5	U				
2-HEXANONE		2.5	U		5	U		2.5	U				
4-METHYL-2-PENTANONE		2.5	U		5	U		2.5	U				
ACETONE		5	U		10	U		5	U				
BENZENE		0.5	U		1	U		0.5	U				
BROMODICHLOROMETHANE		0.5	U		1	U		0.5	U				
BROMOFORM		0.5	U		1	U		0.5	U				
BROMOMETHANE		1	U		2	U		1	U				
CARBON DISULFIDE		0.5	U		2.36			0.5	U				
CARBON TETRACHLORIDE		0.5	U		1	U		0.5	U				
CHLOROBENZENE		0.5	U		1	U		0.5	U				
CHLORODIBROMOMETHANE		0.5	U		1	U		0.5	U				
CHLOROETHANE		1	U		2	U		1	U				
CHLOROFORM		0.5	U		1	U		0.5	U				
CHLOROMETHANE		0.5	U		1	U		0.5	U				
CIS-1,2-DICHLOROETHENE		0.5	U		26.4			0.5	U				
CYCLOHEXANE		0.5	U		1	U		0.5	U				
DICHLORODIFLUOROMETHANE		1	UJ	C	2	U		1	U				
ETHYLBENZENE		0.5	U		1	U		0.5	U				

PROJ_NO: 00771	NSAMPLE	S43MW1401			S43MW17D01			S43MW17S01			S43MW1801		
SDG: 1207126	LAB_ID	1207126-24			1207126-08			1207126-12			1207126-14		
FRACTION: OV	SAMP_DATE	7/22/2012			7/21/2012			7/21/2012			7/21/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE					10	U		10	U		0.5	U	
1,1,2,2-TETRACHLOROETHANE					10	U		10	U		0.5	U	
1,1,2-TRICHLOROETHANE					10	U		10	U		0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE					10	U		10	U		0.5	U	
1,1-DICHLOROETHANE					10	U		10	U		0.5	U	
1,1-DICHLOROETHENE					6.2	J	P	6.6	J	P	0.5	U	
1,2,3-TRICHLOROBENZENE					10	U		10	U		0.5	U	
1,2,4-TRICHLOROBENZENE					10	U		10	U		0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE					10	U		10	U		0.5	U	
1,2-DIBROMOETHANE					10	U		10	U		0.5	U	
1,2-DICHLOROBENZENE					10	U		10	U		0.5	U	
1,2-DICHLOROETHANE					10	U		10	U		0.5	U	
1,2-DICHLOROPROPANE					10	U		10	U		0.5	U	
1,3-DICHLOROPROPANE					10	U		10	U		0.5	U	
1,4-DICHLOROBENZENE					10	U		10	U		0.5	U	
1,4-DIOXANE					200	UR	C	200	UR	C	10	UR	C
2-BUTANONE					100	U		100	U		5	U	
2-HEXANONE					50	U		50	U		2.5	U	
4-METHYL-2-PENTANONE					50	U		50	U		2.5	U	
ACETONE					100	U		100	U		5	U	
BENZENE					10	U		10	U		0.5	U	
BROMODICHLOROMETHANE					10	U		10	U		0.5	U	
BROMOFORM					10	U		10	U		0.5	U	
BROMOMETHANE					20	U		20	U		1	U	
CARBON DISULFIDE					10	U		10	U		0.5	U	
CARBON TETRACHLORIDE					10	U		10	U		0.5	U	
CHLOROBENZENE					10	U		10	U		0.5	U	
CHLORODIBROMOMETHANE					10	U		10	U		0.5	U	
CHLOROETHANE					20	U		20	U		1	U	
CHLOROFORM					10	U		10	U		0.5	U	
CHLOROMETHANE					10	U		10	U		0.5	U	
CIS-1,2-DICHLOROETHENE					255			212			1.59		
CYCLOHEXANE					10	U		10	U		0.5	U	
DICHLORODIFLUOROMETHANE					20	U		20	U		1	U	
ETHYLBENZENE					10	U		10	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43MW19D01			S43MW19S01			S43MW19S01-D			S43MW2101		
SDG: 1207126	LAB_ID	1207126-10			1207126-04			1207126-06			1207126-22RE1		
FRACTION: OV	SAMP_DATE	7/21/2012			7/21/2012			7/21/2012			7/21/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF							S43MW19S01					
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		1	U		12.5	U		12.5	U		0.5	U	
1,1,2,2-TETRACHLOROETHANE		1	U		12.5	U		12.5	U		0.5	U	
1,1,2-TRICHLOROETHANE		1	U		12.5	U		12.5	U		0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		1	U		12.5	U		12.5	U		0.5	U	
1,1-DICHLOROETHANE		1	U		9.75	J	P	10.2	J	P	0.5	U	
1,1-DICHLOROETHENE		1	U		57			70			0.5	U	
1,2,3-TRICHLOROBENZENE		1	U		12.5	U		12.5	U		0.5	U	
1,2,4-TRICHLOROBENZENE		1	U		12.5	U		12.5	U		0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE		1	U		12.5	U		12.5	U		0.5	U	
1,2-DIBROMOETHANE		1	U		12.5	U		12.5	U		0.5	U	
1,2-DICHLOROBENZENE		1	U		12.5	U		12.5	U		0.5	U	
1,2-DICHLOROETHANE		1	U		12.5	U		12.5	U		0.5	U	
1,2-DICHLOROPROPANE		1	U		12.5	U		12.5	U		0.5	U	
1,3-DICHLOROPROPANE		1	U		12.5	U		12.5	U		0.5	U	
1,4-DICHLOROBENZENE		1	U		12.5	U		12.5	U		0.5	U	
1,4-DIOXANE		20	UR	C	250	UR	C	250	UR	C	10	UR	C
2-BUTANONE		10	U		125	U		125	U		5	U	
2-HEXANONE		5	U		62.5	U		62.5	U		2.5	U	
4-METHYL-2-PENTANONE		5	U		62.5	U		62.5	U		2.5	U	
ACETONE		10	U		125	U		125	U		5	U	
BENZENE		1	U		12.5	U		12.5	U		0.5	U	
BROMODICHLOROMETHANE		1	U		12.5	U		12.5	U		0.5	U	
BROMOFORM		1	U		12.5	U		12.5	U		0.5	U	
BROMOMETHANE		2	U		25	U		25	U		1	U	
CARBON DISULFIDE		1	U		12.5	U		12.5	U		0.5	U	
CARBON TETRACHLORIDE		1	U		12.5	U		12.5	U		0.5	U	
CHLOROBENZENE		1	U		12.5	U		12.5	U		0.5	U	
CHLORODIBROMOMETHANE		1	U		12.5	U		12.5	U		0.5	U	
CHLOROETHANE		2	U		25	U		25	U		1	U	
CHLOROFORM		1	U		12.5	U		12.5	U		0.5	U	
CHLOROMETHANE		1	U		12.5	U		12.5	U		0.5	U	
CIS-1,2-DICHLOROETHENE		30.5			158			166			0.5	U	
CYCLOHEXANE		1	U		12.5	U		12.5	U		0.5	U	
DICHLORODIFLUOROMETHANE		2	U		25	U		25	U		1	UJ	C
ETHYLBENZENE		1	U		12.5	U		12.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43TB12-20120721		
SDG: 1207126	LAB_ID	1207126-01		
FRACTION: OV	SAMP_DATE	7/21/2012		
MEDIA: WATER	QC_TYPE	NM		
	UNITS	UG/L		
	PCT_SOLIDS	0.0		
	DUP_OF			
PARAMETER		RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		0.5	U	
1,1,2,2-TETRACHLOROETHANE		0.5	U	
1,1,2-TRICHLOROETHANE		0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		0.5	U	
1,1-DICHLOROETHANE		0.5	U	
1,1-DICHLOROETHENE		0.5	U	
1,2,3-TRICHLOROBENZENE		0.5	U	
1,2,4-TRICHLOROBENZENE		0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE		0.5	U	
1,2-DIBROMOETHANE		0.5	U	
1,2-DICHLOROBENZENE		0.5	U	
1,2-DICHLOROETHANE		0.5	U	
1,2-DICHLOROPROPANE		0.5	U	
1,3-DICHLOROPROPANE		0.5	U	
1,4-DICHLOROBENZENE		0.5	U	
1,4-DIOXANE		10	UR	C
2-BUTANONE		5	U	
2-HEXANONE		2.5	U	
4-METHYL-2-PENTANONE		2.5	U	
ACETONE		5	U	
BENZENE		0.5	U	
BROMODICHLOROMETHANE		0.5	U	
BROMOFORM		0.5	U	
BROMOMETHANE		1	U	
CARBON DISULFIDE		0.5	U	
CARBON TETRACHLORIDE		0.5	U	
CHLOROBENZENE		0.5	U	
CHLORODIBROMOMETHANE		0.5	U	
CHLOROETHANE		1	U	
CHLOROFORM		0.5	U	
CHLOROMETHANE		0.5	U	
CIS-1,2-DICHLOROETHENE		0.5	U	
CYCLOHEXANE		0.5	U	
DICHLORODIFLUOROMETHANE		1	U	
ETHYLBENZENE		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43AQIDW01-20120721			S43AQIDW02-20120721			S43MW0204			S43MW0204-D		
SDG: 1207126	LAB_ID	1207126-16			1207126-17			1207126-34			1207126-36		
FRACTION: OV	SAMP_DATE	7/21/2012			7/21/2012			7/22/2012			7/22/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF										S43MW0204		
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		1	U		1	U							
METHYL ACETATE		2	U		2	U							
METHYL TERT-BUTYL ETHER		1	U		1	U							
METHYLENE CHLORIDE		2	U		2	U							
STYRENE		1	U		1	U							
TETRACHLOROETHENE		1	U		1	U							
TOLUENE		1	U		1	U							
TOTAL XYLENES		2	U		2	U							
TRANS-1,2-DICHLOROETHENE		1	U		1	U							
TRICHLOROETHENE		213			34.5			0.5	U		0.5	U	
TRICHLOROFLUOROMETHANE		2	U		2	U							
VINYL CHLORIDE		4.94			1	U							

PROJ_NO: 00771	NSAMPLE	S43MW0502			S43MW0602			S43MW0602RE1			S43MW0801		
SDG: 1207126	LAB_ID	1207126-28RE1			1207126-20RE2			1207126-20RE1			1207126-18RE1		
FRACTION: OV	SAMP_DATE	7/22/2012			7/21/2012			7/21/2012			7/21/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		0.5	U					12.5	U		0.5	U	
METHYL ACETATE		1	U					25	U		1	U	
METHYL TERT-BUTYL ETHER		0.5	U					12.5	U		0.5	U	
METHYLENE CHLORIDE		0.53	J	P				25	U		1	U	
STYRENE		0.5	U					12.5	U		0.5	U	
TETRACHLOROETHENE		0.5	U					12.5	U		0.5	U	
TOLUENE		0.5	U					12.5	U		0.5	U	
TOTAL XYLENES		1	U					25	U		1	U	
TRANS-1,2-DICHLOROETHENE		0.5	U					12.5	U		0.5	U	
TRICHLOROETHENE		0.5	U		4420						0.5	U	
TRICHLOROFLUOROMETHANE		1	U					25	U		1	U	
VINYL CHLORIDE		0.5	U					7.5	J	PR	0.5	U	

PROJ_NO: 00771	NSAMPLE	S43MW09D01			S43MW09S01			S43MW1101			S43MW1301		
SDG: 1207126	LAB_ID	1207126-32RE1			1207126-26			1207126-02			1207126-30RE1		
FRACTION: OV	SAMP_DATE	7/22/2012			7/22/2012			7/21/2012			7/22/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		0.5	U		1	U		0.5	U				
METHYL ACETATE		1	U		2	U		1	U				
METHYL TERT-BUTYL ETHER		0.5	U		1	U		0.5	U				
METHYLENE CHLORIDE		0.51	J	PR	2	U		1	U				
STYRENE		0.5	U		1	U		0.5	U				
TETRACHLOROETHENE		0.5	U		1	U		0.5	U				
TOLUENE		0.5	U		1	U		0.5	U				
TOTAL XYLENES		1	U		2	U		1	U				
TRANS-1,2-DICHLOROETHENE		0.5	U		0.58	J	P	0.5	U				
TRICHLOROETHENE		0.5	U		100			0.5	U		1.18		
TRICHLOROFLUOROMETHANE		1	U		2	U		1	U				
VINYL CHLORIDE		0.5	U		2.7	J	C	0.5	U				

PROJ_NO: 00771	NSAMPLE	S43MW1401			S43MW17D01			S43MW17S01			S43MW1801		
SDG: 1207126	LAB_ID	1207126-24			1207126-08			1207126-12			1207126-14		
FRACTION: OV	SAMP_DATE	7/22/2012			7/21/2012			7/21/2012			7/21/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE					10	U		10	U		0.5	U	
METHYL ACETATE					20	U		20	U		1	U	
METHYL TERT-BUTYL ETHER					10	U		10	U		0.5	U	
METHYLENE CHLORIDE					20	U		20	U		1	U	
STYRENE					10	U		10	U		0.5	U	
TETRACHLOROETHENE					10	U		10	U		0.5	U	
TOLUENE					10	U		10	U		0.5	U	
TOTAL XYLENES					20	U		20	U		1	U	
TRANS-1,2-DICHLOROETHENE					10	U		10	U		0.5	U	
TRICHLOROETHENE		0.5	U		2660			2740			2.78		
TRICHLOROFLUOROMETHANE					20	U		20	U		1	U	
VINYL CHLORIDE					65.6			45.2			0.5	U	

PROJ_NO: 00771	NSAMPLE	S43MW19D01			S43MW19S01			S43MW19S01-D			S43MW2101		
SDG: 1207126	LAB_ID	1207126-10			1207126-04			1207126-06			1207126-22RE1		
FRACTION: OV	SAMP_DATE	7/21/2012			7/21/2012			7/21/2012			7/21/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF							S43MW19S01					
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		1	U		12.5	U		12.5	U		0.5	U	
METHYL ACETATE		2	U		25	U		25	U		1	U	
METHYL TERT-BUTYL ETHER		1	U		12.5	U		12.5	U		0.5	U	
METHYLENE CHLORIDE		2	U		25	U		25	U		1	U	
STYRENE		1	U		12.5	U		12.5	U		0.5	U	
TETRACHLOROETHENE		1	U		12.5	U		12.5	U		0.5	U	
TOLUENE		1	U		12.5	U		12.5	U		0.5	U	
TOTAL XYLENES		2	U		25	U		25	U		1	U	
TRANS-1,2-DICHLOROETHENE		1	U		12.5	U		12.5	U		0.5	U	
TRICHLOROETHENE		72.8			3620			4090			0.83	J	P
TRICHLOROFLUOROMETHANE		2	U		25	U		25	U		1	U	
VINYL CHLORIDE		9.12			12.5	U		12.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43TB12-20120721		
SDG: 1207126	LAB_ID	1207126-01		
FRACTION: OV	SAMP_DATE	7/21/2012		
MEDIA: WATER	QC_TYPE	NM		
	UNITS	UG/L		
	PCT_SOLIDS	0.0		
	DUP_OF			
PARAMETER		RESULT	VQL	QLCD
ISOPROPYLBENZENE		0.5	U	
METHYL ACETATE		1	U	
METHYL TERT-BUTYL ETHER		0.5	U	
METHYLENE CHLORIDE		1	U	
STYRENE		0.5	U	
TETRACHLOROETHENE		0.5	U	
TOLUENE		0.5	U	
TOTAL XYLENES		1	U	
TRANS-1,2-DICHLOROETHENE		0.5	U	
TRICHLOROETHENE		0.5	U	
TRICHLOROFLUOROMETHANE		1	U	
VINYL CHLORIDE		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43MW0502			S43MW0602			S43MW0801			S43MW09D01		
SDG: 1207126	LAB_ID	1207126-28			1207126-20			1207126-18			1207126-32		
FRACTION: EXP	SAMP_DATE	7/22/2012			7/21/2012			7/21/2012			7/22/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,3,5-TRINITROBENZENE		0.168	U		0.158	U		0.155	U		0.168	U	
1,3-DINITROBENZENE		0.168	U		0.158	U		0.155	U		0.168	U	
2,4,6-TRINITROTOLUENE		0.168	U		0.158	U		0.155	U		0.168	U	
2,4-DINITROTOLUENE		0.168	U		0.158	U		0.155	U		0.168	U	
2,6-DINITROTOLUENE		0.168	U		0.158	U		0.155	U		0.168	U	
2-AMINO-4,6-DINITROTOLUENE		0.168	U		0.158	U		0.155	U		0.168	U	
2-NITROTOLUENE		0.168	U		0.158	U		0.155	U		0.168	U	
3-NITROTOLUENE		0.439	J	QRU	0.871			0.107	J	PQU	0.168	U	
4-AMINO-2,6-DINITROTOLUENE		0.168	U		0.158	U		0.155	U		0.168	U	
4-NITROTOLUENE		0.168	U		0.142	J	PU	0.155	U		0.168	U	
HMX		0.168	U		0.158	U		0.155	U		0.168	U	
NITROBENZENE		0.168	U		0.158	U		0.155	U		0.168	U	
NITROGLYCERIN		0.421	U		0.396	U		0.388	U		0.421	U	
NITROGUANIDINE		10	U		10	U		10	U		10	U	
RDX		0.305	B	B	0.398	B	B	0.229	B	B	0.168	U	
TETRYL		0.168	U		0.158	U		0.155	U		0.168	U	

PROJ_NO: 00771	NSAMPLE	S43MW09S01			S43MW1101			S43MW17D01			S43MW17S01		
SDG: 1207126	LAB_ID	1207126-26			1207126-02			1207126-08			1207126-12		
FRACTION: EXP	SAMP_DATE	7/22/2012			7/21/2012			7/21/2012			7/21/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,3,5-TRINITROBENZENE		0.154	U		0.164	U		0.168	U		0.151	U	
1,3-DINITROBENZENE		0.154	U		0.164	U		0.168	U		0.151	U	
2,4,6-TRINITROTOLUENE		0.154	U		0.164	U		0.168	U		0.151	U	
2,4-DINITROTOLUENE		0.154	U		0.164	U		0.168	U		0.151	U	
2,6-DINITROTOLUENE		0.154	U		0.164	U		0.168	U		0.151	U	
2-AMINO-4,6-DINITROTOLUENE		0.154	U		0.164	U		0.168	U		0.151	U	
2-NITROTOLUENE		0.154	U		0.164	U		0.168	U		0.151	U	
3-NITROTOLUENE		0.365	J	QRU	0.418	J	DQRU	0.168	U		0.419		
4-AMINO-2,6-DINITROTOLUENE		0.154	U		0.164	U		0.168	U		0.151	U	
4-NITROTOLUENE		0.381			0.164	U		2.13	J	U	0.6	J	U
HMX		0.154	U		0.164	U		0.135	J	PQU	0.236	J	P
NITROBENZENE		0.154	U		0.164	U		0.168	U		0.151	U	
NITROGLYCERIN		0.385	U		0.318	B	B	0.421	U		0.377	U	
NITROGUANIDINE		10	U		10	U		10	U		10	U	
RDX		0.583	B	B	0.164	U		0.103	B	B	0.499	B	B
TETRYL		0.154	U		0.164	U		0.168	U		0.151	U	

PROJ_NO: 00771	NSAMPLE	S43MW1801			S43MW19D01			S43MW19S01			S43MW19S01-D		
SDG: 1207126	LAB_ID	1207126-14			1207126-10			1207126-04			1207126-06		
FRACTION: EXP	SAMP_DATE	7/21/2012			7/21/2012			7/21/2012			7/21/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF										S43MW19S01		
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,3,5-TRINITROBENZENE		0.168	U		0.16	U		0.157	U		0.157	U	
1,3-DINITROBENZENE		0.168	U		0.16	U		0.157	U		0.157	U	
2,4,6-TRINITROTOLUENE		0.168	U		0.16	U		0.157	U		0.157	U	
2,4-DINITROTOLUENE		0.168	U		0.16	U		0.157	U		0.157	U	
2,6-DINITROTOLUENE		0.168	U		0.16	U		0.157	U		0.157	U	
2-AMINO-4,6-DINITROTOLUENE		0.168	U		0.16	U		0.157	U		0.157	U	
2-NITROTOLUENE		0.168	U		0.16	U		0.0967	B	B	0.157	U	
3-NITROTOLUENE		0.168	U		0.366	J	U	0.222	J	PQU	0.157	U	
4-AMINO-2,6-DINITROTOLUENE		0.168	U		0.16	U		0.157	U		0.157	U	
4-NITROTOLUENE		0.168	U		0.0904	J	PQU	0.303	J	PQU	0.0968	J	PQU
HMX		0.123	J	P	0.16	U		0.13	J	P	0.125	J	P
NITROBENZENE		0.168	U		0.16	U		0.157	U		0.157	U	
NITROGLYCERIN		0.421	U		0.4	U		0.392	U		0.392	U	
NITROGUANIDINE		10	U		10	U		10	U		10	U	
RDX		0.348	B	B	0.239	B	B	0.497	B	B	0.369	B	B
TETRYL		0.168	U		0.16	U		0.157	U		0.157	U	

PROJ_NO: 00771	NSAMPLE	S43MW2101		
SDG: 1207126	LAB_ID	1207126-22		
FRACTION: EXP	SAMP_DATE	7/21/2012		
MEDIA: WATER	QC_TYPE	NM		
	UNITS	UG/L		
	PCT_SOLIDS	0.0		
	DUP_OF			
PARAMETER		RESULT	VQL	QLCD
1,3,5-TRINITROBENZENE		0.168	U	
1,3-DINITROBENZENE		0.168	U	
2,4,6-TRINITROTOLUENE		0.168	U	
2,4-DINITROTOLUENE		0.168	U	
2,6-DINITROTOLUENE		0.168	U	
2-AMINO-4,6-DINITROTOLUENE		0.168	U	
2-NITROTOLUENE		0.168	U	
3-NITROTOLUENE		0.168	U	
4-AMINO-2,6-DINITROTOLUENE		0.168	U	
4-NITROTOLUENE		0.168	U	
HMX		0.168	U	
NITROBENZENE		0.117	B	B
NITROGLYCERIN		0.421	U	
NITROGUANIDINE		10	U	
RDX		0.168	U	
TETRYL		0.168	U	

Tetra Tech INC **INTERNAL CORRESPONDENCE**

TO:	**R. SOK**	**DATE:**	**SEPTEMBER 24, 2012**
FROM:	**J. KALINYAK**	**COPIES:**	**DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – VOC / EXPLOSIVES / NITROGUANIDINE**
NSF INDIAN HEAD, CTO 114
SAMPLE DELIVERY GROUP 1207127

SAMPLES: 9 / Aqueous / VOC

S43AQIDW03-20120722	S43FB07-20120722	S43MW0104
S43MW0104-D	S43MW0302	S43MW0402
S43MW0701	S43MW1001	S43MW1201

2 / Aqueous / VOC - Trichloroethene only

S43MW1501	S43MW1601

8 / Aqueous / Explosives / Nitroguanidine

S43FB07-20120722	S43MW0104	S43MW0104-D
S43MW0302	S43MW0402	S43MW0701
S43MW1001	S43MW1201	

2 / TCLPV

S43SOIDW01-20120721	S43SOIDW02-20120721

OVERVIEW

The sample set for NSF Indian Head, CTO 114, SDG 1207127, consisted of eleven (11) aqueous samples including one (1) aqueous field blank sample, and two (2) TCLPV samples. Nine (9) samples were analyzed for volatile organic compounds (VOC), two (2) samples were analyzed for the VOC trichloroethene only, eight (8) of the samples were analyzed for explosives, including nitroguanidine, and two (2) samples were analyzed for TCLPV as listed above. One (1) field duplicate sample pair was contained within this sample delivery group (SDG); S43MW0104-D / S43MW0104.

The samples were collected by Tetra Tech on July 21, and 22, 2012 and analyzed by Empirical Laboratory LLC. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using EPA SW-846 Methods 8260B for VOCs, 8330B for explosives, and 8330A/IAAP for nitroguanidine, analysis and reporting protocols.

The data contained in this SDG were validated with regard to the following parameters: data completeness, hold times, GC/MS tuning, initial/continuing calibrations, laboratory method blank results, blank spike results, matrix spike/spike duplicate recoveries, surrogate spike recoveries, internal standard recoveries, field duplicate results, chromatographic resolution, compound identification, compound quantitation, and detection limits. Areas of concern are listed below.

MAJOR

- The relative response factor (RRF) was less than the 0.05 criteria for the VOC 1,4-dioxane for the initial calibration on instrument MS-VOA4 on 04/13/12, on instrument MS-VOA3 on 07/05/12 and 07/30/12, and for all the continuing calibration verifications (CCV) for both instrument MS-VOA4 and instrument MS-VOA3 affecting all samples. All samples had non-detected results for 1,4-dioxane which were qualified rejected, (UR).

MINOR

- Positive results reported below the quantitation limit but above the method detection limit were qualified as estimated, (J).

- The sample to extraction and analysis hold time of 14 days was exceeded for the TCLPV analysis for samples S43SOIDW01-20120721 and S43SOIDW02-20120721. Both samples had non-detected TCLPV sample results which were qualified estimated, (UJ).

- The common laboratory VOC contaminants were detected in the field blank sample S43FB07-20120722 at the following concentrations.

Analyte	Maximum Conc. µg/l	Action Level µg/l
Acetone	12.0	120.0
2-Butanone	7.34	73.4

  An action level of 10X the maximum concentration for the common laboratory contaminants acetone and 2-butanone were established to evaluate the samples for blank contamination. Sample aliquot and dilution factors, if applicable, were taken into account when applying the action level. Sample S43AQIDW03-20120722 acetone result less than the action level was qualified, (B), due to the field blank sample contamination.

- The VOC CCV %Ds were greater than the 20% and less than the 50% quality control limit for vinyl chloride for instrument MS-VOA4 on 07/26/12 @ 22:05.

  Affected Samples:

S43AQIDW03-20120722	S43FB07-20120722	S43MW0104
S43MW0104-D	S43MW0402	S43MW0701
S43MW1201		

  Action: The sample S43MW0402 positive vinyl chloride result was qualified estimated, (J). The remaining samples had non-detected results for vinyl chloride and no validation action was necessary.

- The VOC CCV %D was greater than the 20% and greater than the 50% quality control limit for dichlorodifluoromethane for instrument MS-VOA3 on 07/27/12 @ 11:09.

  Affected Samples:

  S43MW0302 S43MW1001

  Action: The sample non-detected results were qualified estimated, (UJ).

- The matrix spike (MS) and MS duplicate (MSD) %Rs were less than the quality control limit for trichloroethene for sample S43MW0402. The positive trichloroethene result for sample S43MW0402 was qualified estimated, (J).

- Field blank explosive contaminants were detected in the field blank sample S43FB07-20120722 at the following concentrations.

Analyte	Maximum Conc. µg/l	Action Level µg/l
2-Amino-4,6-dinitrotoluene	0.227	1.135
2-Nitrotoluene	1.65	8.25
Nitrobenzene	0.45	2.25
Nitroglycerin	0.37	1.85
RDX	0.217	1.085

An action level of 5X the maximum concentration for the laboratory contaminants were established to evaluate the samples for blank contamination. Sample aliquot and dilution factors, if applicable, were taken into account when applying the action level. Samples explosive results less than the action level were qualified, (B), due to the field blank sample contamination.

- The MS and MSD %Rs were less than the quality control limit for nitroguanidine for sample S43MW0402. The non-detected nitroguanidine result for sample S43MW0402 was qualified estimated, (UJ).

- The explosives MS and MSD %Rs were greater than the quality control limit for 3-nitrotoluene for sample S43MW0402. The positive 3-nitrotoluene result for sample S43MW0402 was qualified estimated, (J).

- The explosives surrogate 1-chloro-3-nitrobenzene %Rs for column 2 were greater than the quality control limit for the samples listed.

  Affected Samples:

S43MW0104	S43MW0104-D	S43MW0302
S43MW0402	S43MW0701	S43MW1001
S43MW1201		

  Actions: The non-detected sample explosives results were not qualified. The sample positive results reported from column 2 as listed below were qualified estimated, (J).

Sample	Qualified positive analyte
S43MW0104	3-nitrotoluene
S43MW0104-D	3-nitrotoluene

- The explosives analysis relative percent differences (RPD) between the two analytical column results were greater than the 40% quality control limit for some sample positive explosives results. The positive explosives results for these samples were qualified estimated, (J), and reported from the HPLC1 column except when the RPD exceeded 100%. In cases when the positive column result RPDs exceeded 100%, the laboratory indicated matrix interferences and reported the lower of the two column positive results (also qualified estimated, (J)). The table below lists the samples, analytes qualified, and RPDs.

Sample	Analyte	RPD
S43FB07-20120722	2-Amino-4,6-dinitrotoluene	49%
	Nitroglycerin	84%
	RDX	197%
S43MW0104	2,6-Dinitrotoluene	72%
	3-Nitrotoluene	137%
	4-Nitrotoluene	97%
S43MW0104-D	3-Nitrotoluene	123%
	4-Nitrotoluene	143%
S43MW0302	4-Nitrotoluene	120%

S43MW0402	3-Nitrotoluene	88%
	4-Nitrotoluene	152%
S43MW0701	3-Nitrotoluene	84%
	4-Nitrotoluene	148%
S43MW1001	2,6-Dinitrotoluene	554%
	3-Nitrotoluene	173%
	4-Nitrotoluene	161%
S43MW1201	4-Nitrotoluene	146%

NOTES

The VOC CCV %Ds were greater than the 20% and less than the 50% quality control limit for carbon tetrachloride, 1,4-dioxane, and 4-methyl-2-pentanone for instrument MS-VOA3 on 07/27/12 @ 11:09.

Affected Samples: S43MW0302 and S43MW1001

Action: All sample 2-butanone and 4-methyl-2-pentanone sample results were non-detected and no validation action was necessary. All sample 1,4-dioxane result were rejected for a RRF criteria non-compliance and no further action was necessary.

The laboratory control sample (LCS) and LCS duplicate (LCSD) analyte result relative percent differences (RPDs) were greater than the quality control limit for the 1,4-dioxane for batch 2G27014. No validation action was taken as analyte results are not qualified based on RPD non-compliances alone.

The following samples were analyzed for VOC analytes at dilutions, as listed below, resulting in elevated detection limits for the non-detected VOC analytes.

Sample	Dilution
S43AQIDW03-20120722	2X (diluted due to foaming per the laboratory narrative)
S43MW0104	100X
S43MW0104	100X
S43MW0104-D	100X
S43MW0402	5X

The following samples were analyzed for TCLPV analytes at dilutions, as listed below, resulting in elevated detection limits for the non-detected VOC analytes.

Sample	Dilution
S43SOIDW01-20120721	10X
S43SOIDW02-20120721	10X

The MS/MSD result RPD for 1,4-dioxane was greater than the quality control limit for sample S43MW0402. No validation action was necessary as the result was previously rejected for a RRF criteria non-compliane.

The laboratory explosives surrogate standard recovery and retention time (RT) summary forms were missing the retention times for the surrogate 1-chloro-3-nitrobenzene for the column 2 for a number of samples, blanks, CCVs, etc. making it appear that there were quality control limit retention time exceedances. The data validation chemist added the correct retention times from the raw data to the RT summary forms for the affected samples. All sample surrogate standard retention times were within the quality control limits.

Sample field duplicate explosive results for samples S43MW0104 and S43MW19S01-D were not qualified for analyte RPD criteria exceedances as the difference between the sample results were less than 2X the sample analyte reporting limits (RL) as listed below.

Analyte	S43MW0104	RL	S43MW0104-D	RL	Result Delta	2X RL
2,6-Dinitrotoluene	0.185 µg/l	0.305 µg/l	ND	0.337 µg/l	0.185 µg/l	less than
4-Nitrotoluene	0.394 µg/l	0.305 µg/l	0.221 µg/l	0.337 µg/l	0.221 µg/l	less than

Non-detected results were reported to the limit of detection (LOD).

Method blank explosive analytes were tentatively identified on analytical column 1 but those analytes were not confirmed on column 2. Other method blank explosive analytes were tentatively identified on column 2 but were not confirmed on column 1. None of the tentatively identified explosive method blank analytes were confirmed on the alternate column. Therefore, no explosive analytes tentatively identified on the analytical columns were used to establish action levels to qualify sample results for method blank contamination. The explosive sample raw data for the method blanks, CCVs, and samples for both analytical columns is included in the data package for reference.

EXECUTIVE SUMMARY

Laboratory Performance Issues: The TCLPV sample results were qualified for a sample to analysis hold time non-compliance. VOC sample 1,4-dioxane non-detected results were rejected due to RRF non-compliances. The sample S43AQIDW03-20120722 acetone result was qualified for field blank contamination. Sample VOC results were qualified for CCV %D, and MS/MSD %R non-compliances. Sample positive explosive results were qualified for field blank contamination results, MS/MSD %R non-compliances and surrogate %R non-compliances.

Other Factors Affecting Data Quality: Positive results reported below the quantitation limit but above the method detection limit were qualified as estimated (J). Sample positive explosive results were qualified for analytical column RPD non-compliances and matrix interferences.

The data for these analyses were reviewed with reference to the Region III modifications to U.S. EPA National Functional Guidelines for Organic Data Validation (Sept. 1994), USEPA SW-846 Methods 8260B, 8330A, and 8330B, and the Department of Defense (DoD) document entitled "Quality Systems Manual (QSM) for Environmental Laboratories" (April 2009).

Tetra Tech
Joseph Kalinyak
Chemist/Data Validator

Tetra Tech
Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:
Appendix A - Qualified Analytical Results
Appendix B - Results as reported by the Laboratory
Appendix C - Support Documentation

Appendix A

Qualified Analytical Results

DATA QUALIFICATION CODE (QUAL CODE)

Qualifier Codes:

A	=	Lab Blank Contamination
B	=	Field Blank Contamination
C	=	Calibration Noncompliance (i.e., % RSDs, %Ds, ICVs, CCVs, RRFs, etc.)
C01	=	GC/MS Tuning Noncompliance
D	=	MS/MSD Recovery Noncompliance
E	=	LCS/LCSD Recovery Noncompliance
F	=	Lab Duplicate Imprecision
G	=	Field Duplicate Imprecision
H	=	Holding Time Exceedance
I	=	ICP Serial Dilution Noncompliance
J	=	ICP PDS Recovery Noncompliance; MSA's $r < 0.995$
K	=	ICP Interference - includes ICS % R Noncompliance
L	=	Instrument Calibration Range Exceedance
M	=	Sample Preservation Noncompliance
N	=	Internal Standard Noncompliance
N01	=	Internal Standard Recovery Noncompliance Dioxins
N02	=	Recovery Standard Noncompliance Dioxins
N03	=	Clean-up Standard Noncompliance Dioxins
O	=	Poor Instrument Performance (i.e., base-time drifting)
P	=	Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q	=	Other problems (can encompass a number of issues; i.e.chromatography,interferences, etc.)
R	=	Surrogates Recovery Noncompliance
S	=	Pesticide/PCB Resolution
T	=	% Breakdown Noncompliance for DDT and Endrin
U	=	RPD between columns/detectors >40% for positive results determined via GC/HPLC
V	=	Non-linear calibrations; correlation coefficient $r < 0.995$
W	=	EMPC result
X	=	Signal to noise response drop
Y	=	Percent solids <30%
Z	=	Uncertainty at 2 sigma deviation is less than sample activity
Z1	=	Tentatively Identified Compound considered presumptively present
Z2	=	Tentatively Identified Compound column bleed

PROJ_NO: 00771	NSAMPLE	S43AQIDW03-20120722			S43FB07-20120722			S43MW0104			S43MW0104-D		
SDG: 1207127	LAB_ID	1207127-21			1207127-19			1207127-11			1207127-13		
FRACTION: OV	SAMP_DATE	7/22/2012			7/22/2012			7/22/2012			7/22/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF										S43MW0104		
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		1	U		0.5	U		50	U		50	U	
1,1,2,2-TETRACHLOROETHANE		1	U		0.5	U		50	U		50	U	
1,1,2-TRICHLOROETHANE		1	U		0.5	U		50	U		50	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		1	U		0.5	U		50	U		50	U	
1,1-DICHLOROETHANE		0.9	J	P	0.5	U		50	U		50	U	
1,1-DICHLOROETHENE		1	U		0.5	U		50	U		50	U	
1,2,3-TRICHLOROBENZENE		1	U		0.5	U		50	U		50	U	
1,2,4-TRICHLOROBENZENE		1	U		0.5	U		50	U		50	U	
1,2-DIBROMO-3-CHLOROPROPANE		1	U		0.5	U		50	U		50	U	
1,2-DIBROMOETHANE		1	U		0.5	U		50	U		50	U	
1,2-DICHLOROBENZENE		1	U		0.5	U		50	U		50	U	
1,2-DICHLOROETHANE		1	U		0.5	U		50	U		50	U	
1,2-DICHLOROPROPANE		1	U		0.5	U		50	U		50	U	
1,3-DICHLOROPROPANE		1	U		0.5	U		50	U		50	U	
1,4-DICHLOROBENZENE		1	U		0.5	U		50	U		50	U	
1,4-DIOXANE		20	UR	C	10	UR	C	1000	UR	C	1000	UR	C
2-BUTANONE		10	U		7.34	J	P	500	U		500	U	
2-HEXANONE		5	U		2.5	U		250	U		250	U	
4-METHYL-2-PENTANONE		5	U		2.5	U		250	U		250	U	
ACETONE		60.3	B	B	12			500	U		500	U	
BENZENE		1	U		0.5	U		50	U		50	U	
BROMODICHLOROMETHANE		1	U		0.5	U		50	U		50	U	
BROMOFORM		1	U		0.5	U		50	U		50	U	
BROMOMETHANE		2	U		1	U		100	U		100	U	
CARBON DISULFIDE		1	U		0.5	U		50	U		50	U	
CARBON TETRACHLORIDE		1	U		0.5	U		50	U		50	U	
CHLOROBENZENE		1	U		0.5	U		50	U		50	U	
CHLORODIBROMOMETHANE		1	U		0.5	U		50	U		50	U	
CHLOROETHANE		2	U		1	U		100	U		100	U	
CHLOROFORM		1	U		0.5	U		50	U		50	U	
CHLOROMETHANE		1	U		0.5	U		50	U		50	U	
CIS-1,2-DICHLOROETHENE		5.84			0.5	U		400			355		
CYCLOHEXANE		1	U		0.5	U		50	U		50	U	
DICHLORODIFLUOROMETHANE		2	U		1	U		100	U		100	U	
ETHYLBENZENE		1	U		0.5	U		50	U		50	U	

PROJ_NO: 00771	NSAMPLE	S43MW0302			S43MW0402			S43MW0701			S43MW1001		
SDG: 1207127	LAB_ID	1207127-01RE1			1207127-15			1207127-17			1207127-05RE1		
FRACTION: OV	SAMP_DATE	7/22/2012			7/22/2012			7/22/2012			7/22/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		0.5	U		2.5	U		0.5	U		0.5	U	
1,1,2,2-TETRACHLOROETHANE		0.5	U		2.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROETHANE		0.5	U		2.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		0.5	U		2.5	U		0.5	U		0.5	U	
1,1-DICHLOROETHANE		0.5	U		2.5	U		0.5	U		0.5	U	
1,1-DICHLOROETHENE		0.5	U		2.95	J	P	0.5	U		0.5	U	
1,2,3-TRICHLOROBENZENE		0.5	U		2.5	U		0.5	U		0.5	U	
1,2,4-TRICHLOROBENZENE		0.5	U		2.5	U		0.5	U		0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE		0.5	U		2.5	U		0.5	U		0.5	U	
1,2-DIBROMOETHANE		0.5	U		2.5	U		0.5	U		0.5	U	
1,2-DICHLOROBENZENE		0.5	U		2.5	U		0.5	U		0.5	U	
1,2-DICHLOROETHANE		0.5	U		2.5	U		0.5	U		0.5	U	
1,2-DICHLOROPROPANE		0.5	U		2.5	U		0.5	U		0.5	U	
1,3-DICHLOROPROPANE		0.5	U		2.5	U		0.5	U		0.5	U	
1,4-DICHLOROBENZENE		0.5	U		2.5	U		0.5	U		0.5	U	
1,4-DIOXANE		10	UR	C	50	UR	C	10	UR	C	10	UR	C
2-BUTANONE		5	U		25	U		5	U		5	U	
2-HEXANONE		2.5	U		12.5	U		2.5	U		2.5	U	
4-METHYL-2-PENTANONE		2.5	U		12.5	U		2.5	U		2.5	U	
ACETONE		5	U		25	U		5	U		5	U	
BENZENE		0.5	U		2.5	U		0.5	U		0.5	U	
BROMODICHLOROMETHANE		0.5	U		2.5	U		0.5	U		0.5	U	
BROMOFORM		0.5	U		2.5	U		0.5	U		0.5	U	
BROMOMETHANE		1	U		5	U		1	U		1	U	
CARBON DISULFIDE		0.5	U		2.25	J	P	0.5	U		2.65		
CARBON TETRACHLORIDE		0.5	U		2.5	U		0.5	U		0.5	U	
CHLOROBENZENE		0.5	U		2.5	U		0.5	U		0.5	U	
CHLORODIBROMOMETHANE		0.5	U		2.5	U		0.5	U		0.5	U	
CHLOROETHANE		1	U		5	U		1	U		1	U	
CHLOROFORM		0.5	U		2.5	U		0.5	U		0.5	U	
CHLOROMETHANE		0.5	U		2.5	U		0.5	U		0.5	U	
CIS-1,2-DICHLOROETHENE		0.77	J	P	203			0.5	U		0.5	U	
CYCLOHEXANE		0.5	U		2.5	U		0.5	U		0.5	U	
DICHLORODIFLUOROMETHANE		1	UJ	C	5	U		1	U		1	UJ	C
ETHYLBENZENE		0.5	U		2.5	U		0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43MW1201			S43MW1501			S43MW1601		
SDG: 1207127	LAB_ID	1207127-07			1207127-09			1207127-03		
FRACTION: OV	SAMP_DATE	7/22/2012			7/22/2012			7/22/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0		
	DUP_OF									
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		0.5	U							
1,1,2,2-TETRACHLOROETHANE		0.5	U							
1,1,2-TRICHLOROETHANE		0.5	U							
1,1,2-TRICHLOROTRIFLUOROETHANE		0.5	U							
1,1-DICHLOROETHANE		0.5	U							
1,1-DICHLOROETHENE		0.5	U							
1,2,3-TRICHLOROBENZENE		0.5	U							
1,2,4-TRICHLOROBENZENE		0.5	U							
1,2-DIBROMO-3-CHLOROPROPANE		0.5	U							
1,2-DIBROMOETHANE		0.5	U							
1,2-DICHLOROBENZENE		0.5	U							
1,2-DICHLOROETHANE		0.5	U							
1,2-DICHLOROPROPANE		0.5	U							
1,3-DICHLOROPROPANE		0.5	U							
1,4-DICHLOROBENZENE		0.5	U							
1,4-DIOXANE		10	UR	C						
2-BUTANONE		5	U							
2-HEXANONE		2.5	U							
4-METHYL-2-PENTANONE		2.5	U							
ACETONE		5	U							
BENZENE		0.5	U							
BROMODICHLOROMETHANE		0.5	U							
BROMOFORM		0.5	U							
BROMOMETHANE		1	U							
CARBON DISULFIDE		0.55	J	P						
CARBON TETRACHLORIDE		0.5	U							
CHLOROBENZENE		0.5	U							
CHLORODIBROMOMETHANE		0.5	U							
CHLOROETHANE		1	U							
CHLOROFORM		0.5	U							
CHLOROMETHANE		0.5	U							
CIS-1,2-DICHLOROETHENE		0.5	U							
CYCLOHEXANE		0.5	U							
DICHLORODIFLUOROMETHANE		1	U							
ETHYLBENZENE		0.5	U							

PROJ_NO: 00771	NSAMPLE	S43AQIDW03-20120722			S43FB07-20120722			S43MW0104			S43MW0104-D		
SDG: 1207127	LAB_ID	1207127-21			1207127-19			1207127-11			1207127-13		
FRACTION: OV	SAMP_DATE	7/22/2012			7/22/2012			7/22/2012			7/22/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF										S43MW0104		
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		1	U		0.5	U		50	U		50	U	
METHYL ACETATE		2	U		1	U		100	U		100	U	
METHYL TERT-BUTYL ETHER		1	U		0.5	U		50	U		50	U	
METHYLENE CHLORIDE		2	U		1	U		100	U		100	U	
STYRENE		1	U		0.5	U		50	U		50	U	
TETRACHLOROETHENE		1	U		0.5	U		50	U		50	U	
TOLUENE		1	U		0.5	U		50	U		50	U	
TOTAL XYLENES		2	U		1	U		100	U		100	U	
TRANS-1,2-DICHLOROETHENE		1	U		0.5	U		50	U		50	U	
TRICHLOROETHENE		114			0.5	U		17500			16200		
TRICHLOROFLUOROMETHANE		2	U		1	U		100	U		100	U	
VINYL CHLORIDE		1	U		0.5	U		50	U		50	U	

PROJ_NO: 00771	NSAMPLE	S43MW0302			S43MW0402			S43MW0701			S43MW1001		
SDG: 1207127	LAB_ID	1207127-01RE1			1207127-15			1207127-17			1207127-05RE1		
FRACTION: OV	SAMP_DATE	7/22/2012			7/22/2012			7/22/2012			7/22/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		0.5	U		2.5	U		0.5	U		0.5	U	
METHYL ACETATE		1	U		5	U		1	U		1	U	
METHYL TERT-BUTYL ETHER		0.5	U		2.5	U		0.5	U		0.5	U	
METHYLENE CHLORIDE		1	U		5	U		1	U		1	U	
STYRENE		0.5	U		2.5	U		0.5	U		0.5	U	
TETRACHLOROETHENE		0.5	U		2.5	U		0.5	U		0.5	U	
TOLUENE		0.5	U		2.5	U		0.5	U		0.5	U	
TOTAL XYLENES		1	U		5	U		1	U		1	U	
TRANS-1,2-DICHLOROETHENE		0.5	U		1.4	J	P	0.5	U		0.5	U	
TRICHLOROETHENE		0.66	J	P	644	J	D	0.31	J	P	0.5	U	
TRICHLOROFLUOROMETHANE		1	U		5	U		1	U		1	U	
VINYL CHLORIDE		1.23			37.9	J	C	0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43MW1201			S43MW1501			S43MW1601		
SDG: 1207127	LAB_ID	1207127-07			1207127-09			1207127-03		
FRACTION: OV	SAMP_DATE	7/22/2012			7/22/2012			7/22/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0		
	DUP_OF									
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		0.5	U							
METHYL ACETATE		1	U							
METHYL TERT-BUTYL ETHER		0.5	U							
METHYLENE CHLORIDE		1	U							
STYRENE		0.5	U							
TETRACHLOROETHENE		0.5	U							
TOLUENE		0.5	U							
TOTAL XYLENES		1	U							
TRANS-1,2-DICHLOROETHENE		0.5	U							
TRICHLOROETHENE		1.77			0.5	U		0.5	U	
TRICHLOROFLUOROMETHANE		1	U							
VINYL CHLORIDE		0.5	U							

PROJ_NO: 00771	NSAMPLE	S43FB07-20120722			S43MW0104			S43MW0104-D			S43MW0302		
SDG: 1207127	LAB_ID	1207127-19			1207127-11			1207127-13			1207127-01		
FRACTION: EXP	SAMP_DATE	7/22/2012			7/22/2012			7/22/2012			7/22/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF							S43MW0104					
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,3,5-TRINITROBENZENE		0.16	U		0.152	U		0.168	U		0.168	U	
1,3-DINITROBENZENE		0.16	U		0.152	U		0.168	U		0.168	U	
2,4,6-TRINITROTOLUENE		0.16	U		0.152	U		0.168	U		0.168	U	
2,4-DINITROTOLUENE		0.16	U		0.152	U		0.168	U		0.168	U	
2,6-DINITROTOLUENE		0.16	U		0.185	J	PU	0.168	U		0.168	U	
2-AMINO-4,6-DINITROTOLUENE		0.227	J	PU	0.152	U		0.168	U		0.168	U	
2-NITROTOLUENE		1.65			0.152	U		0.168	U		0.168	U	
3-NITROTOLUENE		0.16	U		0.511	J	QRU	0.609	J	QRU	0.168	U	
4-AMINO-2,6-DINITROTOLUENE		0.16	U		0.152	U		0.168	U		0.168	U	
4-NITROTOLUENE		0.16	U		0.394	J	U	0.173	J	PQU	0.291	J	PQU
HMX		0.16	U		0.152	U		0.168	U		0.168	U	
NITROBENZENE		0.45			0.152	U		0.168	U		0.168	U	
NITROGLYCERIN		0.37	J	PU	0.381	U		0.421	U		0.421	U	
NITROGUANIDINE		10	U		10	U		10	U		10	U	
RDX		0.217	J	PQU	0.215	B	B	0.225	B	B	0.168	U	
TETRYL		0.16	U		0.152	U		0.168	U		0.168	U	

PROJ_NO: 00771	NSAMPLE	S43MW0402			S43MW0701			S43MW1001			S43MW1201		
SDG: 1207127	LAB_ID	1207127-15			1207127-17			1207127-05			1207127-07		
FRACTION: EXP	SAMP_DATE	7/22/2012			7/22/2012			7/22/2012			7/22/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,3,5-TRINITROBENZENE		0.155	U		0.155	U		0.168	U		0.168	U	
1,3-DINITROBENZENE		0.155	U		0.155	U		0.168	U		0.168	U	
2,4,6-TRINITROTOLUENE		0.155	U		0.155	U		0.168	U		0.168	U	
2,4-DINITROTOLUENE		0.155	U		0.155	U		0.168	U		0.168	U	
2,6-DINITROTOLUENE		0.155	U		0.155	U		0.504	J	U	0.168	U	
2-AMINO-4,6-DINITROTOLUENE		0.155	U		0.155	U		0.168	U		0.168	U	
2-NITROTOLUENE		0.155	U		0.155	U		0.168	U		0.168	U	
3-NITROTOLUENE		0.28	J	DPU	0.227	J	PU	0.168	U		0.507		
4-AMINO-2,6-DINITROTOLUENE		0.155	U		0.155	U		0.168	U		0.168	U	
4-NITROTOLUENE		0.148	J	PQU	0.0861	J	PQU	0.101	J	PQU	0.174	J	PQU
HMX		0.155	U		0.155	U		0.168	U		0.168	U	
NITROBENZENE		0.155	U		0.155	U		0.234	B	B	0.168	U	
NITROGLYCERIN		0.388	U		0.388	U		0.421	U		0.421	U	
NITROGUANIDINE		10	UJ	D	10	U		10	U		10	U	
RDX		0.546	B	B	0.217	B	B	0.791	B	B	0.168	U	
TETRYL		0.155	U		0.155	U		0.168	U		0.168	U	

PROJ_NO: 00771	NSAMPLE	S43SOIDW01-20120721			S43SOIDW02-20120721		
SDG: 1207127	LAB_ID	1207127-22			1207127-23		
FRACTION: TCLPV	SAMP_DATE	7/21/2012			7/21/2012		
MEDIA: SOIL	QC_TYPE	NM			NM		
	UNITS	MG/L			MG/L		
	PCT_SOLIDS						
	DUP_OF						
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1-DICHLOROETHENE		0.005	UJ	H	0.005	UJ	H
1,2-DICHLOROETHANE		0.005	UJ	H	0.005	UJ	H
1,4-DICHLOROBENZENE		0.005	UJ	H	0.005	UJ	H
2-BUTANONE		0.05	UJ	H	0.05	UJ	H
BENZENE		0.005	UJ	H	0.005	UJ	H
CARBON TETRACHLORIDE		0.005	UJ	H	0.005	UJ	H
CHLOROBENZENE		0.005	UJ	H	0.005	UJ	H
CHLOROFORM		0.005	UJ	H	0.005	UJ	H
TETRACHLOROETHENE		0.005	UJ	H	0.005	UJ	H
TRICHLOROETHENE		0.005	UJ	H	0.005	UJ	H
VINYL CHLORIDE		0.005	UJ	H	0.005	UJ	H

Tetra Tech **INTERNAL CORRESPONDENCE**

TO:	**R. SOK**	**DATE:**	**SEPTEMBER 24, 2012**
FROM:	**TERRI L. SOLOMON**	**COPIES:**	**DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION – TOTAL AND DISSOLVED METALS, TCLP METALS, IGNIGHTABILITY, pH**
NSF INDIAN HEAD – CTO 114
SAMPLE DELIVERY GROUP (SDG) – 1207127

SAMPLES: 10/Groundwater/ Filtered and Unflitered Metals

S43FB07-20120722	S43MW0104	S43MW0104-D
S43MW0302	S43MW0402	S43MW0701
S43MW1001	S43MW1201	S43MW1501
S43MW1601	S43FB07-20120722-F	S43MW0104-DF
S43MW0104-F	S43MW0302-F	S43MW0402-F
S43MW0701-F	S43MW1001-F	S43MW1201-F
S43MW1501-F	S43MW1601-F	

1/IDW Sample

S43AQIDW03-20120722

2/Solids

S4SOIDW01-20120721 S43SOIDW02-20120721

Overview

The sample set for NSF Indian Head – CTO 114, SDG 1207127, consists of ten (10) aqueous environmental samples (filtered and unfiltered, two (2) field blanks (S43FB07-20120722 and S43FB07-20120722-F), two (2) solid investigative derived waste samples (S4SOIDW01-20120721 and S43SOIDW02-20120721) and one (1) aqueous investigative derived waste sample (S43AQIDW03-20120722). Two (2) field duplicate pairs (S43MW0104 / S43MW0104-D and S43MW0104-F / S43MW0104-DF) were included within this SDG.

All samples, with the exception of S43MW1501, S43MW1601, S43MW1501-F, S43MW1601-F S43AQIDW03-20120722, S4SOIDW01-20120721 and S43SOIDW02-20120721 were analyzed for select total and dissolved (designated –F) metals. Samples S43MW1501, S43MW1601, S43MW1501-F and S43MW1601-F were analyzed for total and dissolved (designated –F) cobalt. Samples S43AQIDW03-20120722, S4SOIDW01-20120721 and S43SOIDW02-20120721 were analyzed for toxicity characteristic leaching procedure (TCLP) metals, ignitability and pH. The samples were collected by Tetra Tech on July 21 and 22, 2012 and analyzed by Empirical Laboratories, LLC under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. Metals analyses were conducted using SW-846 method 6010C. Mercury analyses were conducted using SW-846 method 7470A. Ignitability analyses were conducted using SW-846 method 1010A and pH analyses were conducted using SW-846 method 9040C.

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 time, initial and continuing calibration data, laboratory method / preparation blank analyses, ICP Interference data, laboratory control sample results, matrix spike / matrix spike duplicate results, laboratory duplicate results, ICP serial dilution results, field duplicate results, 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 limit of quantitation (LOQ) but above the detection limit (DL) were qualified as estimated, "J".

- The pH analysis was performed 9 days after sampling for sample S43AQIDW03-20120722. The positive result reported for pH was qualified as estimated, "J".

- The contract required detection limit (CRDL) percent recovery on 08/01/2012 for lead was < 90% quality control limit affecting sample S43MW0402. The nondetected result reported for lead in the affected sample was qualified as biased low, "UL".

- The CRDL percent recovery on 07/31/2012 for mercury was < 80% quality control limit affecting sample S43MW0302. The nondetected result reported for mercury was qualified as biased low, "UL".

- The CRDL percent recovery on 08/02/2012 for silver was < 90% quality control limit affecting samples S43MW0104, S43MW0104-D, S43MW0302, S43MW1001, S43MW1201, S43MW0104-F, S43MW0104-DF, S43MW0302-F, S43MW1001-F, S43MW1201-F, S43MW0402-F, S43AQIDW03-20120722, S4SOIDW01-20120721 and S43SOIDW02-20120721. The nondetected results reported for silver were qualified as biased low, "UL".

- The CRDL percent recoveries on 08/02/2012 for arsenic and selenium were > 110% quality control limit affecting samples S43MW0104, S43MW0104-D, S43MW0302, S43MW1001, S43MW1201, S43MW0104-F, S43MW0104-DF, S43MW0302-F, S43MW1001-F, S43MW1201-F, S43MW0402-F, S43AQIDW03-20120722, S4SOIDW01-20120721 and S43SOIDW02-20120721. The positive results < 2X CRDL reported for arsenic were qualified as either biased high, "K", or estimated, "J", as a result of conflicting noncompliances. No validation actions were warranted for selenium as all sample results were nondetects.

- The CRDL percent recoveries on 08/13/2012 for aluminum and arsenic were > 110% quality control limit affecting samples S43FB07-20120722, S43FB07-20120722-F, S43MW0701 and S43MW0701-F. The positive results < 2X CRDL reported for aluminum were qualified as estimated, "J", as a result of conflicting noncompliances. No validation actions were warranted for arsenic as all sample results were nondetects.

- The matrix spike duplicate percent recovery for dissolved manganese was < 80% quality control limit. The positive and nondetected results reported for dissolved manganese were qualified as estimated, "L" and "UL", respectively.

- The laboratory control sample (LCS) percent recovery for iron (batch 2G31005) was > 120% quality control limit affecting sample S43MW0402. The positive result reported for iron in the affected sample was qualified as biased high, "K".

- The LCS percent recovery for iron (batch 2G31025) was > 120% quality control limit affecting samples S43MW0104, S43MW0104-D, S43MW0302, S43MW1001, S43MW1201, S43MW0104-F, S43MW0104-DF, S43MW0302-F, S43MW1001-F, S43MW1201-F, and S43MW0402-F. The positive results reported for iron in the affected samples were qualified as biased high, "K".

Notes

Nondetected inorganic results are reported to the limit of detection (LOD).

The CRDL percent recoveries on 08/01/2012 for silver and thallium were > 110% quality control limit affecting sample S43MW0402. No validation actions were required for silver or thallium as all sample results were nondetects.

Executive Summary

Laboratory Performance: Several CRDL recoveries were outside the quality control limits. Several LCS percent recoveries were > 120% quality control limit. The pH analysis was performed 9 days after sampling for sample S43AQIDW03-20120722.

Other Factors Affecting Data Quality: Positive results reported below the LOQ but above the DL were qualified as estimated.

The data for these analyses were reviewed with reference to Region III modifications to the "National Functional Guidelines for Inorganic Data Validation", April 1993 and the Department of Defense (DoD) document entitled "Quality Systems Manual (QSM) for Environmental Laboratories " (April 2009).

The text of this report has been formulated to address only those problem areas affecting data quality.

Tetra Tech
Terri L. Solomon
Environmental Scientist

Tetra Tech
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

APPENDIX A
QUALIFIED ANALYTICAL RESULTS

Qualifier Codes:

A = Lab Blank Contamination
B = Field Blank Contamination
C = Calibration Noncompliance (i.e., % RSDs, %Ds, ICVs, CCVs, RRFs, etc.)
C01 = GC/MS Tuning Noncompliance
D = MS/MSD Recovery Noncompliance
E = LCS/LCSD Recovery Noncompliance
F = Lab Duplicate Imprecision
G = Field Duplicate Imprecision
H = Holding Time Exceedance
I = ICP Serial Dilution Noncompliance
J = ICP PDS Recovery Noncompliance; MSA's $r < 0.995$
K = ICP Interference - includes ICS % R Noncompliance
L = Instrument Calibration Range Exceedance
M = Sample Preservation Noncompliance
N = Internal Standard Noncompliance
N01 = Internal Standard Recovery Noncompliance Dioxins
N02 = Recovery Standard Noncompliance Dioxins
N03 = Clean-up Standard Noncompliance Dioxins
O = Poor Instrument Performance (i.e., base-time drifting)
P = Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q = Other problems (can encompass a number of issues; i.e.chromatography,interferences, etc.)
R = Surrogates Recovery Noncompliance
S = Pesticide/PCB Resolution
T = % Breakdown Noncompliance for DDT and Endrin
U = RPD between columns/detectors >40% for positive results determined via GC/HPLC
V = Non-linear calibrations; correlation coefficient $r < 0.995$
W = EMPC result
X = Signal to noise response drop
Y = Percent solids <30%
Z = Uncertainty at 2 sigma deviations is greater than sample activity
Z1 = Tentatively Identified Compound considered presumptively present
Z2 = Tentatively Identified Compound column bleed

PROJ_NO: 00771	NSAMPLE	S43FB07-20120722			S43MW0104			S43MW0104-D			S43MW0302		
SDG: 1207127	LAB_ID	1207127-19			1207127-11			1207127-13			1207127-01		
FRACTION: M	SAMP_DATE	7/22/2012			7/22/2012			7/22/2012			7/22/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF							S43MW0104					
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM		25	U		156			143			14.8	J	P
ANTIMONY		2	U		2	U		2	U		2	U	
ARSENIC		1.5	U		1.18	J	CP	1.15	J	CP	12.2		
BARIUM		2.5	U		27.1			27			91.8		
BERYLLIUM		0.5	U		0.321	J	P	0.306	J	P	0.5	U	
CADMIUM		0.5	U		0.5	U		0.383	J	P	0.5	U	
CHROMIUM		1	U		0.927	J	P	0.841	J	P	1	U	
COBALT		2.5	U		13.3			13.2			6.96		
COPPER		2	U		1.2	J	P	1.33	J	P	2	U	
IRON		15	U		5360	K	E	5150	K	E	42200	K	E
LEAD		0.75	U		0.785			1.08			0.75	U	
MANGANESE		1.5	U		106			106			763		
MERCURY		0.16	U		0.16	U		0.16	U		0.16	UL	C
NICKEL		1.5	U		13.4			13.5			2.05	J	P
SELENIUM		1.25	U		1.25	U		1.25	U		1.25	U	
SILVER		0.5	U		0.5	UL	C	0.5	UL	C	0.5	UL	C
THALLIUM		1	U		1	U		1	U		1	U	
VANADIUM		2.5	U		2.29	J	P	2.23	J	P	2.19	J	P
ZINC		2.5	U		38.6			38.9			4.1	J	P

PROJ_NO: 00771	NSAMPLE	S43MW0402			S43MW0701			S43MW1001			S43MW1201		
SDG: 1207127	LAB_ID	1207127-15			1207127-17			1207127-05			1207127-07		
FRACTION: M	SAMP_DATE	7/22/2012			7/22/2012			7/22/2012			7/22/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM		16.5	J	P	16.2	J	CP	121			321		
ANTIMONY		2	U		2	U		2	U		2	U	
ARSENIC		1.31	J	P	1.5	U		5.86			5.11		
BARIUM		69.5			109			116			102		
BERYLLIUM		0.355	J	P	1.11	J	P	0.5	U		0.5	U	
CADMIUM		0.5	U		0.5	U		0.5	U		0.5	U	
CHROMIUM		1	U		1	U		1	U		0.842	J	P
COBALT		24.3			60			2.5	U		8.32		
COPPER		2	U		1.02	J	P	2	U		2	U	
IRON		12400	K	E	11600			33600	K	E	33000	K	E
LEAD		0.75	UL	C	0.75	U		0.75	U		0.75	U	
MANGANESE		352			423			196			456		
MERCURY		0.16	U		0.16	U		0.16	U		0.16	U	
NICKEL		14.3			46.5			1.5	U		4.65		
SELENIUM		1.25	U		1.25	U		1.25	U		1.25	U	
SILVER		0.5	U		0.5	U		0.5	UL	C	0.5	UL	C
THALLIUM		1	U		1	U		1	U		1	U	
VANADIUM		1.33	J	P	1.59	J	P	2.5	U		2.19	J	P
ZINC		15.8			53.2			1.65	J	P	6.34		

PROJ_NO: 00771	NSAMPLE	S43MW1501			S43MW1601		
SDG: 1207127	LAB_ID	1207127-09			1207127-03		
FRACTION: M	SAMP_DATE	7/22/2012			7/22/2012		
MEDIA: WATER	QC_TYPE	NM			NM		
	UNITS	UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0		
	DUP_OF						
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM							
ANTIMONY							
ARSENIC							
BARIUM							
BERYLLIUM							
CADMIUM							
CHROMIUM							
COBALT		5.1			108		
COPPER							
IRON							
LEAD							
MANGANESE							
MERCURY							
NICKEL							
SELENIUM							
SILVER							
THALLIUM							
VANADIUM							
ZINC							

PROJ_NO: 00771	NSAMPLE	S43FB07-20120722-F			S43MW0104-DF			S43MW0104-F			S43MW0302-F		
SDG: 1207127	LAB_ID	1207127-20			1207127-14			1207127-12			1207127-02		
FRACTION: MF	SAMP_DATE	7/22/2012			7/22/2012			7/22/2012			7/22/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF				S43MW0104-F								
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM		25	U		49.4	J	P	51.6			25	U	
ANTIMONY		2	U		2	U		2	U		2	U	
ARSENIC		1.5	U		0.807	J	CP	1.23	J	CP	12.3		
BARIUM		2.5	U		26.3			27.8			94.8		
BERYLLIUM		0.5	U		0.276	J	P	0.305	J	P	0.5	U	
CADMIUM		0.5	U		0.5	U		0.5	U		0.5	U	
CHROMIUM		1	U		1	U		0.581	J	P	1	U	
COBALT		2.5	U		13.1			13.7			7.1		
COPPER		2	U		1.04	J	P	2	U		2	U	
IRON		15	U		4820	K	E	5370	K	E	43800	K	E
LEAD		0.75	U		0.75	U		0.75	U		0.75	U	
MANGANESE		1.5	UL	D	103	L	D	109	L	D	795	L	D
MERCURY		0.16	U		0.16	U		0.16	U		0.16	U	
NICKEL		1.5	U		13.2			13.8			2.13	J	P
SELENIUM		1.25	U		1.25	U		1.25	U		1.25	U	
SILVER		0.5	U		0.5	UL	C	0.5	UL	C	0.5	UL	C
THALLIUM		1	U		1	U		1	U		1	U	
VANADIUM		2.5	U		1.55	J	P	1.6	J	P	2.23	J	P
ZINC		2.5	U		38.2			38.8			5.06		

PROJ_NO: 00771	NSAMPLE	S43MW0402-F			S43MW0701-F			S43MW1001-F			S43MW1201-F		
SDG: 1207127	LAB_ID	1207127-16			1207127-18			1207127-06			1207127-08		
FRACTION: MF	SAMP_DATE	7/22/2012			7/22/2012			7/22/2012			7/22/2012		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM		25	U		18.5	J	CP	31.4	J	P	63.7		
ANTIMONY		2	U		2	U		2	U		2	U	
ARSENIC		1.65	J	CP	1.5	U		4.91	K	C	5.58		
BARIUM		68.5			112			104			100		
BERYLLIUM		0.344	J	P	1.15	J	P	0.5	U		0.5	U	
CADMIUM		0.5	U		0.262	J	P	0.5	U		0.5	U	
CHROMIUM		1	U		1	U		1	U		1	U	
COBALT		23.5			61.2			2.5	U		8.11		
COPPER		2	U		2	U		2	U		2	U	
IRON		12500			11800			30600	K	E	33200	K	E
LEAD		0.75	U		0.75	U		0.75	U		0.75	U	
MANGANESE		335	L	D	430	L	D	187	L	D	445	L	D
MERCURY		0.16	U		0.16	U		0.16	U		0.16	U	
NICKEL		14.4			47			1.5	U		4.41		
SELENIUM		1.25	U		1.25	U		1.25	U		1.25	U	
SILVER		0.5	UL	C	0.5	U		0.5	UL	C	0.5	UL	C
THALLIUM		1	U		1	U		1	U		1	U	
VANADIUM		2.5	U		1.67	J	P	2.5	U		1.41	J	P
ZINC		15.3			56.3			2.08	J	P	6.61		

PROJ_NO: 00771	NSAMPLE	S43MW1501-F			S43MW1601-F		
SDG: 1207127	LAB_ID	1207127-10			1207127-04		
FRACTION: MF	SAMP_DATE	7/22/2012			7/22/2012		
MEDIA: WATER	QC_TYPE	NM			NM		
	UNITS	UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0		
	DUP_OF						
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM							
ANTIMONY							
ARSENIC							
BARIUM							
BERYLLIUM							
CADMIUM							
CHROMIUM							
COBALT		5.1			108		
COPPER							
IRON							
LEAD							
MANGANESE							
MERCURY							
NICKEL							
SELENIUM							
SILVER							
THALLIUM							
VANADIUM							
ZINC							

PROJ_NO: 00771	NSAMPLE	S43SOIDW01-20120721			S43SOIDW02-20120721		
SDG: 1207127	LAB_ID	1207127-22			1207127-23		
FRACTION: TCLPM	SAMP_DATE	7/21/2012			7/21/2012		
MEDIA: SOIL	QC_TYPE	NM			NM		
	UNITS	MG/L			MG/L		
	PCT_SOLIDS	0.0			0.0		
	DUP_OF						
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD
ARSENIC		0.06	U		0.06	U	
BARIUM		0.321	J	P	0.403		
CADMIUM		0.02	U		0.02	U	
CHROMIUM		0.04	U		0.04	U	
LEAD		0.03	U		0.03	U	
MERCURY		0.0016	U		0.0016	U	
SELENIUM		0.05	U		0.05	U	
SILVER		0.02	UL	C	0.02	UL	C

PROJ_NO: 00771	NSAMPLE	S43AQIDW03-20120722		
SDG: 1207127	LAB_ID	1207127-21		
FRACTION: TCLPM	SAMP_DATE	7/22/2012		
MEDIA: WATER	QC_TYPE	NM		
	UNITS	MG/L		
	PCT_SOLIDS	0.0		
	DUP_OF			
PARAMETER		RESULT	VQL	QLCD
ARSENIC		0.06	U	
BARIUM		0.1	U	
CADMIUM		0.02	U	
CHROMIUM		0.04	U	
LEAD		0.03	U	
MERCURY		0.0016	U	
SELENIUM		0.05	U	
SILVER		0.02	UL	C

PROJ_NO: 00771	NSAMPLE	S43SOIDW01-20120721						S43SOIDW02-20120721					
SDG: 1207127	LAB_ID	1207127-22						1207127-23					
FRACTION: MISC	SAMP_DATE	7/21/2012						7/21/2012					
MEDIA: SOIL	QC_TYPE	NM						NM					
	UNITS	F			S.U.			F			S.U.		
	PCT_SOLIDS	199.0			81.6			199.0			79.1		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
IGNITABILITY		158	>					158	>				
PH					5.82						5.35		

PROJ_NO: 00771	NSAMPLE	S43AQIDW03-20120722					
SDG: 1207127	LAB_ID	1207127-21					
FRACTION: MISC	SAMP_DATE	7/22/2012					
MEDIA: WATER	QC_TYPE	NM					
	UNITS	F			S.U.		
	PCT_SOLIDS	0.0			0.0		
	DUP_OF						
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD
IGNITABILITY		158	>				
PH					6.67	J	H

2013

Validation Letters and Tables

Tetra Tech INC **INTERNAL CORRESPONDENCE**

TO:	**R. SOK**	**DATE:**	**JUNE 10, 2013**
FROM:	**J. KALINYAK**	**COPIES:**	**DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – VOC**
INORGANIC DATA VALIDATION – METALS
NSF INDIAN HEAD, CTO 114
SAMPLE DELIVERY GROUP 1305111

SAMPLES: 9 / Aqueous / VOC

S43MW00105	S43MW00105-D	S43MW01802
S43MW019D02	S43MW019S02	S43MW02102
S43MW02402	S43MW02502	S43TB02-20130508

8 / Aqueous / Metals

S43MW00105	S43MW00105-D	S43MW01802
S43MW019D02	S43MW019S02	S43MW02102
S43MW02402	S43MW02502	

OVERVIEW

The sample set for NSF Indian Head, CTO 114, SDG 1305111, consisted of nine (9) aqueous samples including one (1) aqueous trip blank sample. All nine (9) samples were analyzed for select volatile organic compounds (VOC) and eight (8) of the samples were analyzed for select metals as listed above. One (1) field duplicate sample pair was contained within this sample delivery group (SDG); S43MW00105-D / S43MW00105.

The samples were collected by Tetra Tech on May 8, 2013 and analyzed by Empirical Laboratory LLC. All analyses were conducted in accordance with EPA SW-846 Methods 8260B for select VOCs and 6010C for select metals.

The data contained in this SDG were validated with regard to the following parameters: data completeness, holding times, GC/MS tuning, initial/continuing calibrations, laboratory method blank/preparation results, surrogate spike recoveries, blank spike/blank spike duplicate results, matrix spike/matrix spike duplicate results, internal standard recoveries, chromatographic resolution, ICP serial dilution results, ICP interference results, field duplicate precision, analyte identification, analyte quantitation, and detection limits. Areas of concern are listed below.

MAJOR

No major issues were identified.

MINOR

- Positive results reported below the quantitation limit but above the method detection limit were qualified as estimated, (J).

- The Contract Required Detection Limit (CRDL) standard, analyzed on 5/30/13, contained a percent recovery (%R) for arsenic was less than the 90% quality control limit. Nondetected results in the following samples were qualified as biased low, (UL) : S43MW00105, S43MW00105-D, and S43MW02102.

NOTES

The following samples were analyzed for VOC analytes at dilutions, as listed below, resulting in elevated detection limits for the non-detected VOC analytes.

Sample	Dilution
S43MW00105	100X
S43MW00105-D	100X
S43MW019S02	25X

Non-detected analyte results were reported to the limit of detection (LOD).

EXECUTIVE SUMMARY

Laboratory Performance Issues: Arsenic results, in three samples, were qualified for a CRDL %R non-compliance.

Other Factors Affecting Data Quality: Positive results reported below the quantitation limit but above the method detection limit were qualified as estimated (J).

The data for these analyses were reviewed with reference to the Region III modifications to U.S. EPA National Functional Guidelines for Organic Data Validation (Sept. 1994), the Region III EPA Modifications to the Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses (April 1993), USEPA SW-846 Methods 8260B and 6010C, and the Department of Defense (DoD) document entitled "Quality Systems Manual (QSM) for Environmental Laboratories" (October 2010).

Tetra Tech
Joseph Kalinyak
Chemist/Data Validator

Tetra Tech
Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:
Appendix A - Qualified Analytical Results
Appendix B - Results as reported by the Laboratory
Appendix C - Support Documentation

Appendix A

Qualified Analytical Results

DATA QUALIFICATION CODE (QUAL CODE)

Qualifier Codes:

A	=	Lab Blank Contamination
B	=	Field Blank Contamination
C	=	Calibration Noncompliance (i.e., % RSDs, %Ds, ICVs, CCVs, RRFs, etc.)
C01	=	GC/MS Tuning Noncompliance
D	=	MS/MSD Recovery Noncompliance
E	=	LCS/LCSD Recovery Noncompliance
F	=	Lab Duplicate Imprecision
G	=	Field Duplicate Imprecision
H	=	Holding Time Exceedance
I	=	ICP Serial Dilution Noncompliance
J	=	ICP PDS Recovery Noncompliance; MSA's $r < 0.995$
K	=	ICP Interference - includes ICS % R Noncompliance
L	=	Instrument Calibration Range Exceedance
M	=	Sample Preservation Noncompliance
N	=	Internal Standard Noncompliance
N01	=	Internal Standard Recovery Noncompliance Dioxins
N02	=	Recovery Standard Noncompliance Dioxins
N03	=	Clean-up Standard Noncompliance Dioxins
O	=	Poor Instrument Performance (i.e., base-time drifting)
P	=	Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q	=	Other problems (can encompass a number of issues; i.e.chromatography,interferences, etc.)
R	=	Surrogates Recovery Noncompliance
S	=	Pesticide/PCB Resolution
T	=	% Breakdown Noncompliance for DDT and Endrin
U	=	RPD between columns/detectors >40% for positive results determined via GC/HPLC
V	=	Non-linear calibrations; correlation coefficient $r < 0.995$
W	=	EMPC result
X	=	Signal to noise response drop
Y	=	Percent solids <30%
Z	=	Uncertainty at 2 sigma deviation is less than sample activity
Z1	=	Tentatively Identified Compound considered presumptively present
Z2	=	Tentatively Identified Compound column bleed

PROJ_NO: 00771	NSAMPLE	S43MW00105			S43MW00105-D			S43MW01802			S43MW019D02		
SDG: 1305111	LAB_ID	1305111-07			1305111-09			1305111-02			1305111-06		
FRACTION: OV	SAMP_DATE	5/8/2013			5/8/2013			5/8/2013			5/8/2013		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF				S43MW00105								
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1-DICHLOROETHANE		50	U		50	U		0.5	U		0.5	U	
1,1-DICHLOROETHENE		50	U		50	U		0.5	U		0.52	J	P
1,2-DICHLOROETHANE		50	U		50	U		0.5	U		0.5	U	
BROMOFORM		50	U		50	U		0.5	U		0.5	U	
CHLOROFORM		50	U		50	U		0.5	U		0.5	U	
CIS-1,2-DICHLOROETHENE		148			151			1.02			32		
METHYLENE CHLORIDE		100	U		100	U		1	U		1	U	
TRANS-1,2-DICHLOROETHENE		50	U		50	U		0.5	U		0.53	J	P
TRICHLOROETHENE		8330			9060			2.36			92.3		
VINYL CHLORIDE		50	U		50	U		0.5	U		6.96		

PROJ_NO: 00771	NSAMPLE	S43MW019S02			S43MW02102			S43MW02402			S43MW02502		
SDG: 1305111	LAB_ID	1305111-03			1305111-08			1305111-04			1305111-05		
FRACTION: OV	SAMP_DATE	5/8/2013			5/8/2013			5/8/2013			5/8/2013		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1-DICHLOROETHANE		12.5	U		0.5	U		41.9			1.46		
1,1-DICHLOROETHENE		16	J	P	0.5	U		7.6			0.8	J	P
1,2-DICHLOROETHANE		12.5	U		0.5	U		0.5	U		0.5	U	
BROMOFORM		12.5	U		0.5	U		0.5	U		0.5	U	
CHLOROFORM		12.5	U		0.5	U		0.5	U		0.5	U	
CIS-1,2-DICHLOROETHENE		56.2			0.5	U		0.5	U		0.95	J	P
METHYLENE CHLORIDE		25	U		1	U		1	U		1	U	
TRANS-1,2-DICHLOROETHENE		12.5	U		0.5	U		0.5	U		0.5	U	
TRICHLOROETHENE		1690			4.63			0.5	U		2.15		
VINYL CHLORIDE		12.5	U		0.5	U		0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43TB02-20130508		
SDG: 1305111	LAB_ID	1305111-01		
FRACTION: OV	SAMP_DATE	5/8/2013		
MEDIA: WATER	QC_TYPE	NM		
	UNITS	UG/L		
	PCT_SOLIDS	0.0		
	DUP_OF			
PARAMETER		RESULT	VQL	QLCD
1,1-DICHLOROETHANE		0.5	U	
1,1-DICHLOROETHENE		0.5	U	
1,2-DICHLOROETHANE		0.5	U	
BROMOFORM		0.5	U	
CHLOROFORM		0.5	U	
CIS-1,2-DICHLOROETHENE		0.5	U	
METHYLENE CHLORIDE		1	U	
TRANS-1,2-DICHLOROETHENE		0.5	U	
TRICHLOROETHENE		0.5	U	
VINYL CHLORIDE		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43MW00105			S43MW00105-D			S43MW01802			S43MW019D02		
SDG: 1305111	LAB_ID	1305111-07			1305111-09			1305111-02			1305111-06		
FRACTION: M	SAMP_DATE	5/8/2013			5/8/2013			5/8/2013			5/8/2013		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF				S43MW00105								
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ARSENIC		1.5	UL	C	1.5	UL	C	1.5	U		1.5	U	
COBALT		3.42			3.46			26.8			2.5	U	
IRON		966			981			90.2			23800		
MANGANESE		33.3			33.3			190			541		

PROJ_NO: 00771	NSAMPLE	S43MW019S02			S43MW02102			S43MW02402			S43MW02502		
SDG: 1305111	LAB_ID	1305111-03			1305111-08			1305111-04			1305111-05		
FRACTION: M	SAMP_DATE	5/8/2013			5/8/2013			5/8/2013			5/8/2013		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ARSENIC		1.5	U		1.5	UL	C	1.5	U		1.5	U	
COBALT		147			5.21			3.83			30.4		
IRON		1910			1920			52.2			402		
MANGANESE		1160			172			60.4			494		

Tetra Tech **INTERNAL CORRESPONDENCE**

TO:	**R. SOK**	**DATE:**	**July 21, 2013**
FROM:	**MEGAN CARSON**	**COPIES:**	**DV FILE**

SUBJECT: **ORGANIC AND INORGANIC DATA VALIDATION –SELECT VOCs AND SELECT TOTAL AND FILTERED METALS**
NSF INDIAN HEAD, CTO 114
SAMPLE DELIVERY GROUP (SDG) – 1305126

SAMPLES:

4/Sediment/

S43SD01	S43SD01-D
S43SD02	S43SD04

22/Aqueous/

S43CL01	S43FB01-20130509
S43MW00303	S43MW00503
S43MW00603	S43MW00802
S43MW01002	S43MW01102
S43MW017D02	S43MW017D02-D
S43MW017S02	S43MW02002
S43MW02202	S43MW02302
S43MW02602	S43OF01
S43SP0102	S43SP0202
S43SW01	S43SW01-D
S43SW02	S43SW04

Overview

The sample set for NSF Indian Head, SDG 1305126 consists of four (4) sediment environmental samples and twenty two (22) aqueous environmental samples. This SDG contained three field duplicate pairs: S43MW017D02/S43MW017D02-D, S43SW01/S43SW01-D, and S43SD01/S43SD01-D.

All samples were analyzed for select volatile organic compounds (VOCs) and select total and filtered metals. The samples were collected by Tetra Tech, Inc. on May 9th and 10th, 2013 and analyzed by Empirical Laboratories, LLC. VOC analyses were conducted using method 8260B. Metals analyses were conducted using SW846 method 6010C.

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, GC/MS tune results, calibration data, laboratory method/preparation blanks, interference check sample (ICS) results, matrix spike / matrix spike duplicate results, field duplicate precision, laboratory duplicate precision, laboratory control sample (LCS) results, ICP serial dilution results, detection limits and analyte quantitation.

Areas of concern with respect to data quality are listed below.

Major Problems:

- None.

Minor Problems:

- Internal standards fluorobenzene and chlorobenzene-d5 had percent recoveries less than the lower QC limit for samples S43SD01, S43SD01-D, S43SD02, and S43SD04. Detected and nondetected sample results were qualified as estimated (J) and (UJ) respectively.

- Field duplicate pair S43MW017D02/S43MW017D02-D had a relative percent difference > 30% for vinyl chloride. Only the sample pair S43MW017D02 and S43MW017D02-D were qualified as the other aqueous field duplicate pair was within QC limits. Detected vinyl chloride results were qualified as estimated (J).

- The matrix spike and matrix spike duplicate for preparation batch 3E29038 had a percent recovery < 10% for manganese. The post digestion spike was within acceptable QC limits for manganese. All sediment samples were affected. Detected results were qualified as estimated (J) due to conflicting directional bias.

- Field duplicate pair S43SD01/S43SD01-D had relative percent differences > 50% for manganese. All sediment samples were affected. Detected results were qualified as estimated (J).

- The interfering analyte iron was present in all soil samples at concentrations comparable to the concentrations of iron in the interference check sample (ICS) solution. A negative arsenic concentration was present in the ICS solution at a concentration whose absolute value exceeded the method detection limit (IDL). Interference effects exist for arsenic in sample S43SD04. The detected arsenic result was qualified as biased low (L).

- Positive results less than Limit of Quantitation (LOQ) and greater than the method detection limit (MDL) were qualified as estimated (J).

Notes

The matrix spike and matrix spike duplicate for samples S43SD04 had percent recoveries less than the lower QC limit for trichloroethene, bromoform and a percent recovery greater than the upper QC limit for methylene chloride. No action was taken for MS noncompliances alone.

The continuing calibration analyzed on 5/20/13 at 19:51 had a percent difference > 20% for vinyl chloride. Samples S43SD01, S43SD01-D, S43SD02, and S43SD04 were affected. No action was taken because the percent difference was less than 50% and all results were nondetected.

The following samples were analyzed at a dilution for the VOC analyses:

Sample ID	Dilution Factor
S43MW00603	50X
S43MW017D02	25X
S43MW017D02-DRE1	20X
S43MW017S02	25X
S43MW02002	10X
S43SP0102	2X

Executive Summary

Laboratory Performance: Calibration non-compliances for vinyl chloride resulted in the qualification of sample results.

Other Factors Affecting Data Quality: MS/MSD non-compliances for trichloroethene, bromoform, methylene chloride, and manganese resulted in the qualification of sample results. Field duplicate non-compliances for vinyl chloride and manganese resulted in the qualification of sample results. Internal standard non-compliances resulted in the qualification of all VOC sediment results. Interference standard non-compliances resulted in the qualification of the arsenic result for sample S43SD04.

The data for these analyses were reviewed with reference to Region III modifications to the "National Functional Guidelines for Inorganic Data Validation", April 1993, "National Functional Guidelines for Organic Data Validation" (Sept. 1994), and the Department of Defense (DoD) document entitled "Quality Systems Manual (QSM) for Environmental Laboratories "(October 2010).

The text of this report has been formulated to address only those problem areas affecting data quality.

Tetra Tech
Megan Carson
Chemist/Data Validator

Tetra Tech
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

APPENDIX A

QUALIFIED ANALYTICAL RESULTS

Qualifier Codes:

A	=	Lab Blank Contamination
B	=	Field Blank Contamination
C	=	Calibration Noncompliance (i.e., % RSDs, %Ds, ICVs, CCVs, RRFs, etc.)
C01	=	GC/MS Tuning Noncompliance
D	=	MS/MSD Recovery Noncompliance
E	=	LCS/LCSD Recovery Noncompliance
F	=	Lab Duplicate Imprecision
G	=	Field Duplicate Imprecision
H	=	Holding Time Exceedance
I	=	ICP Serial Dilution Noncompliance
J	=	ICP PDS Recovery Noncompliance; MSA's $r < 0.995$
K	=	ICP Interference - includes ICS % R Noncompliance
L	=	Instrument Calibration Range Exceedance
M	=	Sample Preservation Noncompliance
N	=	Internal Standard Noncompliance
N01	=	Internal Standard Recovery Noncompliance Dioxins
N02	=	Recovery Standard Noncompliance Dioxins
N03	=	Clean-up Standard Noncompliance Dioxins
O	=	Poor Instrument Performance (i.e., base-time drifting)
P	=	Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q	=	Other problems (can encompass a number of issues; i.e.chromatography,interferences, etc.)
R	=	Surrogates Recovery Noncompliance
S	=	Pesticide/PCB Resolution
T	=	% Breakdown Noncompliance for DDT and Endrin
U	=	RPD between columns/detectors >40% for positive results determined via GC/HPLC
V	=	Non-linear calibrations; correlation coefficient $r < 0.995$
W	=	EMPC result
X	=	Signal to noise response drop
Y	=	Percent solids <30%
Z	=	Uncertainty at 2 sigma deviation is less than sample activity
Z1	=	Tentatively Identified Compound considered presumptively present
Z2	=	Tentatively Identified Compound column bleed

PROJ_NO: 00771	NSAMPLE	S43CL01			S43FB01-20130509			S43MW00303			S43MW00503		
SDG: 1305126	LAB_ID	1305126-27			1305126-11			1305126-15			1305126-18		
FRACTION: OV	SAMP_DATE	5/10/2013			5/9/2013			5/9/2013			5/9/2013		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
BROMOFORM		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROFORM		0.5	U		0.5	U		0.5	U		0.5	U	
CIS-1,2-DICHLOROETHENE		0.5	U		0.5	U		1.28			0.5	U	
METHYLENE CHLORIDE		1	U		1	U		0.72	J	P	1	U	
TRANS-1,2-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
TRICHLOROETHENE		0.5	U		0.5	U		1			1.45		
VINYL CHLORIDE		0.5	U		0.5	U		2.85			0.5	U	

PROJ_NO: 00771	NSAMPLE	S43MW00603			S43MW00802			S43MW01002			S43MW01102		
SDG: 1305126	LAB_ID	1305126-13			1305126-09			1305126-16			1305126-02		
FRACTION: OV	SAMP_DATE	5/9/2013			5/9/2013			5/9/2013			5/9/2013		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1-DICHLOROETHANE		25	U		0.5	U		0.5	U		0.5	U	
1,1-DICHLOROETHENE		25	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROETHANE		25	U		0.5	U		0.5	U		0.5	U	
BROMOFORM		25	U		0.5	U		0.5	U		0.5	U	
CHLOROFORM		25	U		0.5	U		0.5	U		0.5	U	
CIS-1,2-DICHLOROETHENE		110			0.5	U		0.5	U		0.5	U	
METHYLENE CHLORIDE		50	U		1	U		0.54	J	P	1	U	
TRANS-1,2-DICHLOROETHENE		25	U		0.5	U		0.5	U		0.5	U	
TRICHLOROETHENE		3230			0.5	U		1.06			0.5	U	
VINYL CHLORIDE		25	U		0.5	U		0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43MW017D02			S43MW017D02-DRE1			S43MW017S02			S43MW02002		
SDG: 1305126	LAB_ID	1305126-05			1305126-20RE1			1305126-04			1305126-07		
FRACTION: OV	SAMP_DATE	5/9/2013			5/9/2013			5/9/2013			5/9/2013		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF				S43MW017D02								
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1-DICHLOROETHANE		12.5	U		10	U		12.5	U		5	U	
1,1-DICHLOROETHENE		12.5	U		5.6	J	P	12.5	U		5	U	
1,2-DICHLOROETHANE		12.5	U		10	U		12.5	U		5	U	
BROMOFORM		12.5	U		10	U		12.5	U		5	U	
CHLOROFORM		12.5	U		10	U		12.5	U		5	U	
CIS-1,2-DICHLOROETHENE		214			217			176			5	J	P
METHYLENE CHLORIDE		25	U		20	U		25	U		10	U	
TRANS-1,2-DICHLOROETHENE		12.5	U		10	U		12.5	U		5	U	
TRICHLOROETHENE		1100			1290			1280			1800		
VINYL CHLORIDE		22.8	J	GP	56	J	G	18.5	J	P	5	U	

PROJ_NO: 00771	NSAMPLE	S43MW02202			S43MW02302			S43MW02602			S43OF01		
SDG: 1305126	LAB_ID	1305126-06			1305126-03			1305126-10			1305126-34		
FRACTION: OV	SAMP_DATE	5/9/2013			5/9/2013			5/9/2013			5/10/2013		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1-DICHLOROETHANE		0.58	J	P	13.2			0.5	U		0.5	J	P
1,1-DICHLOROETHENE		0.57	J	P	2.68			0.5	U		0.37	J	P
1,2-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
BROMOFORM		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROFORM		0.5	U		0.5	U		0.5	U		0.5	U	
CIS-1,2-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		1.79		
METHYLENE CHLORIDE		1	U		1	U		1	U		1	U	
TRANS-1,2-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
TRICHLOROETHENE		0.5	U		2.27			1.24			4.98		
VINYL CHLORIDE		0.5	U		0.5	U		0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43SD01			S43SD01-D			S43SD02			S43SD04		
SDG: 1305126	LAB_ID	1305126-25			1305126-26			1305126-22			1305126-30		
FRACTION: OV	SAMP_DATE	5/10/2013			5/10/2013			5/10/2013			5/10/2013		
MEDIA: ~~WATER~~ SEDIMENT	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/KG			UG/KG			UG/KG			UG/KG		
	PCT_SOLIDS	65.2			70.7			67.0			63.4		
	DUP_OF				S43SD01								
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1-DICHLOROETHANE		3.03	UJ	N	3.14	UJ	N	3.61	UJ	N	3.34	UJ	N
1,1-DICHLOROETHENE		3.03	UJ	N	3.14	UJ	N	3.61	UJ	N	3.34	UJ	N
1,2-DICHLOROETHANE		3.03	UJ	N	3.14	UJ	N	3.61	UJ	N	3.34	UJ	N
BROMOFORM		3.03	UJ	N	3.14	UJ	N	3.61	UJ	N	3.34	UJ	N
CHLOROFORM		3.03	UJ	N	3.14	UJ	N	3.61	UJ	N	3.34	UJ	N
CIS-1,2-DICHLOROETHENE		4.97	J	NP	5.86	J	NP	4.55	J	NP	3.18	J	NP
METHYLENE CHLORIDE		142	J	N	222	J	N	103	J	N	113	J	N
TRANS-1,2-DICHLOROETHENE		3.03	UJ	N	3.14	UJ	N	3.61	UJ	N	3.34	UJ	N
TRICHLOROETHENE		22.1	J	N	22.3	J	N	8.9	J	N	2.9	J	NP
VINYL CHLORIDE		3.03	UJ	N	3.14	UJ	N	3.61	UJ	N	3.34	UJ	N

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PROJ_NO: 00771	NSAMPLE	S43SP0102			S43SP0202			S43SW01			S43SW01-D		
SDG: 1305126	LAB_ID	1305126-28			1305126-31			1305126-23			1305126-24		
FRACTION: OV	SAMP_DATE	5/10/2013			5/10/2013			5/10/2013			5/10/2013		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF										S43SW01		
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1-DICHLOROETHANE		0.84	J	P	0.5	U		0.75	J	P	0.69	J	P
1,1-DICHLOROETHENE		1	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROETHANE		1	U		0.5	U		0.5	U		0.5	U	
BROMOFORM		1	U		0.5	U		0.5	U		0.5	U	
CHLOROFORM		1	U		0.5	U		0.5	U		0.5	U	
CIS-1,2-DICHLOROETHENE		2.08			0.44	J	P	1.37			1.31		
METHYLENE CHLORIDE		1	J	P	1	U		1	U		1	U	
TRANS-1,2-DICHLOROETHENE		1	U		0.5	U		0.5	U		0.5	U	
TRICHLOROETHENE		156			1.86			27.2			26.6		
VINYL CHLORIDE		1	U		0.5	U		0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43SW02			S43SW04			S43TB03-20130509		
SDG: 1305126	LAB_ID	1305126-21			1305126-29			1305126-01		
FRACTION: OV	SAMP_DATE	5/10/2013			5/10/2013			5/9/2013		
MEDIA: WATER	QC_TYPE	NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0		
	DUP_OF									
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1-DICHLOROETHANE		0.34	J	P	0.5	U		0.5	U	
1,1-DICHLOROETHENE		0.5	U		0.7	J	P	0.5	U	
1,2-DICHLOROETHANE		0.5	U		0.5	U		0.5	U	
BROMOFORM		0.5	U		0.5	U		0.5	U	
CHLOROFORM		0.5	U		0.5	U		0.5	U	
CIS-1,2-DICHLOROETHENE		1.78			48.2			0.5	U	
METHYLENE CHLORIDE		1	U		1	U		1	U	
TRANS-1,2-DICHLOROETHENE		0.5	U		0.5	U		0.5	U	
TRICHLOROETHENE		10.2			30.5			0.5	U	
VINYL CHLORIDE		0.5	U		1.26			0.5	U	

PROJ_NO: 00771	NSAMPLE	S43SD01			S43SD01-D			S43SD02			S43SD04		
SDG: 1305126	LAB_ID	1305126-25			1305126-26			1305126-22			1305126-30		
FRACTION: M	SAMP_DATE	5/10/2013			5/10/2013			5/10/2013			5/10/2013		
MEDIA: SEDIMENT	QC_TYPE	NM			NM			NM			NM		
	UNITS	MG/KG			MG/KG			MG/KG			MG/KG		
	PCT_SOLIDS	65.2			70.7			67.0			63.4		
	DUP_OF				S43SD01								
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ARSENIC		2.55			1.63			2			2.07	L	K
COBALT		10.3			6.85			16.5			13		
IRON		6920			4630			4850			17100		
MANGANESE		64.5	J	DG	32.7	J	DG	83	J	DG	129	J	DG

PROJ_NO: 00771	NSAMPLE	S43CL01			S43FB01-20130509			S43MW00303			S43MW00503		
SDG: 1305126	LAB_ID	1305126-27			1305126-11			1305126-15			1305126-18		
FRACTION: M	SAMP_DATE	5/10/2013			5/9/2013			5/9/2013			5/9/2013		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ARSENIC		1.5	U		1.5	U		12			5.75		
COBALT		2.5	U		2.5	U		7.5			64.9		
IRON		2590			15	U		39800			7510		
MANGANESE		41.2			1.5	U		805			275		

PROJ_NO: 00771	NSAMPLE	S43MW00603			S43MW00802			S43MW01002			S43MW01102		
SDG: 1305126	LAB_ID	1305126-13			1305126-09			1305126-16			1305126-02		
FRACTION: M	SAMP_DATE	5/9/2013			5/9/2013			5/9/2013			5/9/2013		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ARSENIC		3.44			1.5	U		4.49			1.55	J	P
COBALT		29.3			11.5			2.5	U		3.22		
IRON		41300			1080			24500			21700		
MANGANESE		793			95.4			189			516		

PROJ_NO: 00771	NSAMPLE	S43MW017D02			S43MW017D02-D			S43MW017S02			S43MW02002		
SDG: 1305126	LAB_ID	1305126-05			1305126-20			1305126-04			1305126-07		
FRACTION: M	SAMP_DATE	5/9/2013			5/9/2013			5/9/2013			5/9/2013		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF				S43MW017D02								
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ARSENIC		2.44	J	P	2.06	J	P	2.32	J	P	1.5	U	
COBALT		11.3			10.9			15.6			15.6		
IRON		30000			29100			29300			2680		
MANGANESE		495			487			471			124		

PROJ_NO: 00771	NSAMPLE	S43MW02202			S43MW02302			S43MW02602			S43OF01		
SDG: 1305126	LAB_ID	1305126-06			1305126-03			1305126-10			1305126-34		
FRACTION: M	SAMP_DATE	5/9/2013			5/9/2013			5/9/2013			5/10/2013		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ARSENIC		1.5	U		1.5	U		1.5	U		0.751	J	P
COBALT		55.7			6.67			6.35			6.58		
IRON		70.2			468			15	U		1750		
MANGANESE		319			223			51.6			189		

PROJ_NO: 00771	NSAMPLE	S43SP0102			S43SP0202			S43SW01			S43SW01-D		
SDG: 1305126	LAB_ID	1305126-28			1305126-31			1305126-23			1305126-24		
FRACTION: M	SAMP_DATE	5/10/2013			5/10/2013			5/10/2013			5/10/2013		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF										S43SW01		
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ARSENIC		1.5	U		1.5	U		1.5	U		1.5	U	
COBALT		7.13			25.9			4.16			4.17		
IRON		1290			761			1450			1450		
MANGANESE		134			65.7			128			129		

PROJ_NO: 00771	NSAMPLE	S43SW02			S43SW04		
SDG: 1305126	LAB_ID	1305126-21			1305126-29		
FRACTION: M	SAMP_DATE	5/10/2013			5/10/2013		
MEDIA: WATER	QC_TYPE	NM			NM		
	UNITS	UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0		
	DUP_OF						
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD
ARSENIC		1.21	J	P	1.5	U	
COBALT		6.38			10.7		
IRON		3340			1670		
MANGANESE		192			256		

PROJ_NO: 00771	NSAMPLE	S43FB01-20130509-F			S43MW00503-F			S43MW00603-F			S43MW01002-F		
SDG: 1305126	LAB_ID	1305126-12			1305126-19			1305126-14			1305126-17		
FRACTION: MF	SAMP_DATE	5/9/2013			5/9/2013			5/9/2013			5/9/2013		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ARSENIC		1.5	U		1.5	U		3.24			3.83		
COBALT		2.5	U		60.1			26.3			2.5	U	
IRON		15	U		5070			39300			20400		
MANGANESE		1.5	U		273			765			186		

PROJ_NO: 00771	NSAMPLE	S43MW02002-F		
SDG: 1305126	LAB_ID	1305126-08		
FRACTION: MF	SAMP_DATE	5/9/2013		
MEDIA: WATER	QC_TYPE	NM		
	UNITS	UG/L		
	PCT_SOLIDS	0.0		
	DUP_OF			
PARAMETER		RESULT	VQL	QLCD
ARSENIC		1.5	U	
COBALT		15.1		
IRON		559		
MANGANESE		119		

Tetra Tech INC **INTERNAL CORRESPONDENCE**

TO:	**R. SOK**	**DATE:**	**JUNE 13, 2013**
FROM:	**J. KALINYAK**	**COPIES:**	**DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – VOC**
NSF INDIAN HEAD, CTO 114
SAMPLE DELIVERY GROUP (SDG) 1305145

SAMPLES: 5 / Air / VOC

S43SG05-0708	S43SG06-0708	S43SG07-1011
S43SG08-0708	S43SGDup01	

OVERVIEW

The sample set for NSF Indian Head, CTO 114, SDG 1305145, consisted of five (5) air samples. All samples were analyzed for select volatile organic compounds (VOC). One (1) field duplicate sample pair was contained within this sample delivery group (SDG); S43SGDup01 / S43SG05-0708.

The samples were collected by Tetra Tech on May 6 and 7, 2013 and analyzed by Eurofins Air Toxics Ltd. laboratory. The analysis was conducted in accordance with a modified EPA Method TO-15 using simultaneous Full Scan and Single Ion Monitoring (SIM) analytical and reporting protocols.

The data contained in this SDG were validated with regard to the following parameters: data completeness, holding times, GC/MS tuning, initial/continuing calibrations, laboratory method blank/preparation results, surrogate spike recoveries, blank spike/blank spike duplicate results, internal standard recoveries, field duplicate precision, compound identification, compound quantitation, and detection limits. Areas of concern are listed below.

MAJOR

No major issues were identified.

MINOR

- Positive results reported below the quantitation limit but above the method detection limit were qualified as estimated, (J).
- The VOC Full Scan initial calibration relative standard deviation (RSD) was greater than the 30% quality control limit for chloromethane for instrument MSDC on 04/25/13. Detected results in the associated samples were qualified as estimated (UJ).
- The field duplicate sample relative percent difference (RPD) for samples S43SGDup01 / S43SG05-0708 was greater than the 50% quality control limit for toluene. Detected results were qualified as estimated (UJ) in the referenced sample pair.

NOTES

The continuing calibration verification (CCV) percent difference (%D) was greater than the 30% quality control limit for carbon tetrachloride for instrument MSDC on 05/13/13 @ 08:10 for the SIM VOC analysis.

Affected samples: All samples
Action: No validation action was necessary as the Full Scan VOC analysis sample results for carbon tetrachloride were reported and the Full Scan CCV %D was compliant for the analyte.

The following samples were analyzed for VOC analytes at dilutions, as listed below, resulting in elevated detection limits for the non-detected VOC analytes.

Sample	Dilution
S43SG05-0708	3.92X
S43SG06-0708	14.3X
S43SG07-1011	14.3X
S43SG08-0708	1.59X
S43SGDup01	1.77X

The field duplicate sample relative percent difference (RPD) was greater than the 50% quality control limit for the sample S43SGDup01 / S43SG05-0708 methyl tert-butyl ether results.
Affected samples: S43SGDup01 / S43SG05-0708
Action: No validation action was necessary as the difference between the sample methyl tert-butyl ether results was less than 2X the Reporting Limit (RL) for methyl tert-butyl ether for the samples.

Non-detected analyte results were reported to the limit of detection (LOD).

EXECUTIVE SUMMARY

Laboratory Performance Issues: Sample chloromethane results were qualified for an initial calibration %RSD non-compliance.

Other Factors Affecting Data Quality: Positive results reported below the quantitation limit but above the method detection limit were qualified as estimated (J). Field duplicate sample toluene results were qualified for field duplicate imprecision.

The data for these analyses were reviewed with reference to the Region III modifications to U.S. EPA National Functional Guidelines for Organic Data Validation (Sept. 1994), a modified EPA Method TO-15, and the Department of Defense (DoD) document entitled "Quality Systems Manual (QSM) for Environmental Laboratories" (October 2010).

Tetra Tech
Joseph Kalinyak
Chemist/Data Validator

Tetra Tech
Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:
Appendix A - Qualified Analytical Results
Appendix B - Results as reported by the Laboratory
Appendix C - Support Documentation

Appendix A

Qualified Analytical Results

Value Qualifier Key (Val Qual)

J – The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.

UJ – The result is an estimated non-detected quantity. The associated numerical value is the approximate concentration of the analyte in the sample.

U - Value is a non-detect as reported by the laboratory.

UR – Non-detected result is considered rejected, (UR), as a result of technical non-compliances.

DATA QUALIFICATION CODE (QUAL CODE)

Qualifier Codes:

A	=	Lab Blank Contamination
B	=	Field Blank Contamination
C	=	Calibration Noncompliance (i.e., % RSDs, %Ds, ICVs, CCVs, RRFs, etc.)
C01	=	GC/MS Tuning Noncompliance
D	=	MS/MSD Recovery Noncompliance
E	=	LCS/LCSD Recovery Noncompliance
F	=	Lab Duplicate Imprecision
G	=	Field Duplicate Imprecision
H	=	Holding Time Exceedance
I	=	ICP Serial Dilution Noncompliance
J	=	ICP PDS Recovery Noncompliance; MSA's $r < 0.995$
K	=	ICP Interference - includes ICS % R Noncompliance
L	=	Instrument Calibration Range Exceedance
M	=	Sample Preservation Noncompliance
N	=	Internal Standard Noncompliance
N01	=	Internal Standard Recovery Noncompliance Dioxins
N02	=	Recovery Standard Noncompliance Dioxins
N03	=	Clean-up Standard Noncompliance Dioxins
O	=	Poor Instrument Performance (i.e., base-time drifting)
P	=	Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q	=	Other problems (can encompass a number of issues; i.e.chromatography,interferences, etc.)
R	=	Surrogates Recovery Noncompliance
S	=	Pesticide/PCB Resolution
T	=	% Breakdown Noncompliance for DDT and Endrin
U	=	RPD between columns/detectors >40% for positive results determined via GC/HPLC
V	=	Non-linear calibrations; correlation coefficient $r < 0.995$
W	=	EMPC result
X	=	Signal to noise response drop
Y	=	Percent solids <30%
Z	=	Uncertainty at 2 sigma deviation is less than sample activity
Z1	=	Tentatively Identified Compound considered presumptively present
Z2	=	Tentatively Identified Compound column bleed

PROJ_NO: 00771	NSAMPLE	S43SG05-0708			S43SG06-0708			S43SG07-1011			S43SG08-0708		
SDG: 1305145	LAB_ID	1305145-03A			1305145-05A			1305145-02A			1305145-01A		
FRACTION: OV-M3	SAMP_DATE	5/6/2013			5/7/2013			5/6/2013			5/6/2013		
MEDIA: ~~WATER~~ Air	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/M3			UG/M3			UG/M3			UG/M3		
	PCT_SOLIDS												
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		0.33	J	P	21			18			3.9		
1,1-DICHLOROETHANE		0.48			6.7			2.7			0.026	U	
1,1-DICHLOROETHENE		1.5			9.5			28			0.025	U	
1,2-DICHLOROETHANE		0.067	U		0.24	U		0.24	U		0.027	U	
1,4-DIOXANE		0.56	U		2.1	U		2.1	U		0.23	U	
2-BUTANONE		26			26			38			19		
2-HEXANONE		9.3			8.2	U		12	J	P	8.3		
4-METHYL-2-PENTANONE		14			6.5			23			12		
ACETONE		72			220			240			140		
BENZENE		6.6			13			11			12		
BROMOFORM		1.6	U		5.9	U		5.9	U		0.66	U	
CARBON DISULFIDE		21			220			19	J	P	20		
CARBON TETRACHLORIDE		2	U		7.2	U		7.2	U		0.8	U	
CHLOROETHANE		1.4	U		5.3	U		5.3	U		0.59	U	
CHLOROFORM		0.76	U		19			2.8	U		0.31	U	
CHLOROMETHANE		1.2	J	C	2.4	U		2.4	U		0.58	J	C
CIS-1,2-DICHLOROETHENE		1.6			6.1			24			0.11	J	P
DICHLORODIFLUOROMETHANE		1.2	J	P	3.8	J	P	2.8	U		2.5		
ETHYLBENZENE		15			18			29			34		
METHYL TERT-BUTYL ETHER		0.056	U		0.21	U		0.86	J	P	1.1		
METHYLENE CHLORIDE		0.54	U		2	U		2	U		0.22	U	
TETRACHLOROETHENE		0.75			2.1			6.8			6.9		
TOLUENE		180	J	G	92			110			100		
TRANS-1,2-DICHLOROETHENE		0.077	J	P	0.23	U		1.2	J	P	0.025	U	
TRICHLOROETHENE		58			1200			1400			0.51		
TRICHLOROFLUOROMETHANE		0.88	U		3.2	U		3.2	U		1.2		
VINYL CHLORIDE		0.25			0.43			22			0.04	J	P

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PROJ_NO: 00771	NSAMPLE	S43SGDup01
SDG: 1305145	LAB_ID	1305145-04A
FRACTION: OV-M3	SAMP_DATE	5/6/2013
MEDIA: ~~WATER~~ AIR	QC_TYPE	NM
	UNITS	UG/M3
	PCT_SOLIDS	
	DUP_OF	S43SG05-0708

PARAMETER	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE	0.36		
1,1-DICHLOROETHANE	0.59		
1,1-DICHLOROETHENE	2		
1,2-DICHLOROETHANE	0.03	U	
1,4-DIOXANE	0.26	U	
2-BUTANONE	32		
2-HEXANONE	12		
4-METHYL-2-PENTANONE	19		
ACETONE	84		
BENZENE	7.4		
BROMOFORM	0.73	U	
CARBON DISULFIDE	27		
CARBON TETRACHLORIDE	0.89	U	
CHLOROETHANE	0.65	U	
CHLOROFORM	0.34	U	
CHLOROMETHANE	0.83	J	C
CIS-1,2-DICHLOROETHENE	1.9		
DICHLORODIFLUOROMETHANE	0.85	J	P
ETHYLBENZENE	18		
METHYL TERT-BUTYL ETHER	0.07	J	P
METHYLENE CHLORIDE	0.24	U	
TETRACHLOROETHENE	0.86		
TOLUENE	81	J	G
TRANS-1,2-DICHLOROETHENE	0.063	J	P
TRICHLOROETHENE	71		
TRICHLOROFLUOROMETHANE	0.4	U	
VINYL CHLORIDE	0.29		

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Tetra Tech **INTERNAL CORRESPONDENCE**

TO:	**R. SOK**	**DATE:**	**JUNE 12, 2013**
FROM:	**LEANNE M. GANSER**	**COPIES:**	**DV FILE**

SUBJECT: **DATA VALIDATION – VOCS, TOTAL METALS, DISSOLVED METALS**
NSF INDIAN HEAD CTO 114
SAMPLE DELIVERY GROUP (SDG) – 1305159

SAMPLES:

16/Aqueous/VOCs and Total Metals

S43FB02-20130513	S43MW00403	S43MW00702	S43MW009D02
S43MW009S02	S43MW009S02-D	S43MW01202	S43MW02701
S43MW02801	S43MW02901	S43MW03001	S43MW03001-D
S43PZ001	S43PZ002	S43PZ003	S43PZ004

1/Aqueous/VOCs
S43TB04-20130513

2/Aqueous/Dissolved Metals
S43MW009D02-F S43PZ002-F

Overview

The sample set for NSF Indian Head, SDG 1305159, consists of fifteen (15) aqueous environmental samples, one (1) field blank, and one (1) trip blank. Two field duplicate pairs were included within this SDG: S43MW009S02 / S43MW009S02-D and S43MW03001 / S43MW03001-D.

All samples were analyzed for select volatile organic compounds (VOCs) including bromoform, chloroform, 1,1-dichloroethane, 1,2-dichloroethane, 1,2-dichloroethene, cis-1,2-dichloroethene, trans-1,2-dichloroethene, methylene chloride, trichloroethene, and vinyl chloride. All samples, excluding the trip blank, were also analyzed for select total metals (arsenic, cobalt, iron, and manganese). Samples S43MW009D02-F and S43PZ002-F were analyzed for select dissolved metals (arsenic, cobalt, iron, and manganese). The samples were collected by Tetra Tech on May 13 and 14, 2013 and analyzed by Empirical Laboratories, LLC. Analyses were conducted using SW-846 methods 8260B for VOCs and 6010C for metals.

Summary

The findings offered in this report are based upon a general review of all available data. The organic data review was based on data completeness, holding times, GC/MS tuning, initial/continuing calibrations, laboratory method blank results, surrogate spike recoveries, internal standard recoveries, laboratory control sample (LCS) results, matrix spike (MS)/matrix spike duplicate (MSD) results, field duplicate results, detection limits and analyte quantitation. The inorganic data review was based on data completeness, holding times, initial/continuing calibrations, laboratory method/preparation blanks, interference check sample results, LCS

results, MS results, laboratory duplicate results, ICP serial dilution results, field duplicate results, detection limits and analyte quantitation.

Areas of concern with respect to data quality are listed below.

Major Problems - None

Minor Problems

- The initial calibration retention factor relative standard deviation for vinyl chloride was greater than the 20% quality control limit, but was less than 50%, for calibration check compounds on 5/3/2013 on instrument MS-VOA5 affecting samples S43PZ001, S43PZ003, S43PZ004, and S43TB04-20130513. Positive results for vinyl chloride in the affected samples were qualified as estimated, "J" .

- The Contract Required Detection Limit (CRDL) percent recovery was less than the 90% quality control limit for arsenic. Arsenic results less than two times the detection limit were qualified as biased low, "L" or estimated, "J", due to multiple qualifications. Nondetected arsenic results were qualified as biased low, "UL".

- Methylene chloride was detected in six samples including the field blank. Methylene chloride was not detected in the associated method blanks but is a suspected laboratory contaminant. The results for methylene chloride are qualified as estimated "J" due to potential laboratory contamination.

Notes

Nondetected results were reported at the limit of detection.

Positive results below the limit of quantitation and above the detection limit were qualified as estimated, "J", due to uncertainty near the detection limit.

Chloroform and methylene chloride were detected in the field blank (S43FB02-20130513).

The following samples were analyzed for VOCs at dilution due to the high concentrations of target analytes detected during screening:

Sample	Dilution
S43MW00403	10
S43MW03001	2
S43MW03001-D	2

Executive Summary

Laboratory Performance: Calibration noncompliance was noted for vinyl chloride. CRDL percent recovery non-compliance was noted for arsenic. Methylene chloride was detected in six samples and is suspected to be a laboratory contaminant.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to Region III modifications to the "National Functional Guidelines for Inorganic Data Validation", April 1993, and Region III modifications to the "National Functional Guidelines for Data Validation", September 1994.

The text of this report has been formulated to address only those problem areas affecting data quality.

Tetra Tech
Leanne M. Ganser
Environmental Scientist

Tetra Tech
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

APPENDIX A
QUALIFIED ANALYTICAL RESULTS

Data Validation Qualifier Codes:

VQL – Validation Qualifier
QLCD – Validation Qualifier Code

A = Lab Blank Contamination
B = Field Blank Contamination
C = Calibration Noncompliance (e.g. % RSDs, %Ds, ICVs, CCVs, RRFs, etc.)
C01 = GC/MS Tuning Noncompliance
D = MS/MSD Recovery Noncompliance
E = LCS/LCSD Recovery Noncompliance
F = Lab Duplicate Imprecision
G = Field Duplicate Imprecision
H = Holding Time Exceedance
I = ICP Serial Dilution Noncompliance
J = GFAA PDS-GFAA MSA's r < 0.995 / ICP PDS Recovery Noncompliance
K = ICP Interference - includes ICS % R Noncompliance
L = Instrument Calibration Range Exceedance
M = Sample Preservation Noncompliance
N = Internal Standard Noncompliance
N01 = Internal Standard Recovery Noncompliance Dioxins
N02 = Recovery Standard Noncompliance Dioxins
N03 = Clean-up Standard Noncompliance Dioxins
O = Poor Instrument Performance (e.g. base-line drifting)
P = Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q = Other problems (can encompass a number of issues; e.g. chromatography,interferences, etc.)
R = Surrogates Recovery Noncompliance
S = Pesticide/PCB Resolution
T = % Breakdown Noncompliance for DDT and Endrin
U = % Difference between columns/detectors >25% for positive results determined via GC/HPLC
V = Non-linear calibrations; correlation coefficient r < 0.995
W = EMPC result
X = Signal to noise response drop
Y = Percent solids <30%
Z = Uncertainty at 2 sigma deviation is greater than sample activity

PROJ_NO: 00771	NSAMPLE	S43FB02-20130513			S43MW00403			S43MW00702			S43MW009D02		
SDG: 1305159	LAB_ID	1305159-11			1305159-13			1305159-12			1305159-06		
FRACTION: OV	SAMP_DATE	5/13/2013			5/13/2013			5/13/2013			5/13/2013		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1-DICHLOROETHANE		0.5	U		5	U		0.5	U		0.5	U	
1,1-DICHLOROETHENE		0.5	U		5	U		0.5	U		0.5	U	
1,2-DICHLOROETHANE		0.5	U		5	U		0.5	U		0.5	U	
BROMOFORM		0.5	U		5	U		0.5	U		0.5	U	
CHLOROFORM		0.38	J	P	5	U		0.5	U		0.5	U	
CIS-1,2-DICHLOROETHENE		0.5	U		164			0.5	U		0.5	U	
METHYLENE CHLORIDE		1.13	J	P	5.3	J	P	0.58	J	P	1	U	
TRANS-1,2-DICHLOROETHENE		0.5	U		5	U		0.5	U		0.5	U	
TRICHLOROETHENE		0.5	U		903			0.5	U		0.41	J	P
VINYL CHLORIDE		0.5	U		15.2			0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43MW009S02			S43MW009S02-D			S43MW01202			S43MW02701		
SDG: 1305159	LAB_ID	1305159-03			1305159-04			1305159-19			1305159-08		
FRACTION: OV	SAMP_DATE	5/13/2013			5/13/2013			5/14/2013			5/13/2013		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF				S43MW009S02								
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1-DICHLOROETHENE		3.08			3.34			0.5	U		0.5	U	
1,2-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
BROMOFORM		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROFORM		0.5	U		0.5	U		0.5	U		0.5	U	
CIS-1,2-DICHLOROETHENE		17.2			16.5			0.5	U		0.5	U	
METHYLENE CHLORIDE		1	U		1	U		1	U		1	U	
TRANS-1,2-DICHLOROETHENE		0.42	J	P	0.34	J	P	0.5	U		0.5	U	
TRICHLOROETHENE		63.2			61.2			1.37			0.5	U	
VINYL CHLORIDE		1.15			1.18			0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43MW02801			S43MW02901			S43MW03001			S43MW03001-D		
SDG: 1305159	LAB_ID	1305159-05			1305159-02			1305159-09			1305159-10		
FRACTION: OV	SAMP_DATE	5/13/2013			5/13/2013			5/13/2013			5/13/2013		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF										S43MW03001		
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1-DICHLOROETHANE		0.5	U		0.5	U		1	U		1	U	
1,1-DICHLOROETHENE		0.34	J	P	0.5	U		0.72	J	P	0.78	J	P
1,2-DICHLOROETHANE		0.5	U		0.5	U		1	U		1	U	
BROMOFORM		0.5	U		0.5	U		1	U		1	U	
CHLOROFORM		0.5	U		0.5	U		1	U		1	U	
CIS-1,2-DICHLOROETHENE		1.88			0.5	U		77.3			76.6		
METHYLENE CHLORIDE		1	U		1	U		1.64	J	P	1.8	J	P
TRANS-1,2-DICHLOROETHENE		0.5	U		0.5	U		7.86			7.8		
TRICHLOROETHENE		2.14			0.5	U		102			101		
VINYL CHLORIDE		0.5	U		0.5	U		17.6			17.2		

PROJ_NO: 00771	NSAMPLE	S43PZ001			S43PZ002			S43PZ003			S43PZ004		
SDG: 1305159	LAB_ID	1305159-15			1305159-17			1305159-16			1305159-14		
FRACTION: OV	SAMP_DATE	5/14/2013			5/14/2013			5/14/2013			5/14/2013		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1-DICHLOROETHANE		0.5	U		0.5	U		0.59	J	P	0.47	J	P
1,1-DICHLOROETHENE		0.5	U		0.5	U		1.34			0.5	U	
1,2-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
BROMOFORM		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROFORM		0.5	U		0.5	U		0.5	U		0.5	U	
CIS-1,2-DICHLOROETHENE		0.5	U		2.53			9.9			0.5	U	
METHYLENE CHLORIDE		1	U		0.5	J	P	1	U		1	U	
TRANS-1,2-DICHLOROETHENE		0.5	U		0.5	U		0.69	J	P	0.5	U	
TRICHLOROETHENE		0.5	U		0.5	U		41.8			0.5	U	
VINYL CHLORIDE		0.5	U		0.91	J	P	0.81	J	CP	0.5	U	

PROJ_NO: 00771	NSAMPLE	S43TB04-20130513
SDG: 1305159	LAB_ID	1305159-01
FRACTION: OV	SAMP_DATE	5/13/2013
MEDIA: WATER	QC_TYPE	NM
	UNITS	UG/L
	PCT_SOLIDS	0.0
	DUP_OF	

PARAMETER	RESULT	VQL	QLCD
1,1-DICHLOROETHANE	0.5	U	
1,1-DICHLOROETHENE	0.5	U	
1,2-DICHLOROETHANE	0.5	U	
BROMOFORM	0.5	U	
CHLOROFORM	0.5	U	
CIS-1,2-DICHLOROETHENE	0.5	U	
METHYLENE CHLORIDE	1	U	
TRANS-1,2-DICHLOROETHENE	0.5	U	
TRICHLOROETHENE	0.5	U	
VINYL CHLORIDE	0.5	U	

PROJ_NO: 00771	NSAMPLE	S43MW009D02-F			S43PZ002-F		
SDG: 1305159	LAB_ID	1305159-07			1305159-18		
FRACTION: MF	SAMP_DATE	5/13/2013			5/14/2013		
MEDIA: WATER	QC_TYPE	NM			NM		
	UNITS	UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0		
	DUP_OF						
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD
ARSENIC		7.27			1.5	UL	C
COBALT		2.5	U		16.6		
IRON		29400			6670		
MANGANESE		181			563		

PROJ_NO: 00771	NSAMPLE	S43FB02-20130513			S43MW00403			S43MW00702			S43MW009D02		
SDG: 1305159	LAB_ID	1305159-11			1305159-13			1305159-12			1305159-06		
FRACTION: M	SAMP_DATE	5/13/2013			5/13/2013			5/13/2013			5/13/2013		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ARSENIC		1.5	UL	C	1.02	J	CP	1.5	UL	C	7.04		
COBALT		2.5	U		34.8			72.3			2.5	U	
IRON		465			11200			4190			29100		
MANGANESE		9.51			384			324			176		

PROJ_NO: 00771	NSAMPLE	S43MW009S02			S43MW009S02-D			S43MW01202			S43MW02701		
SDG: 1305159	LAB_ID	1305159-03			1305159-04			1305159-19			1305159-08		
FRACTION: M	SAMP_DATE	5/13/2013			5/13/2013			5/14/2013			5/13/2013		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF				S43MW009S02								
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ARSENIC		1.5	UL	C	1.5	UL	C	5.37			1.5	UL	C
COBALT		41.4			42.7			10.4			25.8		
IRON		9790			9940			32300			14000		
MANGANESE		409			417			520			492		

PROJ_NO: 00771	NSAMPLE	S43MW02801			S43MW02901			S43MW03001			S43MW03001-D		
SDG: 1305159	LAB_ID	1305159-05			1305159-02			1305159-09			1305159-10		
FRACTION: M	SAMP_DATE	5/13/2013			5/13/2013			5/13/2013			5/13/2013		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF										S43MW03001		
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ARSENIC		1.32	J	CP	1.5	UL	C	1.5	UL	C	1.5	UL	C
COBALT		5.7			45.2			2.5	U		2.5	U	
IRON		1200			2140			24400			24700		
MANGANESE		63.6			572			376			375		

PROJ_NO: 00771	NSAMPLE	S43PZ001			S43PZ002			S43PZ003			S43PZ004		
SDG: 1305159	LAB_ID	1305159-15			1305159-17			1305159-16			1305159-14		
FRACTION: M	SAMP_DATE	5/14/2013			5/14/2013			5/14/2013			5/14/2013		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ARSENIC		2.81	L	C	1.64	J	CP	1.5	UL	C	1.5	UL	C
COBALT		7.62			15			2.5	U		9.42		
IRON		32100			10700			21400			102		
MANGANESE		2060			600			343			135		

Tetra Tech INC **INTERNAL CORRESPONDENCE**

TO:	**R. SOK**	**DATE:**	**JUNE 14, 2013**
FROM:	**J. KALINYAK**	**COPIES:**	**DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – SELECT VOCS**
INORGANIC DATA VALIDATION – SELECT METALS
NSF INDIAN HEAD, CTO 114
SAMPLE DELIVERY GROUP 1305219

SAMPLES: 6 / Aqueous / Select VOCs

S43MW00205	S43MW01302	S43MW01402
S43MW01502	S43MW01602	S43TB05-20130519

5 / Aqueous / Select Metals

S43MW00205	S43MW01302	S43MW01402
S43MW01502	S43MW01602	

OVERVIEW

The sample set for NSF Indian Head, CTO 114, SDG 1305219, consisted of six (6) aqueous samples including one (1) aqueous trip blank sample. All six (6) samples were analyzed for select volatile organic compounds (VOC) and five (5) of the samples were analyzed for select metals as listed above. No field duplicate sample pairs were contained within this sample delivery group (SDG).

The samples were collected by Tetra Tech on May 19, 2013 and analyzed by Empirical Laboratory LLC. All analyses were conducted in accordance with EPA SW-846 Methods 8260B for select VOCs and 6010C for select metals.

The data contained in this SDG were validated with regard to the following parameters: data completeness, holding times, GC/MS tuning, initial/continuing calibrations, laboratory method blank/preparation results, surrogate spike recoveries, blank spike/blank spike duplicate results, internal standard recoveries, chromatographic resolution, ICP serial dilution results, ICP interference results, compound identification, compound quantitation, and detection limits. Areas of concern are listed below.

MAJOR

No major issues were identified.

MINOR

- Positive results reported below the quantitation limit but above the method detection limit were qualified as estimated, (J).
- The Contract Required Detection Limit (CRDL) standare percent recovery (%R) for arsenic was less than the 90% quality control limit affecting all samples. Nondetected results were qualified as biased low (UL).

NOTES

Headspace was observed by the laboratory for the trip blank sample S43TB05-20130519 VOC sample

vials as noted in the laboratory sample receipt documentation. No documentation was provided by the laboratory as to the size of the head space in the sample vials. No validation action was taken on the trip blank.

Non-detected analyte results were reported to the limit of detection (LOD).

EXECUTIVE SUMMARY

Laboratory Performance Issues: Sample arsenic non-detected results were qualified for a CRDL %R non-compliance.

Other Factors Affecting Data Quality: Positive results reported below the quantitation limit but above the method detection limit were qualified as estimated (J).

The data for these analyses were reviewed with reference to the Region III modifications to U.S. EPA National Functional Guidelines for Organic Data Validation (Sept. 1994), the Region III EPA Modifications to the Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses (April 1993), USEPA SW-846 Methods 8260B and 6010C, and the Department of Defense (DoD) document entitled "Quality Systems Manual (QSM) for Environmental Laboratories" (October 2010).

Tetra Tech
Joseph Kalinyak
Chemist/Data Validator

Tetra Tech
Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:
Appendix A - Qualified Analytical Results
Appendix B - Results as reported by the Laboratory
Appendix C - Support Documentation

Appendix A

Qualified Analytical Results

DATA QUALIFICATION CODE (QUAL CODE)

Qualifier Codes:

A	=	Lab Blank Contamination
B	=	Field Blank Contamination
C	=	Calibration Noncompliance (i.e., % RSDs, %Ds, ICVs, CCVs, RRFs, etc.)
C01	=	GC/MS Tuning Noncompliance
D	=	MS/MSD Recovery Noncompliance
E	=	LCS/LCSD Recovery Noncompliance
F	=	Lab Duplicate Imprecision
G	=	Field Duplicate Imprecision
H	=	Holding Time Exceedance
I	=	ICP Serial Dilution Noncompliance
J	=	ICP PDS Recovery Noncompliance; MSA's $r < 0.995$
K	=	ICP Interference - includes ICS % R Noncompliance
L	=	Instrument Calibration Range Exceedance
M	=	Sample Preservation Noncompliance
N	=	Internal Standard Noncompliance
N01	=	Internal Standard Recovery Noncompliance Dioxins
N02	=	Recovery Standard Noncompliance Dioxins
N03	=	Clean-up Standard Noncompliance Dioxins
O	=	Poor Instrument Performance (i.e., base-time drifting)
P	=	Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q	=	Other problems (can encompass a number of issues; i.e.chromatography,interferences, etc.)
R	=	Surrogates Recovery Noncompliance
S	=	Pesticide/PCB Resolution
T	=	% Breakdown Noncompliance for DDT and Endrin
U	=	RPD between columns/detectors >40% for positive results determined via GC/HPLC
V	=	Non-linear calibrations; correlation coefficient $r < 0.995$
W	=	EMPC result
X	=	Signal to noise response drop
Y	=	Percent solids <30%
Z	=	Uncertainty at 2 sigma deviation is less than sample activity
Z1	=	Tentatively Identified Compound considered presumptively present
Z2	=	Tentatively Identified Compound column bleed

PROJ_NO: 00771	NSAMPLE	S43MW00205			S43MW01302			S43MW01402			S43MW01502		
SDG: 1305219	LAB_ID	1305219-04			1305219-02			1305219-03			1305219-05		
FRACTION: OV	SAMP_DATE	5/19/2013			5/19/2013			5/19/2013			5/19/2013		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1-DICHLOROETHANE		5.06			20.5			6.98			5.14		
1,1-DICHLOROETHENE		0.52	J	P	3.36			0.68	J	P	0.51	J	P
1,2-DICHLOROETHANE		0.5	U		0.36	J	P	0.5	U		0.5	U	
BROMOFORM		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROFORM		0.5	U		0.5	U		0.5	U		0.5	U	
CIS-1,2-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
METHYLENE CHLORIDE		1	U		1	U		1	U		1	U	
TRANS-1,2-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
TRICHLOROETHENE		0.26	J	P	0.78	J	P	0.5	U		0.5	U	
VINYL CHLORIDE		0.5	U		0.5	U		0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43MW01602			S43TB05-20130519		
SDG: 1305219	LAB_ID	1305219-06			1305219-01		
FRACTION: OV	SAMP_DATE	5/19/2013			5/19/2013		
MEDIA: WATER	QC_TYPE	NM			NM		
	UNITS	UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0		
	DUP_OF						
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1-DICHLOROETHANE		0.34	J	P	0.5	U	
1,1-DICHLOROETHENE		0.5	U		0.5	U	
1,2-DICHLOROETHANE		0.5	U		0.5	U	
BROMOFORM		0.5	U		0.5	U	
CHLOROFORM		0.14	J	P	0.5	U	
CIS-1,2-DICHLOROETHENE		0.5	U		0.5	U	
METHYLENE CHLORIDE		1	U		1	U	
TRANS-1,2-DICHLOROETHENE		0.5	U		0.5	U	
TRICHLOROETHENE		0.5	U		0.5	U	
VINYL CHLORIDE		0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43MW00205			S43MW01302			S43MW01402			S43MW01502		
SDG: 1305219	LAB_ID	1305219-04			1305219-02			1305219-03			1305219-05		
FRACTION: M	SAMP_DATE	5/19/2013			5/19/2013			5/19/2013			5/19/2013		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ARSENIC		1.5	UL	C	1.5	UL	C	1.5	UL	C	1.5	UL	C
COBALT		42.8			113			37.3			14.4		
IRON		16.4	J	P	65.4			2930			403		
MANGANESE		239			491			263			451		

PROJ_NO: 00771	NSAMPLE	S43MW01602		
SDG: 1305219	LAB_ID	1305219-06		
FRACTION: M	SAMP_DATE	5/19/2013		
MEDIA: WATER	QC_TYPE	NM		
	UNITS	UG/L		
	PCT_SOLIDS	0.0		
	DUP_OF			
PARAMETER		RESULT	VQL	QLCD
ARSENIC		1.5	UL	C
COBALT		122		
IRON		12.4	J	P
MANGANESE		95.1		

Appendix P

Validated Analytical Result Tables

LOCATION	43SA01		43SA02	43SA03	43SA04	S43SB001		S43SB002		S43SB003				S43SB004	
SAMPLE ID	43SA01	43SA01-D	43SA02	43SA03	43SA04	S43SB0010101	S43SS0010001	S43SB0020101	S43SS0020001	S43SB0030101	S43SB0030101-D	S43SS0030001	S43SS0030001-D	S43SB0040101	S43SS0040001
SAMPLE DATE	19920801	19920801	19920801	19920801	19920801	20050714	20050714	20050714	20050714	20050714	20050714	20050714	20050714	20050714	20050714
SAMPLE CODE	ORIG	DUP	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	ORIG	DUP	ORIG	DUP	NORMAL	NORMAL
MATRIX	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO
TOP DEPTH	0	0	0	0	0	1	0	1	0	1	1	0	0	1	0
BOTTOM DEPTH	1	1	1	1	1	2	1	2	1	2	2	1	1	2	1
VOLATILES (UG/KG)															
1,1,1-TRICHLOROETHANE	12 U	13 U	12 U	11 U	11 U	10 U	15 U	12 U	20 U	14 U	13 U	13 U	13 U	14 U	14 U
1,1,2,2-TETRACHLOROETHANE	12 U	13 U	12 U	11 U	11 U	10 U	15 U	12 U	20 U	14 U	13 U	13 U	13 U	14 U	14 U
1,1,2-TRICHLOROETHANE	12 U	13 U	12 U	11 U	11 U	10 U	15 U	12 U	20 U	14 U	13 U	13 U	13 U	14 U	14 U
1,1,2-TRICHLOROTRIFLUOROETHANE	--	--	--	--	--	10 U	15 U	12 U	20 U	14 U	13 U	13 U	13 U	14 U	14 U
1,1-DICHLOROETHANE	12 U	13 U	12 U	11 U	11 U	10 U	15 U	12 U	20 U	14 U	13 U	13 U	13 U	14 U	14 U
1,1-DICHLOROETHENE	12 U	13 U	12 U	11 U	11 U	10 U	15 U	12 U	20 U	14 U	13 U	13 U	13 U	14 U	14 U
1,2,3-TRICHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-TRICHLOROBENZENE	--	--	--	--	--	10 U	15 U	12 U	20 U	14 U	13 U	13 U	13 U	14 U	14 U
1,2-DIBROMO-3-CHLOROPROPANE	--	--	--	--	--	10 UR	15 UR	12 UR	20 UR	14 UR	13 UR	13 UR	13 UR	14 UR	14 UR
1,2-DIBROMOETHANE	--	--	--	--	--	10 U	15 U	12 U	20 U	14 U	13 U	13 U	13 U	14 U	14 U
1,2-DICHLOROBENZENE	--	--	--	--	--	10 U	15 U	12 U	20 U	14 U	13 U	13 U	13 U	14 U	14 U
1,2-DICHLOROETHANE	12 U	13 U	12 U	11 U	11 U	10 U	15 U	12 U	20 U	14 U	13 U	13 U	13 U	14 U	14 U
1,2-DICHLOROPROPANE	12 U	13 U	12 U	11 U	11 U	10 U	15 U	12 U	20 U	14 U	13 U	13 U	13 U	14 U	14 U
1,3-DICHLOROBENZENE	--	--	--	--	--	10 U	15 U	12 U	20 U	14 U	13 U	13 U	13 U	14 U	14 U
1,3-DICHLOROPROPANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-DICHLOROBENZENE	--	--	--	--	--	10 U	15 U	12 U	20 U	14 U	13 U	13 U	13 U	14 U	14 U
1,4-DIOXANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-BUTANONE	12 U	13 U	12 U	11 U	2 U	10 U	15 U	12 U	20 U	9 J	6 J	8 J	13 U	7 J	14 U
2-HEXANONE	12 U	13 U	12 U	11 U	11 U	10 U	15 U	12 U	20 U	14 U	13 U	13 U	13 U	14 U	14 U
4-METHYL-2-PENTANONE	12 U	13 U	12 U	11 U	11 U	10 U	15 U	12 U	20 U	14 U	13 U	13 U	13 U	14 U	14 U
ACETONE	29 U	340	10 U	5 U	10 U	10 U	15 U	12 U	20 U	12 J	13 J	31 J	48 J	10 J	12 J
BENZENE	12 U	13 U	12 U	11 U	11 U	10 U	15 U	12 U	20 U	14 U	13 U	13 U	13 U	14 U	14 U
BROMODICHLOROMETHANE	12 U	13 U	12 U	11 U	11 U	10 U	15 U	12 U	20 U	14 U	13 U	13 U	13 U	14 U	14 U
BROMOFORM	12 U	13 U	12 U	11 U	11 U	10 U	15 U	12 U	20 U	14 U	13 U	13 U	13 U	14 U	14 U
BROMOMETHANE	12 U	13 U	12 U	11 U	11 U	10 U	15 U	12 U	20 U	14 U	13 U	13 U	13 U	14 U	14 U
CARBON DISULFIDE	12 U	13 U	12 U	11 U	11 U	10 U	15 U	12 U	20 U	14 U	13 U	13 U	13 U	14 U	14 U
CARBON TETRACHLORIDE	12 U	13 U	12 U	11 U	11 U	10 U	15 U	12 U	20 U	14 U	13 U	13 U	13 U	14 U	14 U
CHLOROBENZENE	12 U	13 U	12 U	11 U	11 U	10 U	15 U	12 U	20 U	14 U	13 U	13 U	13 U	14 U	14 U
CHLORODIBROMOMETHANE	12 U	13 U	12 U	11 U	11 U	10 U	15 U	12 U	20 U	14 U	13 U	13 U	13 U	14 U	14 U
CHLOROETHANE	12 U	13 U	12 U	11 U	11 U	10 U	15 U	12 U	20 U	14 U	13 U	13 U	13 U	14 U	14 U
CHLOROFORM	12 U	13 U	12 U	11 U	11 U	10 U	15 U	12 U	20 U	14 U	13 U	13 U	13 U	14 U	14 U
CHLOROMETHANE	12 U	13 U	12 U	11 U	11 U	10 U	15 U	12 U	20 U	14 U	13 U	13 U	13 U	14 U	14 U
CIS-1,2-DICHLOROETHENE	--	--	--	--	--	10 U	15 U	12 U	20 U	14 U	13 U	13 U	13 U	14 U	14 U
CIS-1,3-DICHLOROPROPENE	12 U	13 U	12 U	11 U	11 U	10 U	15 U	12 U	20 U	14 U	13 U	13 U	13 U	14 U	14 U
CYCLOHEXANE	--	--	--	--	--	10 U	15 U	12 U	20 U	14 U	13 U	13 U	13 U	14 U	14 U
DICHLORODIFLUOROMETHANE	--	--	--	--	--	10 U	15 U	12 U	20 U	14 U	13 U	13 U	13 U	14 U	14 U
ETHYLBENZENE	12 U	13 U	12 U	11 U	11 U	10 U	15 U	12 U	20 U	14 U	13 U	13 U	13 U	14 U	14 U
ISOPROPYLBENZENE	--	--	--	--	--	10 U	15 U	12 U	20 U	14 U	13 U	13 U	13 U	14 U	14 U
METHYL ACETATE	--	--	--	--	--	10 U	15 U	12 U	20 U	14 U	13 U	13 U	13 U	14 U	14 U
METHYL CYCLOHEXANE	--	--	--	--	--	10 U	15 U	12 U	20 U	14 U	13 U	13 U	13 U	14 U	14 U
METHYL TERT-BUTYL ETHER	--	--	--	--	--	10 U	15 U	12 U	20 U	14 U	13 U	13 U	13 U	14 U	14 U
METHYLENE CHLORIDE	2 U	13 U	12 U	3 U	3 U	8 B	8 B	5 B	210 J	150 J	130 J	130 J	6 B	140 J	130 J
STYRENE	12 U	13 U	12 U	11 U	11 U	10 U	15 U	12 U	20 U	14 U	13 U	13 U	13 U	14 U	14 U
TETRACHLOROETHENE	12 U	13 U	12 U	11 U	11 U	10 U	15 U	12 U	20 U	14 U	13 U	13 U	13 U	14 U	14 U
TOLUENE	12 U	13 U	12 U	11 U	11 U	10 U	15 U	12 U	20 U	14 U	13 U	13 U	13 U	14 U	14 U
TOTAL 1,2-DICHLOROETHENE	12 U	13 U	12 U	11 U	11 U	--	--	--	--	--	--	--	--	--	--
TOTAL XYLENES	--	--	--	--	--	10 U	15 U	12 U	20 U	14 U	13 U	13 U	13 U	14 U	14 U
TRANS-1,2-DICHLOROETHENE	--	--	--	--	--	10 U	15 U	12 U	20 U	14 U	13 U	13 U	13 U	14 U	14 U
TRANS-1,3-DICHLOROPROPENE	12 U	13 U	12 U	11 U	11 U	10 U	15 U	12 U	20 U	14 U	13 U	13 U	13 U	14 U	14 U
TRICHLOROETHENE	12 U	13 U	12 U	11 U	11 U	8 J	15 U	12 U	20 U	14 U	13 U	13 U	13 U	14 U	14 U
TRICHLOROFLUOROMETHANE	--	--	--	--	--	10 U	15 U	12 U	20 U	14 U	13 U	13 U	13 U	14 U	14 U
VINYL CHLORIDE	12 U	13 U	12 U	11 U	11 U	10 U	15 U	12 U	20 U	14 U	13 U	13 U	13 U	14 U	14 U
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	0.25 U	0.25 U
1,3-DINITROBENZENE	--	--	--	--	--	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2,4,6-TRINITROTOLUENE	--	--	--	--	--	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2,4-DINITROTOLUENE	--	--	--	--	--	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2,6-DINITROTOLUENE	--	--	--	--	--	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2-AMINO-4,6-DINITROTOLUENE	--	--	--	--	--	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2-NITROTOLUENE	--	--	--	--	--	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
3-NITROTOLUENE	--	--	--	--	--	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
4-AMINO-2,6-DINITROTOLUENE	--	--	--	--	--	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
4-NITROTOLUENE	--	--	--	--	--	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
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	0.25 U	0.25 U
NITROBENZENE	--	--	--	--	--	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
NITROCELLULOSE	--	--	--	--	--	1.5 B	8 J	1.4 B	9 J	1.1 B	1.2 B	1.2 B	1.3 B	1.5 B	1.4 B
NITROGLYCERIN	--	--	--	--	--	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 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	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	0.25 U	0.25 U
TETRYL	--	--	--	--	--	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
MISCELLANEOUS PARAMETERS (UG/KG)															
PERCHLORATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

LOCATION	43SA01		43SA02	43SA03	43SA04	S43SB001		S43SB002		S43SB003				S43SB004	
SAMPLE ID	43SA01	43SA01-D	43SA02	43SA03	43SA04	S43SB0010101	S43SS0010001	S43SB0020101	S43SS0020001	S43SB0030101	S43SB0030101-D	S43SS0030001	S43SS0030001-D	S43SB0040101	S43SS0040001
SAMPLE DATE	19920801	19920801	19920801	19920801	19920801	20050714	20050714	20050714	20050714	20050714	20050714	20050714	20050714	20050714	20050714
SAMPLE CODE	ORIG	DUP	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	ORIG	DUP	ORIG	DUP	NORMAL	NORMAL
MATRIX	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO
TOP DEPTH	0	0	0	0	0	1	0	1	0	1	1	0	0	1	0
BOTTOM DEPTH	1	1	1	1	1	2	1	2	1	2	2	1	1	2	1
SEMIVOLATILES (UG/KG)															
1,2,4-TRICHLOROBENZENE	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
1,2-DICHLOROBENZENE	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
1,3-DICHLOROBENZENE	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
1,4-DICHLOROBENZENE	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
2,2'-OXYBIS(1-CHLOROPROPANE)	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
2,4,5-TRICHLOROPHENOL	900 U	920 U	930 U	870 U	890 U	--	--	--	--	--	--	--	--	--	--
2,4,6-TRICHLOROPHENOL	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
2,4-DICHLOROPHENOL	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
2,4-DIMETHYLPHENOL	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
2,4-DINITROPHENOL	900 U	920 U	930 U	870 U	890 U	--	--	--	--	--	--	--	--	--	--
2,4-DINITROTOLUENE	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
2,6-DINITROTOLUENE	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
2-CHLORONAPHTHALENE	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
2-CHLOROPHENOL	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
2-METHYLNAPHTHALENE	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
2-METHYLPHENOL	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
2-NITROANILINE	900 U	920 U	930 U	870 U	890 U	--	--	--	--	--	--	--	--	--	--
2-NITROPHENOL	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
3,3'-DICHLOROBENZIDINE	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
3-NITROANILINE	900 U	920 U	930 U	870 U	890 U	--	--	--	--	--	--	--	--	--	--
4,6-DINITRO-2-METHYLPHENOL	900 U	920 U	930 U	870 U	890 U	--	--	--	--	--	--	--	--	--	--
4-BROMOPHENYL PHENYL ETHER	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
4-CHLORO-3-METHYLPHENOL	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
4-CHLOROANILINE	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
4-CHLOROPHENYL PHENYL ETHER	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
4-METHYLPHENOL	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
4-NITROANILINE	900 U	920 U	930 U	870 U	890 U	--	--	--	--	--	--	--	--	--	--
4-NITROPHENOL	900 U	920 U	930 U	870 U	890 U	--	--	--	--	--	--	--	--	--	--
ACENAPHTHENE	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
ACENAPHTHYLENE	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
ANTHRACENE	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
BENZO(A)ANTHRACENE	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
BENZO(A)PYRENE	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
BENZO(B)FLUORANTHENE	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
BENZO(G,H,I)PERYLENE	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
BENZO(K)FLUORANTHENE	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
BIS(2-CHLOROETHOXY)METHANE	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
BIS(2-CHLOROETHYL)ETHER	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
BIS(2-ETHYLHEXYL)PHTHALATE	53 U	48 U	380 U	20 UJ	370 U	--	--	--	--	--	--	--	--	--	--
BUTYL BENZYL PHTHALATE	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
CARBAZOLE	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
CHRYSENE	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
DIBENZO(A,H)ANTHRACENE	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
DIBENZOFURAN	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
DIETHYL PHTHALATE	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
DIMETHYL PHTHALATE	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
DI-N-BUTYL PHTHALATE	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
DI-N-OCTYL PHTHALATE	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
FLUORANTHENE	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
FLUORENE	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
HEXACHLOROBENZENE	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
HEXACHLOROBUTADIENE	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
HEXACHLOROCYCLOPENTADIENE	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
HEXACHLOROETHANE	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
INDENO(1,2,3-CD)PYRENE	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
ISOPHORONE	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
NAPHTHALENE	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
NITROBENZENE	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
N-NITROSO-DI-N-PROPYLAMINE	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
N-NITROSODIPHENYLAMINE	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
PENTACHLOROPHENOL	900 U	920 U	930 U	870 U	890 U	--	--	--	--	--	--	--	--	--	--
PHENANTHRENE	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
PHENOL	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--
PYRENE	370 U	380 U	380 U	360 U	370 U	--	--	--	--	--	--	--	--	--	--

LOCATION	43SA01		43SA02	43SA03	43SA04	S43SB001		S43SB002		S43SB003				S43SB004	
SAMPLE ID	43SA01	43SA01-D	43SA02	43SA03	43SA04	S43SB0010101	S43SS0010001	S43SB0020101	S43SS0020001	S43SB0030101	S43SB0030101-D	S43SS0030001	S43SS0030001-D	S43SB0040101	S43SS0040001
SAMPLE DATE	19920801	19920801	19920801	19920801	19920801	20050714	20050714	20050714	20050714	20050714	20050714	20050714	20050714	20050714	20050714
SAMPLE CODE	ORIG	DUP	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	ORIG	DUP	ORIG	DUP	NORMAL	NORMAL
MATRIX	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO
TOP DEPTH	0	0	0	0	0	1	0	1	0	1	1	0	0	1	0
BOTTOM DEPTH	1	1	1	1	1	2	1	2	1	2	2	1	1	2	1
MISCELLANEOUS PARAMETERS (MG/KG)															
CYANIDE	--	--	--	--	--	1.4	0.095 U	0.097 U	0.089 U	0.13 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U
TOTAL ORGANIC CARBON	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METALS (MG/KG)															
ALUMINUM	--	--	--	--	--	3490 J	4410 J	3380 J	7230 J	16200 J	16800 J	17000 J	18300 J	16200 J	18400 J
ANTIMONY	--	--	--	--	--	0.74 B	1.3 B	1.1 B	1.3 B	1.7 B	1.9 B	2 B	1.8 B	1.9 B	1.3 B
ARSENIC	--	--	--	--	--	3.6	4.3	2.7	5.3 K	11.3 K	13.5 K	5.7 K	3.9	8.5	3.8
BARIUM	--	--	--	--	--	20.4	25.9 J	29.5	64 J	93.4	92.4	165 J	457 J	106	112 J
BERYLLIUM	--	--	--	--	--	0.26	0.27	1.6	0.4	1.2	1.2	1.2	0.95	1.1	0.63
CADMIUM	--	--	--	--	--	0.16	0.95	0.4	0.82 K	0.41 K	0.4 K	0.35 K	0.13	0.16	0.22
CALCIUM	--	--	--	--	--	176	1610	1280	1170	143	194	279	256	116	350
CHROMIUM	--	--	--	--	--	18.2 J	19.9 J	17.3 J	37.5 J	18.5 J	22.1 J	20.2 J	17.1 J	16.7 J	20.2 J
COBALT	--	--	--	--	--	3.5	7	4.6	19.3	3	3	1.7 L	2.4	4.9	3.2
COPPER	--	--	--	--	--	9.7	22.8 J	21.9	25.7 J	16.8	17.7	20.2 J	14 J	14.8	13.9 J
IRON	--	--	--	--	--	14100	13500	18700	23400	41200	41500	34600	16800	19200	16500
LEAD	--	--	--	--	--	6.1	91	7.7	42.3	15.6	16.8	22.9	19.7	17	15.8
MAGNESIUM	--	--	--	--	--	196	3860	777	765	586	637	469	535	607	675
MANGANESE	--	--	--	--	--	110 J	228 J	227 J	813 J	10.9 J	12.3 J	9.9 J	9.9 J	10.2 J	15.9 J
MERCURY	--	--	--	--	--	0.045 U	0.05 U	0.048 U	0.05 U	0.056 U	0.06 U	0.062 K	0.063 U	0.065 U	0.34
NICKEL	--	--	--	--	--	7	38.8	5.5	12.6	7.5 L	7.9 L	5.1 L	7.4	9.7	7.1
POTASSIUM	--	--	--	--	--	311	299	380	441	420 L	504 L	366 L	466	408	530
SELENIUM	--	--	--	--	--	0.49 UR	0.56 UR	0.58 UR	0.54 UR	0.6 UR	0.67 UR	0.62 UR	0.72 UR	0.71 UR	0.56 UR
SILVER	--	--	--	--	--	0.31 B	0.46 B	0.14 U	0.55 B	1.5 B	1.6 B	1.7 B	2 B	1.8 B	2 B
SODIUM	--	--	--	--	--	288	281	265	465	128 K	129 K	99.9 K	111	263	102
THALLIUM	--	--	--	--	--	0.33 U	0.38 U	0.39 U	0.36 U	0.4 U	0.45 U	0.41 U	0.88 B	0.48 U	0.38 U
VANADIUM	--	--	--	--	--	16.2	39.4	25.3	36	49.2	55.8	26.3	24.2	38.7	31
ZINC	--	--	--	--	--	23.1 K	70.8 K	13.1 K	58.4 K	16.7 K	18.7 K	14.5 K	16.2 K	22.6 K	19.4 K

APPENDIX P
SOIL ANALYTICAL RESULTS
SITE 43 - TOLUENE DISPOSAL AREA
NAVAL SUPPORT FACILITY INDIAN HEAD
INDIAN HEAD, MARYLAND

LOCATION	S43SB005		S43SB006		S43SB008		S43SB009			S43SB010	S43SB011			S43SB012	
SAMPLE ID	S43SB0050101	S43SS0050001	S43SB0060101	S43SS0060001	S43SB008-0607	S43SB008-0608	S43SB009-0608	S43SB009-0708	S43SB009-0708-D	S43SB010-0709	S43SB011-0507	S43SB011-0709	S43SB011-0709-D	S43SB012-0507	S43SB012-0507-D
SAMPLE DATE	20050714	20050714	20050714	20050714	20110610	20110604	20110604	20110610	20110610	20110603	20110610	20110604	20110604	20110611	20110611
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	ORIG	DUP	NORMAL	NORMAL	ORIG	DUP	ORIG	DUP
MATRIX	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO
TOP DEPTH	2	1	2	1	6	6	6	7	7	7	5	7	7	5	5
BOTTOM DEPTH	3	2	3	2	7	8	8	8	8	9	7	9	9	7	7
VOLATILES (UG/KG)															
1,1,1-TRICHLOROETHANE	12 U	10 U	10 U	7 U	2.5 U	--	--	2.45 U	2.53 U	2.81 U	104 U	--	--	2.52 U	2.52 U
1,1,2,2-TETRACHLOROETHANE	12 U	10 U	10 U	7 U	2.5 U	--	--	2.45 U	2.53 U	2.81 U	104 U	--	--	2.52 U	2.52 U
1,1,2-TRICHLOROETHANE	12 U	10 U	10 U	7 U	2.5 U	--	--	2.45 U	2.53 U	2.81 U	104 U	--	--	2.52 U	2.52 U
1,1,2-TRICHLOROTRIFLUOROETHANE	12 U	10 U	10 U	7 U	5 U	--	--	4.91 U	5.07 U	5.62 U	208 U	--	--	5.04 U	5.04 U
1,1-DICHLOROETHANE	12 U	10 U	10 U	7 U	2.5 U	--	--	2.45 U	2.53 U	2.81 U	104 U	--	--	2.52 U	2.52 U
1,1-DICHLOROETHENE	12 U	10 U	10 U	7 U	2.5 U	--	--	2.45 U	2.53 U	2.81 U	104 U	--	--	2.52 U	2.52 U
1,2,3-TRICHLOROBENZENE	--	--	--	--	2.5 U	--	--	2.45 U	2.53 U	2.81 U	104 U	--	--	2.52 U	2.52 U
1,2,4-TRICHLOROBENZENE	12 U	10 U	10 U	7 U	2.5 U	--	--	2.45 U	2.53 U	2.81 U	104 U	--	--	2.52 U	2.52 U
1,2-DIBROMO-3-CHLOROPROPANE	12 UR	10 UR	10 UR	7 UR	5 U	--	--	4.91 U	5.07 U	5.62 U	208 U	--	--	5.04 U	5.04 U
1,2-DIBROMOETHANE	12 U	10 U	10 U	7 U	2.5 U	--	--	2.45 U	2.53 U	2.81 U	104 U	--	--	2.52 U	2.52 U
1,2-DICHLOROBENZENE	12 U	10 U	10 U	7 U	2.5 U	--	--	2.45 U	2.53 U	2.81 U	104 U	--	--	2.52 U	2.52 U
1,2-DICHLOROETHANE	12 U	10 U	10 U	7 U	2.5 U	--	--	2.45 U	2.53 U	2.81 U	104 U	--	--	2.52 U	2.52 U
1,2-DICHLOROPROPANE	12 U	10 U	10 U	7 U	2.5 U	--	--	2.45 U	2.53 U	2.81 U	104 U	--	--	2.52 U	2.52 U
1,3-DICHLOROBENZENE	12 U	10 U	10 U	7 U	--	--	--	--	--	--	--	--	--	--	--
1,3-DICHLOROPROPANE	--	--	--	--	2.5 U	--	--	2.45 U	2.53 U	2.81 U	104 U	--	--	2.52 U	2.52 U
1,4-DICHLOROBENZENE	12 U	10 U	10 U	7 U	2.5 U	--	--	2.45 U	2.53 U	2.81 U	104 U	--	--	2.52 U	2.52 U
1,4-DIOXANE	--	--	--	--	100 UR	--	--	98.2 UR	101 UR	112 UR	4160 UR	--	--	101 UR	101 UR
2-BUTANONE	8 J	10 U	10 U	7 U	5 U	--	--	4.91 U	5.07 U	5.62 U	208 U	--	--	5.04 U	5.04 U
2-HEXANONE	12 U	10 U	10 U	7 U	2.5 U	--	--	2.45 U	2.53 U	2.81 U	104 U	--	--	2.52 U	2.52 U
4-METHYL-2-PENTANONE	12 U	10 U	10 U	7 U	2.5 U	--	--	2.45 U	2.53 U	2.81 U	104 U	--	--	2.52 U	2.52 U
ACETONE	17 J	25 J	19 J	16 J	20 J	--	--	14.5 J	13.3 J	11.2 UR	416 U	--	--	12.1 B	12 J
BENZENE	12 U	10 U	10 U	7 U	2.5 U	--	--	2.45 U	2.53 U	2.81 U	104 U	--	--	2.52 U	2.52 U
BROMODICHLOROMETHANE	12 U	10 U	10 U	7 U	2.5 U	--	--	2.45 U	2.53 U	2.81 U	104 U	--	--	2.52 U	2.52 U
BROMOFORM	12 U	10 U	10 U	7 U	2.5 U	--	--	2.45 U	2.53 U	2.81 U	104 U	--	--	2.52 U	2.52 U
BROMOMETHANE	12 U	10 U	10 U	7 U	5 U	--	--	4.91 U	5.07 U	5.62 U	208 U	--	--	5.04 U	5.04 U
CARBON DISULFIDE	12 U	10 U	10 U	0.8 J	2.5 U	--	--	2.45 U	2.53 U	2.81 U	104 U	--	--	2.52 U	2.52 U
CARBON TETRACHLORIDE	12 U	10 U	10 U	7 U	2.5 U	--	--	2.45 U	2.53 U	2.81 U	104 U	--	--	2.52 U	2.52 U
CHLOROBENZENE	12 U	10 U	10 U	7 U	2.5 U	--	--	2.45 U	2.53 U	2.81 U	104 U	--	--	2.52 U	2.52 U
CHLORODIBROMOMETHANE	12 U	10 U	10 U	7 U	2.5 U	--	--	2.45 U	2.53 U	2.81 U	104 U	--	--	2.52 U	2.52 U
CHLOROETHANE	12 U	10 U	10 U	7 U	5 U	--	--	4.91 U	5.07 U	5.62 U	208 U	--	--	5.04 U	5.04 U
CHLOROFORM	12 U	10 U	10 U	7 U	2.5 U	--	--	2.45 U	2.53 U	2.81 U	104 U	--	--	2.52 U	2.52 U
CHLOROMETHANE	12 U	10 U	10 U	7 U	5 U	--	--	4.91 U	5.07 U	5.62 U	208 U	--	--	5.04 U	5.04 U
CIS-1,2-DICHLOROETHENE	12 U	10 U	10 U	7 U	2.5 U	--	--	2.45 U	2.53 U	2.81 U	104 U	--	--	2.52 U	2.52 U
CIS-1,3-DICHLOROPROPENE	12 U	10 U	10 U	7 U	--	--	--	--	--	--	--	--	--	--	--
CYCLOHEXANE	12 U	10 U	10 U	7 U	2.5 U	--	--	2.45 U	2.53 U	2.81 U	104 U	--	--	2.52 U	2.52 U
DICHLORODIFLUOROMETHANE	12 U	10 U	10 U	7 U	5 U	--	--	4.91 U	5.07 U	5.62 U	208 U	--	--	5.04 U	5.04 U
ETHYLBENZENE	12 U	10 U	10 U	7 U	2.5 U	--	--	2.45 U	2.53 U	2.81 U	104 U	--	--	2.52 U	2.52 U
ISOPROPYLBENZENE	12 U	10 U	10 U	7 U	2.5 U	--	--	2.45 U	2.53 U	2.81 U	104 U	--	--	2.52 U	2.52 U
METHYL ACETATE	12 U	10 U	10 U	7 U	5 U	--	--	4.91 U	5.07 U	5.62 U	208 U	--	--	5.04 U	5.04 U
METHYL CYCLOHEXANE	12 U	10 U	10 U	7 U	--	--	--	--	--	--	--	--	--	--	--
METHYL TERT-BUTYL ETHER	12 U	10 U	10 U	7 U	2.5 U	--	--	2.45 U	2.53 U	2.81 U	104 U	--	--	2.52 U	2.52 U
METHYLENE CHLORIDE	120 J	6 B	8 B	9 B	5 U	--	--	4.91 U	5.07 U	9.47 B	208 U	--	--	5.04 U	5.04 U
STYRENE	12 U	10 U	10 U	7 U	2.5 U	--	--	2.45 U	2.53 U	2.81 U	104 U	--	--	2.52 U	2.52 U
TETRACHLOROETHENE	12 U	10 U	10 U	7 U	2.5 U	--	--	2.45 U	2.53 U	1.65 J	104 U	--	--	2.52 U	2.52 U
TOLUENE	12 U	10 U	10 U	0.8 J	2.5 U	--	--	2.45 U	2.53 U	2.81 U	104 U	--	--	2.52 U	2.52 U
TOTAL 1,2-DICHLOROETHENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL XYLENES	12 U	10 U	10 U	7 U	5 U	--	--	4.91 U	5.07 U	8.43 U	208 U	--	--	5.04 U	5.04 U
TRANS-1,2-DICHLOROETHENE	12 U	10 U	10 U	7 U	2.5 U	--	--	2.45 U	2.53 U	2.81 U	104 U	--	--	2.52 U	2.52 U
TRANS-1,3-DICHLOROPROPENE	12 U	10 U	10 U	7 U	--	--	--	--	--	--	--	--	--	--	--
TRICHLOROETHENE	12 U	10 U	10 U	7 U	2.5 U	--	--	2.45 U	2.53 U	2.81 U	470	--	--	2.52 U	2.52 U
TRICHLOROFLUOROMETHANE	12 U	10 U	10 U	7 U	5 U	--	--	4.91 U	5.07 U	5.62 U	208 U	--	--	5.04 U	5.04 U
VINYL CHLORIDE	12 U	10 U	10 U	7 U	2.5 U	--	--	2.45 U	2.53 U	2.81 U	104 U	--	--	2.52 U	2.52 U
EXPLOSIVES (MG/KG)															
1,3,5-TRINITROBENZENE	0.25 U	0.25 U	0.25 U	0.25 U	--	0.0392 U	0.0385 U	--	--	0.0396 U	--	0.0396 U	0.0367 U	0.0367 U	0.0396 U
1,3-DINITROBENZENE	0.25 U	0.25 U	0.25 U	0.25 U	--	0.0392 U	0.0375 J	--	--	0.0396 U	--	0.0396 U	0.0367 U	0.0367 U	0.0396 U
2,4,6-TRINITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	--	0.0392 UJ	0.0385 UJ	--	--	0.0396 U	--	0.0396 UJ	0.0367 UJ	0.0367 UJ	0.0396 UJ
2,4-DINITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	--	0.0392 U	0.0385 U	--	--	0.0396 U	--	0.0396 U	0.0367 U	0.0367 U	0.0396 U
2,6-DINITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	--	0.0392 U	0.0385 U	--	--	0.0396 U	--	0.0396 U	0.0367 U	0.0367 U	0.0396 U
2-AMINO-4,6-DINITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	--	0.0392 U	0.0385 U	--	--	0.0396 U	--	0.0396 U	0.0367 U	0.0367 U	0.0396 U
2-NITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	--	0.0392 U	0.0385 U	--	--	0.0396 U	--	0.0396 U	0.0367 U	0.0367 U	0.0396 U
3-NITROTOLUENE	0.25 U	0.043 J	0.25 U	0.25 U	--	0.0392 U	0.0385 U	--	--	0.0396 U	--	0.0396 U	0.0367 U	0.0367 U	0.0396 U
4-AMINO-2,6-DINITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	--	0.0392 UJ	0.0385 UJ	--	--	0.0396 U	--	0.0396 UJ	0.0367 UJ	0.0367 U	0.0396 U
4-NITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	--	0.0392 U	0.0385 U	--	--	0.0396 U	--	0.064 J	0.0367 U	0.0367 U	0.0396 U
HMX	0.25 U	0.25 U	0.25 U	0.25 U	--	0.0392 U	0.0385 U	--	--	0.0396 U	--	0.0396 U	0.0367 U	0.0367 U	0.0396 U
NITROBENZENE	0.25 U	0.25 U	0.25 U	0.25 U	--	0.0392 U	0.0385 U	--	--	0.0396 U	--	0.0396 U	0.0367 U	0.0367 U	0.0396 U
NITROCELLULOSE	1.5 B	1.4 B	1.5 B	1 B	--	--	--	--	--	--	--	--	--	--	--
NITROGLYCERIN	0.5 U	0.5 U	0.5 U	0.5 U	--	0.196 U	0.192 U	--	--	0.198 U	--	0.198 U	0.183 U	0.183 U	0.198 U
NITROGUANIDINE	0.25 U	0.25 U	0.25 U	0.25 U	--	0.37 UJ	0.455 UJ	--	--	0.345 U	--	0.455 UJ	0.37 UJ	0.476 UJ	0.455 UJ
RDX	0.25 U	0.25 U	0.25 U	0.25 U	--	0.0392 U	0.0385 U	--	--	0.0396 U	--	0.0396 U	0.0367 U	0.0367 U	0.0396 U
TETRYL	0.25 U	0.25 U	0.25 U	0.25 U	--	0.0392 U	0.0385 U	--	--	0.0396 U	--	0.0396 U	0.0367 U	0.0367 U	0.0396 U
MISCELLANEOUS PARAMETERS (UG/KG)															
PERCHLORATE	--	--	--	--	--	3.86 J	2.38 UJ	--	--	2.45 U	--	2.42 UJ	4.84 J	2.36 UJ	2.33 U

LOCATION	S43SB005		S43SB006		S43SB008		S43SB009			S43SB010	S43SB011			S43SB012	
SAMPLE ID	S43SB0050101	S43SS0050001	S43SB0060101	S43SS0060001	S43SB008-0607	S43SB008-0608	S43SB009-0608	S43SB009-0708	S43SB009-0708-D	S43SB010-0709	S43SB011-0507	S43SB011-0709	S43SB011-0709-D	S43SB012-0507	S43SB012-0507-D
SAMPLE DATE	20050714	20050714	20050714	20050714	20110610	20110604	20110604	20110610	20110610	20110603	20110610	20110604	20110604	20110611	20110611
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	ORIG	DUP	NORMAL	NORMAL	ORIG	DUP	ORIG	DUP
MATRIX	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO
TOP DEPTH	2	1	2	1	6	6	6	7	7	7	5	7	7	5	5
BOTTOM DEPTH	3	2	3	2	7	8	8	8	8	9	7	9	9	7	7
SEMIVOLATILES (UG/KG)															
1,2,4-TRICHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-DICHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-DICHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-DICHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
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	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
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	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ACENAPHTHYLENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ANTHRACENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZO(A)ANTHRACENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZO(A)PYRENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZO(B)FLUORANTHENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZO(G,H,I)PERYLENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZO(K)FLUORANTHENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BIS(2-CHLOROETHOXY)METHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BIS(2-CHLOROETHYL)ETHER	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BIS(2-ETHYLHEXYL)PHTHALATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BUTYL BENZYL PHTHALATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CARBAZOLE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHRYSENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DIBENZO(A,H)ANTHRACENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DIBENZOFURAN	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DIETHYL PHTHALATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DIMETHYL PHTHALATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DI-N-BUTYL PHTHALATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DI-N-OCTYL PHTHALATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FLUORANTHENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FLUORENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HEXACHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HEXACHLOROBUTADIENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HEXACHLOROCYCLOPENTADIENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HEXACHLOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
INDENO(1,2,3-CD)PYRENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ISOPHORONE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NAPHTHALENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NITROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-NITROSO-DI-N-PROPYLAMINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-NITROSODIPHENYLAMINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PENTACHLOROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PHENANTHRENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PYRENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

LOCATION	S43SB005		S43SB006		S43SB008		S43SB009			S43SB010	S43SB011			S43SB012	
SAMPLE ID	S43SB0050101	S43SS0050001	S43SB0060101	S43SS0060001	S43SB008-0607	S43SB008-0608	S43SB009-0608	S43SB009-0708	S43SB009-0708-D	S43SB010-0709	S43SB011-0507	S43SB011-0709	S43SB011-0709-D	S43SB012-0507	S43SB012-0507-D
SAMPLE DATE	20050714	20050714	20050714	20050714	20110610	20110604	20110604	20110610	20110610	20110603	20110610	20110604	20110604	20110611	20110611
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	ORIG	DUP	NORMAL	NORMAL	ORIG	DUP	ORIG	DUP
MATRIX	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO
TOP DEPTH	2	1	2	1	6	6	6	7	7	7	5	7	7	5	5
BOTTOM DEPTH	3	2	3	2	7	8	8	8	8	9	7	9	9	7	7
MISCELLANEOUS PARAMETERS (MG/KG)															
CYANIDE	0.11 U	0.1 U	0.21	0.096 U	--	0.292 U	0.266 U	--	--	0.266 U	--	0.285 U	0.291 U	0.883 U	0.873 U
TOTAL ORGANIC CARBON	--	--	--	--	--	1180 J	1660	--	--	702 J	--	1210 J	900 J	1260 J	1690
METALS (MG/KG)															
ALUMINUM	18300 J	7190 J	18500 J	3370 J	--	5890	8690	--	--	5970	--	8040	7100	10500	8440
ANTIMONY	1.2 B	1.1 B	1.6 B	0.86 B	--	0.469 UL	0.472 UL	--	--	0.956 UL	--	0.474 UL	0.461 UL	0.569 U	0.585 U
ARSENIC	2.6	5.2 K	3	4.6	--	1.53 J	3.01 J	--	--	0.925 J	--	2.25 J	5.24 J	2.91	2.92
BARIUM	133	37.8 J	134	15.1 J	--	28.2 J	51.1 J	--	--	30.8	--	39.6 J	16.7 J	221	165
BERYLLIUM	0.88	0.37	0.91	0.19	--	0.361	0.777	--	--	0.455 J	--	0.557	0.613	0.713	0.666
CADMIUM	0.058	0.2 K	0.1	0.16 K	--	0.117 U	0.118 U	--	--	0.239 U	--	0.119 U	0.115 U	0.284 U	0.292 U
CALCIUM	296	1140	131	20000	--	--	--	--	--	--	--	--	--	--	--
CHROMIUM	17.1 J	27.5 J	17 J	23.5 J	--	8.03 K	15.8 K	--	--	10	--	13.3 K	14.5 K	16.2	13.4
COBALT	3.8	5.7	2.8	4.1	--	3.36	5.28	--	--	2.54	--	6.12	5.13	6.16	5.32
COPPER	12	13 J	11.6	17.1 J	--	4.8	14	--	--	10	--	8.13	11.6	12.1	10.2
IRON	8550	19700	13400	12100	--	9430	14500	--	--	8670	--	9380	15500	9620	9590
LEAD	18.5	9.5	17.2	5.5	--	5.34	11.6	--	--	5.99	--	9.23	9.19	10.7	9.36
MAGNESIUM	629	369	579	11500	--	--	--	--	--	--	--	--	--	--	--
MANGANESE	29.9 J	156 J	43.4 J	102 J	--	23.3 K	16.9 K	--	--	11.5	--	28.6 K	30 K	30.9 J	18.1 J
MERCURY	0.056 U	0.051 U	0.049 U	0.043 U	--	0.0128 J	0.0347 U	--	--	0.0418 U	--	0.0292 U	0.0383 U	0.0376 U	0.036 U
NICKEL	8.2	6.6	7.4	7.7	--	6.02	10.3	--	--	5.92	--	10.4	9.5	11.2	9.88
POTASSIUM	357	351	412	366	--	--	--	--	--	--	--	--	--	--	--
SELENIUM	0.65 UR	0.52 UR	0.64 UR	0.54 UR	--	0.293 UL	0.343 J	--	--	0.597 U	--	0.223 J	0.258 J	0.569 UL	0.585 UL
SILVER	2 B	0.6 B	2 B	0.13 U	--	0.117 U	0.118 U	--	--	0.239 U	--	0.119 U	0.115 U	0.569 UL	0.585 UL
SODIUM	344	173	260	133	--	--	--	--	--	--	--	--	--	--	--
THALLIUM	0.43 U	0.34 U	0.61 B	0.36 U	--	0.235 U	0.472 U	--	--	0.478 U	--	0.474 U	0.461 U	0.455 U	0.468 U
VANADIUM	18.3	37.3	22.2	42	--	11.3 J	27.1 J	--	--	12.7	--	16.4 J	29.9 J	18.3	18
ZINC	20.5 K	13.2 K	15.2 K	9.7 K	--	18.8 K	35.7 K	--	--	16.9	--	27.8 K	31.4 K	35.2	33.8

LOCATION	S43SB013	S43SB014	S43SB015	S43SB016		S43SB017	S43SB018	S43SB019	S43SB022	S43SB023			S43SB024		
SAMPLE ID	S43SB013-0608	S43SB014-0709	S43SB015-0810	S43SB016-0607	S43SB016-0608	S43SB017-0608	S43SB018-0507	S43SB019-0607	S43SB022-0708	S43SB023-0001	S43SB023-0001-D	S43SB023-0607	S43SB024-0001	S43SB024-0607	S43SB024-0607-D
SAMPLE DATE	20110603	20110604	20110603	20110612	20110605	20110610	20110610	20110611	20110611	20120513	20120513	20120513	20120513	20120513	20120513
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	ORIG	DUP	NORMAL	NORMAL	ORIG	DUP
MATRIX	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO
TOP DEPTH	6	7	8	6	6	6	5	6	7	0	0	6	0	6	6
BOTTOM DEPTH	8	9	10	7	8	8	7	7	8	1	1	7	1	7	7
VOLATILES (UG/KG)															
1,1,1-TRICHLOROETHANE	2.3 U	--	2.44 U	2.37 U	--	120 U	118 U	2.26 U	132 U	2.64 U	2.47 U	2510 U	2.3 U	128 U	128 U
1,1,2,2-TETRACHLOROETHANE	2.3 U	--	2.44 U	2.37 U	--	120 U	118 U	2.26 U	132 U	2.64 U	2.47 U	2510 U	2.3 U	128 U	128 U
1,1,2-TRICHLOROETHANE	2.3 U	--	2.44 U	2.37 U	--	120 U	118 U	2.26 U	132 U	2.64 U	2.47 U	2510 U	2.3 U	128 U	128 U
1,1,2-TRICHLOROTRIFLUOROETHANE	4.6 U	--	4.87 U	4.73 U	--	239 U	236 U	4.52 U	265 U	5.28 U	4.93 U	5020 U	4.59 U	256 U	257 U
1,1-DICHLOROETHANE	2.3 U	--	2.44 U	2.37 U	--	120 U	118 U	2.26 U	132 U	2.64 U	2.47 U	2510 U	2.3 U	128 U	128 U
1,1-DICHLOROETHENE	2.3 U	--	2.44 U	2.37 U	--	120 U	118 U	2.26 U	132 U	2.64 U	2.47 U	2510 U	2.3 U	128 U	128 U
1,2,3-TRICHLOROBENZENE	2.3 U	--	2.44 U	2.37 U	--	120 U	118 U	2.26 U	132 U	2.64 U	2.47 U	2510 U	2.3 U	128 U	128 U
1,2,4-TRICHLOROBENZENE	2.3 U	--	2.44 U	2.37 U	--	120 U	118 U	2.26 U	132 U	2.64 U	2.47 U	2510 U	2.3 U	128 U	128 U
1,2-DIBROMO-3-CHLOROPROPANE	4.6 U	--	4.87 U	4.73 U	--	239 U	236 U	4.52 U	265 U	5.28 U	4.93 U	5020 U	4.59 U	256 U	257 U
1,2-DIBROMOETHANE	2.3 U	--	2.44 U	2.37 U	--	120 U	118 U	2.26 U	132 U	2.64 U	2.47 U	2510 U	2.3 U	128 U	128 U
1,2-DICHLOROBENZENE	2.3 U	--	2.44 U	2.37 U	--	120 U	118 U	2.26 U	132 U	2.64 U	2.47 U	2510 U	2.3 U	128 U	128 U
1,2-DICHLOROETHANE	2.3 U	--	2.44 U	2.37 U	--	120 U	118 U	2.26 U	132 U	2.64 U	2.47 U	2510 U	2.3 U	128 U	128 U
1,2-DICHLOROPROPANE	2.3 U	--	2.44 U	2.37 U	--	120 U	118 U	2.26 U	132 U	2.64 U	2.47 U	2510 U	2.3 U	128 U	128 U
1,3-DICHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-DICHLOROPROPANE	2.3 U	--	2.44 U	2.37 U	--	120 U	118 U	2.26 U	132 U	2.64 U	2.47 U	2510 U	2.3 U	128 U	128 U
1,4-DICHLOROBENZENE	2.3 U	--	2.44 U	2.37 U	--	120 U	118 U	2.26 U	132 U	2.64 U	2.47 U	2510 U	2.3 U	128 U	128 U
1,4-DIOXANE	92 UR	--	97.4 UR	94.6 UR	--	4780 UR	4720 UR	90.4 UR	5300 UR	106 UR	98.7 UR	100000 UR	91.8 UR	5120 UR	5130 UR
2-BUTANONE	4.6 U	--	564 J	4.73 U	--	239 U	236 U	4.52 U	837	5.28 U	4.93 U	5020 U	4.59 U	256 U	257 U
2-HEXANONE	2.3 U	--	16	2.37 U	--	120 U	118 U	2.26 U	132 U	2.64 U	2.47 U	2510 U	2.3 U	128 U	128 U
4-METHYL-2-PENTANONE	2.3 U	--	5190 J	2.37 U	--	120 U	118 U	2.26 U	19100 J	2.64 U	2.47 U	2510 U	2.3 U	128 U	128 U
ACETONE	9.2 UR	--	157000 J	18.3 J	--	478 U	472 U	23.6 J	4660000	26.1 B	19.1 B	195000 J	20.4 B	512 U	513 U
BENZENE	2.3 U	--	2.44 U	2.37 U	--	120 U	118 U	2.26 U	132 U	2.64 U	2.47 U	2510 U	2.3 U	128 U	128 U
BROMODICHLOROMETHANE	2.3 U	--	2.44 U	2.37 U	--	120 U	118 U	2.26 U	132 U	2.64 U	2.47 U	2510 U	2.3 U	128 U	128 U
BROMOFORM	2.3 U	--	2.44 U	2.37 U	--	120 U	118 U	2.26 U	132 U	2.64 U	2.47 U	2510 U	2.3 U	128 U	128 U
BROMOMETHANE	4.6 UJ	--	4.87 UJ	4.73 U	--	239 U	236 U	4.52 U	265 U	5.28 U	4.93 U	5020 U	4.59 U	256 U	257 U
CARBON DISULFIDE	2.3 U	--	2.44 U	2.37 U	--	120 U	118 U	2.26 U	132 U	2.64 U	2.47 U	2510 U	2.3 U	128 U	128 U
CARBON TETRACHLORIDE	2.3 U	--	2.44 U	2.37 U	--	120 U	118 U	2.26 U	132 U	2.64 U	2.47 U	2510 U	2.3 U	128 U	128 U
CHLOROBENZENE	2.3 U	--	2.44 U	2.37 U	--	120 U	118 U	2.26 U	132 U	2.64 U	2.47 U	2510 U	2.3 U	128 U	128 U
CHLORODIBROMOMETHANE	2.3 U	--	2.44 U	2.37 U	--	120 U	118 U	2.26 U	132 U	2.64 U	2.47 U	2510 U	2.3 U	128 U	128 U
CHLOROETHANE	4.6 U	--	4.87 U	4.73 U	--	239 U	236 U	4.52 U	265 U	5.28 U	4.93 U	5020 U	4.59 U	256 U	257 U
CHLOROFORM	2.3 U	--	2.44 U	2.37 U	--	120 U	118 U	2.26 U	132 U	2.64 U	2.47 U	2510 U	2.3 U	128 U	128 U
CHLOROMETHANE	4.6 U	--	4.87 U	4.73 U	--	239 U	236 U	4.52 U	265 U	5.28 U	4.93 U	5020 U	4.59 U	256 U	257 U
CIS-1,2-DICHLOROETHENE	2.3 U	--	2.44 U	2.37 U	--	397	118 U	2.26 U	585	2.64 U	2.47 U	2510 U	14.4	442	397
CIS-1,3-DICHLOROPROPENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CYCLOHEXANE	2.3 U	--	2.44 U	2.37 U	--	120 U	118 U	2.26 U	132 U	2.64 U	2.47 U	2510 U	2.3 U	128 U	128 U
DICHLORODIFLUOROMETHANE	4.6 U	--	4.87 U	4.73 U	--	239 U	236 U	4.52 U	265 U	5.28 U	4.93 U	5020 U	4.59 U	256 U	257 U
ETHYLBENZENE	2.3 U	--	2.44 U	2.37 U	--	120 U	118 U	2.26 U	132 U	2.64 U	2.47 U	2510 U	2.3 U	128 U	128 U
ISOPROPYLBENZENE	2.3 U	--	2.44 U	2.37 U	--	120 U	118 U	2.26 U	132 U	2.64 U	2.47 U	2510 U	2.3 U	128 U	128 U
METHYL ACETATE	4.6 U	--	4.87 U	4.73 U	--	239 U	236 U	4.52 U	265 U	5.28 U	4.93 U	5020 U	4.59 U	256 U	257 U
METHYL CYCLOHEXANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METHYL TERT-BUTYL ETHER	2.3 U	--	2.44 U	2.37 U	--	120 U	118 U	2.26 U	132 U	2.64 U	2.47 U	2510 U	2.3 U	128 U	128 U
METHYLENE CHLORIDE	6.81 J	--	8.6 J	4.73 U	--	239 U	236 U	4.52 U	265 U	5.28 U	4.93 U	3590 J	4.59 U	256 U	257 U
STYRENE	2.3 U	--	2.44 U	2.37 U	--	120 U	118 U	2.26 U	132 U	2.64 U	2.47 U	2510 U	2.3 U	128 U	128 U
TETRACHLOROETHENE	2.3 U	--	2.44 U	2.37 U	--	120 U	118 U	2.26 U	132 U	2.64 U	2.47 U	2510 U	2.3 U	128 U	128 U
TOLUENE	1.29 J	--	2.44 U	2.37 U	--	120 U	118 U	2.26 U	132 U	2.64 U	2.47 U	2510 U	2.3 U	128 U	128 U
TOTAL 1,2-DICHLOROETHENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL XYLENES	6.9 U	--	7.31 U	4.73 U	--	239 U	236 U	4.52 U	265 U	5.28 U	4.93 U	5020 U	4.59 U	256 U	257 U
TRANS-1,2-DICHLOROETHENE	2.3 U	--	2.44 U	2.37 U	--	120 U	118 U	2.26 U	132 U	2.64 U	2.47 U	2510 U	2.3 U	128 U	128 U
TRANS-1,3-DICHLOROPROPENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TRICHLOROETHENE	2.3 U	--	2.44 U	2.37 U	--	3940	776	2.26 U	132 U	2.64 U	2.47 U	2510 U	2.3 U	2080	1700
TRICHLOROFLUOROMETHANE	4.6 U	--	4.87 U	4.73 U	--	239 U	236 U	4.52 U	265 U	5.28 U	4.93 U	5020 U	4.59 U	256 U	257 U
VINYL CHLORIDE	2.3 U	--	2.44 U	2.37 U	--	120 U	118 U	14.3	132 U	2.64 U	2.47 U	2510 U	2.3 U	128 U	128 U
EXPLOSIVES (MG/KG)															
1,3,5-TRINITROBENZENE	0.0367 U	0.0377 U	0.0381 U	--	0.0392 U	0.0377 U	0.0381 U	--	--	0.0392 U	0.0385 U	0.0385 U	0.0385 U	0.0385 U	0.04 U
1,3-DINITROBENZENE	0.0367 U	0.0377 U	0.0381 U	--	0.032 J	0.0377 U	0.0381 U	--	--	0.0392 U	0.0385 U	0.0385 U	0.0385 U	0.0385 U	0.04 U
2,4,6-TRINITROTOLUENE	0.0367 U	0.0377 UJ	0.0381 U	--	0.0392 UJ	0.0377 U	0.0381 UJ	--	--	0.0392 U	0.0385 U	0.0385 U	0.0385 U	0.0385 U	0.04 U
2,4-DINITROTOLUENE	0.0367 U	0.0377 U	0.0381 U	--	0.0392 U	0.0377 U	0.0381 U	--	--	0.0392 U	0.0385 U	0.0385 U	0.0385 U	0.0385 U	0.04 U
2,6-DINITROTOLUENE	0.0367 U	0.0377 U	0.0381 U	--	0.0392 U	0.0377 U	0.0381 U	--	--	0.0392 U	0.0385 U	0.0385 U	0.0385 U	0.0385 U	0.04 U
2-AMINO-4,6-DINITROTOLUENE	0.0367 U	0.0377 U	0.0381 U	--	0.0392 U	0.0377 U	0.0381 U	--	--	0.0392 U	0.0385 U	0.0385 U	0.0385 U	0.0385 U	0.04 U
2-NITROTOLUENE	0.0367 U	0.0377 UJ	0.0381 U	--	0.0392 U	0.0377 U	0.0381 U	--	--	0.0392 U	0.0385 U	0.0385 U	0.0385 U	0.0385 U	0.04 U
3-NITROTOLUENE	0.0367 U	0.0377 U	0.0381 U	--	0.0392 U	0.0377 U	0.0381 U	--	--	0.0392 U	0.0385 U	0.0385 U	0.0385 U	0.0385 U	0.04 U
4-AMINO-2,6-DINITROTOLUENE	0.0367 U	0.0377 UJ	0.0381 U	--	0.0392 UJ	0.0377 U	0.0381 U	--	--	0.0392 U	0.0385 U	0.0385 U	0.0385 U	0.0385 U	0.04 U
4-NITROTOLUENE	0.0367 U	0.0234 J	0.0381 U	--	0.0239 J	0.0377 U	0.0381 U	--	--	0.0392 U	0.0385 U	0.0385 U	0.0385 U	0.0385 U	0.04 U
HMX	0.0367 U	0.0377 U	0.0381 U	--	0.0392 U	0.0377 U	0.0381 U	--	--	0.0392 U	0.0385 U	0.0385 U	0.0385 U	0.0385 U	0.04 U
NITROBENZENE	0.0367 U	0.0377 U	0.0381 U	--	0.0392 U	0.0377 U	0.0381 U	--	--	0.0392 U	0.0385 U	0.0385 U	0.0385 U	0.0385 U	0.04 U
NITROCELLULOSE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NITROGLYCERIN	0.183 U	0.189 U	0.19 U	--	0.196 U	0.189 U	0.19 U	--	--	0.196 U	0.192 U	0.192 U	0.192 U	0.192 U	0.2 U
NITROGUANIDINE	0.435 U	0.385 UJ	0.417 U	--	0.37 UJ	0.476 UJ	0.455 UJ	--	--	0.182 U	0.2 U	0.19 U	0.211 U	0.19 U	0.182 U
RDX	0.0367 U	0.0377 U	0.0381 U	--	0.0392 U	0.0377 U	0.0381 U	--	--	0.0392 U	0.0385 U	0.0385 U	0.0385 U	0.0385 U	0.04 U
TETRYL	0.0367 U	0.0377 U	0.0381 U	--	0.0392 U	0.0377 U	0.0381 U	--	--	0.0392 U	0.0385 U	0.0385 U	0.0385 U	0.0385 U	0.04 U
MISCELLANEOUS PARAMETERS (UG/KG)															
PERCHLORATE	2.38 U	1.08 J	2.35 U	--	2.35 UJ	2.34 UJ	2.36 UJ	--	--	--	--	--	--	--	--

LOCATION	S43SB013	S43SB014	S43SB015	S43SB016		S43SB017	S43SB018	S43SB019	S43SB022	S43SB023			S43SB024		
SAMPLE ID	S43SB013-0608	S43SB014-0709	S43SB015-0810	S43SB016-0607	S43SB016-0608	S43SB017-0608	S43SB018-0507	S43SB019-0607	S43SB022-0708	S43SB023-0001	S43SB023-0001-D	S43SB023-0607	S43SB024-0001	S43SB024-0607	S43SB024-0607-D
SAMPLE DATE	20110603	20110604	20110603	20110612	20110605	20110610	20110610	20110611	20110611	20120513	20120513	20120513	20120513	20120513	20120513
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	ORIG	DUP	NORMAL	NORMAL	ORIG	DUP
MATRIX	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO
TOP DEPTH	6	7	8	6	6	6	5	6	7	0	0	6	0	6	6
BOTTOM DEPTH	8	9	10	7	8	8	7	7	8	1	1	7	1	7	7
SEMIVOLATILES (UG/KG)															
1,2,4-TRICHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-DICHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-DICHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-DICHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
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	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
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	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ACENAPHTHYLENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ANTHRACENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZO(A)ANTHRACENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZO(A)PYRENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZO(B)FLUORANTHENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZO(G,H,I)PERYLENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZO(K)FLUORANTHENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BIS(2-CHLOROETHOXY)METHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BIS(2-CHLOROETHYL)ETHER	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BIS(2-ETHYLHEXYL)PHTHALATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BUTYL BENZYL PHTHALATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CARBAZOLE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHRYSENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DIBENZO(A,H)ANTHRACENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DIBENZOFURAN	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DIETHYL PHTHALATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DIMETHYL PHTHALATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DI-N-BUTYL PHTHALATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DI-N-OCTYL PHTHALATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FLUORANTHENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FLUORENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HEXACHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HEXACHLOROBUTADIENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HEXACHLOROCYCLOPENTADIENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HEXACHLOROETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
INDENO(1,2,3-CD)PYRENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ISOPHORONE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NAPHTHALENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NITROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-NITROSO-DI-N-PROPYLAMINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-NITROSODIPHENYLAMINE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PENTACHLOROPHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PHENANTHRENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PHENOL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PYRENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

LOCATION	S43SB013	S43SB014	S43SB015	S43SB016		S43SB017	S43SB018	S43SB019	S43SB022	S43SB023			S43SB024		
SAMPLE ID	S43SB013-0608	S43SB014-0709	S43SB015-0810	S43SB016-0607	S43SB016-0608	S43SB017-0608	S43SB018-0507	S43SB019-0607	S43SB022-0708	S43SB023-0001	S43SB023-0001-D	S43SB023-0607	S43SB024-0001	S43SB024-0607	S43SB024-0607-D
SAMPLE DATE	20110603	20110604	20110603	20110612	20110605	20110610	20110610	20110611	20110611	20120513	20120513	20120513	20120513	20120513	20120513
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	ORIG	DUP	NORMAL	NORMAL	ORIG	DUP
MATRIX	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO
TOP DEPTH	6	7	8	6	6	6	5	6	7	0	0	6	0	6	6
BOTTOM DEPTH	8	9	10	7	8	8	7	7	8	1	1	7	1	7	7
MISCELLANEOUS PARAMETERS (MG/KG)															
CYANIDE	0.268 U	0.294 U	0.272 U	--	0.265 U	0.877 U	0.884 U	--	--	--	--	--	--	--	--
TOTAL ORGANIC CARBON	1100 J	1030 J	828 J	--	1020 J	588 J	1130 J	--	--	--	--	--	--	--	--
METALS (MG/KG)															
ALUMINUM	2180	12300	10600	--	9680	7220	7260	--	--	20200	20000	11200	17400	8860	8640
ANTIMONY	0.928 UL	0.448 UL	0.932 UL	--	0.454 UL	0.596 U	0.575 U	--	--	0.532 UL	0.513 UL	0.296 B	0.492 UL	0.319 B	0.371 B
ARSENIC	0.834 J	2.48 J	2.14 L	--	1.19 J	1.28	0.895	--	--	2.69 L	4.28 L	1.88 L	1.95 L	1.41 L	2.08 L
BARIUM	19	115 J	148	--	55.4 J	33.2	25.6	--	--	76 L	80.2 L	408 K	60.9 L	33.5 L	31.6 L
BERYLLIUM	0.295 J	0.855	0.844	--	0.675	0.545	0.605	--	--	0.815	0.859	0.704	0.691	0.557	0.552
CADMIUM	0.232 U	0.112 U	0.233 U	--	0.113 U	0.298 U	0.288 U	--	--	0.459 J	2.13 J	0.118 U	0.471	0.122 U	0.121 U
CALCIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHROMIUM	18.5	15.7 K	13.1	--	14.2 K	12.7	11.9	--	--	21.3 K	24.4 K	16.4 K	19.1 K	14.3 K	13.4 K
COBALT	1.47	5.45	4.17	--	5.29	5.04	4.71	--	--	3.64	4.38	6.28	3.34	4.58	3.81
COPPER	7.38	15.3	12.9	--	10.4	6.77	9.81	--	--	21.1	32.7	15.1	16.6	10.8	10.2
IRON	4010	10600	8630	--	8290	9110	10500	--	--	25900 J	32100 J	12300 J	18500 J	13700 J	12200 J
LEAD	5.02	13.3	11.4	--	9.87	8.21	8.1	--	--	14.8 J	28.2 J	9.2	12.3	7.8	7.85
MAGNESIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MANGANESE	23	17 K	10.3	--	9.75 K	16.5 J	15.4 J	--	--	26.8 K	36.6 K	17.8 K	14.7 K	17.3 K	19.6 K
MERCURY	0.0368 U	0.0133 J	0.0364 U	--	0.0388 U	0.0351 U	0.0365 U	--	--	0.0259 J	0.0207 J	0.03 U	0.034 U	0.029 U	0.037 U
NICKEL	5.26	11.8	10.1	--	9.09	8.38	8.97	--	--	9.2	9.72	14.5	7.66	8.23	7.63
POTASSIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SELENIUM	0.58 U	0.28 UL	0.583 U	--	0.284 UL	0.596 UL	0.575 UL	--	--	0.54 J	0.565 J	0.295 UL	0.331 J	0.253 J	0.353 J
SILVER	0.232 U	0.112 U	0.233 U	--	0.113 U	0.596 UL	0.575 UL	--	--	0.133 U	0.086 J	0.118 U	0.0673 J	0.122 U	0.121 U
SODIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
THALLIUM	0.464 U	0.392 U	0.466 U	--	0.454 U	0.477 U	0.46 U	--	--	0.266 UL	0.257 UL	0.295 UL	0.369 UL	0.304 UL	0.303 UL
VANADIUM	7.53	20.3 J	20.1	--	12.6 J	17.8	16.7	--	--	32	33.8	25.4	29.5	17	19.8
ZINC	9.98	46.6 K	26.3	--	36.2 K	23.1	22.7	--	--	47.1 J	110 J	23.5 J	33.5 J	24.4 J	21.4 J

LOCATION	S43SB025		S43SB026		S43SB027		S43SB028	
SAMPLE ID	S43SB025-0001	S43SB025-0607	S43SB026-0001	S43SB026-0506	S43SB027-0001	S43SB027-0708	S43SB028-0001	S43SB028-0405
SAMPLE DATE	20120513	20120513	20120513	20120513	20120513	20120513	20120513	20120513
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
MATRIX	SO	SO	SO	SO	SO	SO	SO	SO
TOP DEPTH	0	6	0	5	0	7	0	4
BOTTOM DEPTH	1	7	1	6	1	8	1	5
VOLATILES (UG/KG)								
1,1,1-TRICHLOROETHANE	2.17 U	125 U	3.02 U	117 U	114 U	139 U	243 U	2.56 U
1,1,2,2-TETRACHLOROETHANE	2.17 U	125 U	3.02 U	117 U	114 U	139 U	243 U	2.56 U
1,1,2-TRICHLOROETHANE	2.17 U	125 U	3.02 U	117 U	114 U	139 U	243 U	2.56 U
1,1,2-TRICHLOROTRIFLUOROETHANE	4.34 U	250 U	6.03 U	233 U	229 U	278 U	486 U	5.12 U
1,1-DICHLOROETHANE	2.17 U	125 U	3.02 U	117 U	114 U	139 U	243 U	2.56 U
1,1-DICHLOROETHENE	2.17 U	125 U	3.02 U	117 U	114 U	139 U	243 U	2.56 U
1,2,3-TRICHLOROBENZENE	2.17 U	125 U	3.02 U	117 U	114 U	139 U	243 U	2.56 UJ
1,2,4-TRICHLOROBENZENE	2.17 U	125 U	3.02 U	117 U	114 U	139 U	243 U	2.56 UJ
1,2-DIBROMO-3-CHLOROPROPANE	4.34 U	250 U	6.03 U	233 U	229 U	278 U	486 U	5.12 U
1,2-DIBROMOETHANE	2.17 U	125 U	3.02 U	117 U	114 U	139 U	243 U	2.56 UJ
1,2-DICHLOROBENZENE	2.17 U	125 U	3.02 U	117 U	114 U	139 U	243 U	2.56 UJ
1,2-DICHLOROETHANE	2.17 U	125 U	3.02 U	117 U	114 U	139 U	243 U	2.56 U
1,2-DICHLOROPROPANE	2.17 U	125 U	3.02 U	117 U	114 U	139 U	243 U	2.56 U
1,3-DICHLOROBENZENE	--	--	--	--	--	--	--	--
1,3-DICHLOROPROPANE	2.17 U	125 U	3.02 U	117 U	114 U	139 U	243 U	2.56 UJ
1,4-DICHLOROBENZENE	2.17 U	125 U	3.02 U	117 U	114 U	139 U	243 U	2.56 UJ
1,4-DIOXANE	86.8 UR	5000 UR	121 UR	4670 UR	4570 UR	5560 UR	9720 UR	102 UR
2-BUTANONE	4.34 U	250 U	6.03 U	233 U	229 U	278 U	486 U	5.12 U
2-HEXANONE	2.17 U	125 U	3.02 U	117 U	114 U	139 U	243 U	2.56 U
4-METHYL-2-PENTANONE	2.17 U	125 U	3.02 U	117 U	114 U	139 U	243 U	2.56 U
ACETONE	8.95 B	500 U	14.8 B	467 U	457 U	556 U	972 U	10.2 U
BENZENE	2.17 U	125 U	3.02 U	117 U	114 U	139 U	243 U	2.56 U
BROMODICHLOROMETHANE	2.17 U	125 U	3.02 U	117 U	114 U	139 U	243 U	2.56 U
BROMOFORM	2.17 U	125 U	3.02 U	117 U	114 U	139 U	243 U	2.56 U
BROMOMETHANE	4.34 U	250 U	6.03 U	233 U	229 U	278 U	486 U	5.12 U
CARBON DISULFIDE	2.17 U	125 U	3.02 U	117 U	114 U	139 U	243 U	2.56 U
CARBON TETRACHLORIDE	2.17 U	125 U	3.02 U	117 U	114 U	139 U	243 U	2.56 U
CHLOROBENZENE	2.17 U	125 U	3.02 U	117 U	114 U	139 U	243 U	2.56 UJ
CHLORODIBROMOMETHANE	2.17 U	125 U	3.02 U	117 U	114 U	139 U	243 U	2.56 U
CHLOROETHANE	4.34 U	250 U	6.03 U	233 U	229 U	278 U	486 U	5.12 U
CHLOROFORM	2.17 U	125 U	3.02 U	117 U	114 U	139 U	243 U	2.56 U
CHLOROMETHANE	4.34 U	250 U	6.03 U	233 U	229 U	278 U	486 U	5.12 U
CIS-1,2-DICHLOROETHENE	2.17 U	100 J	23.7	117 U	175 J	447	243 U	2.56 U
CIS-1,3-DICHLOROPROPENE	--	--	--	--	--	--	--	--
CYCLOHEXANE	2.17 U	125 U	3.02 U	117 U	114 U	139 U	243 U	2.56 U
DICHLORODIFLUOROMETHANE	4.34 U	250 U	6.03 U	233 U	229 U	278 U	486 U	5.12 U
ETHYLBENZENE	2.17 U	125 U	3.02 U	117 U	114 U	139 U	243 U	2.56 UJ
ISOPROPYLBENZENE	2.17 U	125 U	3.02 U	117 U	114 U	139 U	243 U	2.56 UJ
METHYL ACETATE	4.34 U	250 U	6.03 U	233 U	229 U	278 U	486 U	5.12 U
METHYL CYCLOHEXANE	--	--	--	--	--	--	--	--
METHYL TERT-BUTYL ETHER	2.17 U	125 U	3.02 U	117 U	114 U	139 U	243 U	2.56 U
METHYLENE CHLORIDE	4.34 U	250 U	6.03 U	233 U	229 U	278 U	486 U	5.12 U
STYRENE	2.17 U	125 U	3.02 U	117 U	114 U	139 U	243 U	2.56 UJ
TETRACHLOROETHENE	2.17 U	125 U	3.02 U	117 U	114 U	139 U	243 U	2.56 U
TOLUENE	2.17 U	125 U	3.02 U	117 U	114 U	139 U	243 U	2.56 UJ
TOTAL 1,2-DICHLOROETHENE	--	--	--	--	--	--	--	--
TOTAL XYLENES	4.34 U	250 U	6.03 U	233 U	229 U	278 U	486 U	5.12 UJ
TRANS-1,2-DICHLOROETHENE	2.17 U	125 U	3.02 U	117 U	114 U	139 U	243 U	2.56 U
TRANS-1,3-DICHLOROPROPENE	--	--	--	--	--	--	--	--
TRICHLOROETHENE	1.91 J	2380	69.4	1150	2720	4790	243 U	2.56 U
TRICHLOROFLUOROMETHANE	4.34 U	250 U	6.03 U	233 U	229 U	278 U	486 U	5.12 U
VINYL CHLORIDE	2.17 U	125 U	2.18 J	117 U	114 U	139 U	243 U	2.56 U
EXPLOSIVES (MG/KG)								
1,3,5-TRINITROBENZENE	0.0396 U	0.0392 U	0.04 U	0.0396 U	0.0385 U	0.0388 U	0.032 J	0.0388 U
1,3-DINITROBENZENE	0.0396 U	0.0392 U	0.04 U	0.0396 U	0.0385 U	0.0277 J	0.0388 U	0.0388 U
2,4,6-TRINITROTOLUENE	0.0396 U	0.0392 U	0.04 U	0.0396 U	0.0385 U	0.0388 U	0.0388 U	0.0388 U
2,4-DINITROTOLUENE	0.0396 U	0.0392 U	0.04 U	0.0396 U	0.0385 U	0.0388 U	0.0388 U	0.0388 U
2,6-DINITROTOLUENE	0.0396 U	0.0392 U	0.04 U	0.0396 U	0.0385 U	0.0388 U	0.0388 U	0.0388 U
2-AMINO-4,6-DINITROTOLUENE	0.0396 U	0.0392 U	0.04 U	0.0396 U	0.0385 U	0.0388 U	0.0388 U	0.0388 U
2-NITROTOLUENE	0.0396 U	0.0392 U	0.04 U	0.0396 U	0.0385 U	0.0388 U	0.0388 U	0.0388 U
3-NITROTOLUENE	0.0396 U	0.0392 U	0.04 U	0.0396 U	0.0385 U	0.0388 U	0.0388 U	0.0388 U
4-AMINO-2,6-DINITROTOLUENE	0.0396 U	0.0392 U	0.04 U	0.0396 U	0.0385 U	0.0388 U	0.0388 U	0.0388 U
4-NITROTOLUENE	0.0396 U	0.0392 U	0.04 U	0.0396 U	0.0385 U	0.0388 U	0.0388 U	0.0388 U
HMX	0.0396 U	0.0392 U	0.04 U	0.0396 U	0.0385 U	0.0388 U	0.0388 U	0.0388 U
NITROBENZENE	0.0396 U	0.0392 U	0.04 U	0.0396 U	0.0385 U	0.0388 U	0.0388 U	0.0388 U
NITROCELLULOSE	--	--	--	--	--	--	--	--
NITROGLYCERIN	0.198 U	0.196 U	0.2 U	0.198 U	0.192 U	0.194 U	0.194 U	0.194 U
NITROGUANIDINE	0.182 U	0.19 U	0.19 U	0.211 U	0.2 U	0.19 U	0.429 J	0.174 U
RDX	0.0396 U	0.0392 U	0.04 U	0.0396 U	0.0385 U	0.0388 U	0.0388 U	0.0388 U
TETRYL	0.0396 U	0.0392 U	0.04 U	0.0396 U	0.0385 U	0.0388 U	0.0388 U	0.0388 U
MISCELLANEOUS PARAMETERS (UG/KG)								
PERCHLORATE	--	--	--	--	--	--	--	--

LOCATION	S43SB025		S43SB026		S43SB027		S43SB028	
SAMPLE ID	S43SB025-0001	S43SB025-0607	S43SB026-0001	S43SB026-0506	S43SB027-0001	S43SB027-0708	S43SB028-0001	S43SB028-0405
SAMPLE DATE	20120513	20120513	20120513	20120513	20120513	20120513	20120513	20120513
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
MATRIX	SO	SO	SO	SO	SO	SO	SO	SO
TOP DEPTH	0	6	0	5	0	7	0	4
BOTTOM DEPTH	1	7	1	6	1	8	1	5
SEMIVOLATILES (UG/KG)								
1,2,4-TRICHLOROBENZENE	--	--	--	--	--	--	--	--
1,2-DICHLOROBENZENE	--	--	--	--	--	--	--	--
1,3-DICHLOROBENZENE	--	--	--	--	--	--	--	--
1,4-DICHLOROBENZENE	--	--	--	--	--	--	--	--
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	--	--	--	--	--	--	--	--
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	--	--	--	--	--	--	--	--
ACENAPHTHYLENE	--	--	--	--	--	--	--	--
ANTHRACENE	--	--	--	--	--	--	--	--
BENZO(A)ANTHRACENE	--	--	--	--	--	--	--	--
BENZO(A)PYRENE	--	--	--	--	--	--	--	--
BENZO(B)FLUORANTHENE	--	--	--	--	--	--	--	--
BENZO(G,H,I)PERYLENE	--	--	--	--	--	--	--	--
BENZO(K)FLUORANTHENE	--	--	--	--	--	--	--	--
BIS(2-CHLOROETHOXY)METHANE	--	--	--	--	--	--	--	--
BIS(2-CHLOROETHYL)ETHER	--	--	--	--	--	--	--	--
BIS(2-ETHYLHEXYL)PHTHALATE	--	--	--	--	--	--	--	--
BUTYL BENZYL PHTHALATE	--	--	--	--	--	--	--	--
CARBAZOLE	--	--	--	--	--	--	--	--
CHRYSENE	--	--	--	--	--	--	--	--
DIBENZO(A,H)ANTHRACENE	--	--	--	--	--	--	--	--
DIBENZOFURAN	--	--	--	--	--	--	--	--
DIETHYL PHTHALATE	--	--	--	--	--	--	--	--
DIMETHYL PHTHALATE	--	--	--	--	--	--	--	--
DI-N-BUTYL PHTHALATE	--	--	--	--	--	--	--	--
DI-N-OCTYL PHTHALATE	--	--	--	--	--	--	--	--
FLUORANTHENE	--	--	--	--	--	--	--	--
FLUORENE	--	--	--	--	--	--	--	--
HEXACHLOROBENZENE	--	--	--	--	--	--	--	--
HEXACHLOROBUTADIENE	--	--	--	--	--	--	--	--
HEXACHLOROCYCLOPENTADIENE	--	--	--	--	--	--	--	--
HEXACHLOROETHANE	--	--	--	--	--	--	--	--
INDENO(1,2,3-CD)PYRENE	--	--	--	--	--	--	--	--
ISOPHORONE	--	--	--	--	--	--	--	--
NAPHTHALENE	--	--	--	--	--	--	--	--
NITROBENZENE	--	--	--	--	--	--	--	--
N-NITROSO-DI-N-PROPYLAMINE	--	--	--	--	--	--	--	--
N-NITROSODIPHENYLAMINE	--	--	--	--	--	--	--	--
PENTACHLOROPHENOL	--	--	--	--	--	--	--	--
PHENANTHRENE	--	--	--	--	--	--	--	--
PHENOL	--	--	--	--	--	--	--	--
PYRENE	--	--	--	--	--	--	--	--

LOCATION	S43SB025		S43SB026		S43SB027		S43SB028	
SAMPLE ID	S43SB025-0001	S43SB025-0607	S43SB026-0001	S43SB026-0506	S43SB027-0001	S43SB027-0708	S43SB028-0001	S43SB028-0405
SAMPLE DATE	20120513	20120513	20120513	20120513	20120513	20120513	20120513	20120513
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
MATRIX	SO	SO	SO	SO	SO	SO	SO	SO
TOP DEPTH	0	6	0	5	0	7	0	4
BOTTOM DEPTH	1	7	1	6	1	8	1	5
MISCELLANEOUS PARAMETERS (MG/KG)								
CYANIDE	--	--	--	--	--	--	--	--
TOTAL ORGANIC CARBON	--	--	--	--	--	--	--	--
METALS (MG/KG)								
ALUMINUM	15700	8390	16000	9620	13100	7170	17600	10400
ANTIMONY	0.496 UL	0.335 B	0.309 B	0.326 B	0.342 B	0.357 B	0.548 B	0.531 UL
ARSENIC	2.27 L	1.45 L	1.6 L	2.34 L	2.68 L	1.15 L	12.3	2.53 L
BARIUM	56.1 L	53.7 L	70.3 L	177 L	233 L	14.9 L	132 L	43.5 L
BERYLLIUM	0.572	0.507	0.524	0.462	0.534	0.435	0.883	0.742
CADMIUM	0.072 J	0.119 U	0.0996 J	0.124 U	0.0774 J	0.121 U	12.2	0.0771 J
CALCIUM	--	--	--	--	--	--	--	--
CHROMIUM	18.3 K	13.3 K	19.5 K	14.3 K	17.1 K	10.7 K	30.3 K	18.5 K
COBALT	2.94	3.69	3.76	4.38	4.74	3.73	11.7	4.38
COPPER	14.9	11.3	12.3	11.9	10.6	10.4	57.4	14.4
IRON	15400 J	10400 J	12700 J	14400 J	12500 J	14600 J	23900 J	17300 J
LEAD	11	7.79	10.4	8.96	9.69	6.63	74	10.9
MAGNESIUM	--	--	--	--	--	--	--	--
MANGANESE	17.2 K	20.4 K	28.2 K	18.3 K	22.2 K	11.5 K	391 K	106 K
MERCURY	0.035 U	0.032 U	0.033 U	0.035 U	0.033 U	0.03 U	0.12	0.0221 J
NICKEL	7.1	8.06	8.25	8.22	9.14	6.12	24.3	7.26
POTASSIUM	--	--	--	--	--	--	--	--
SELENIUM	0.396 J	0.227 J	0.31 J	0.358 J	0.256 J	0.279 J	0.801 J	0.327 J
SILVER	0.0848 J	0.119 U	0.121 U	0.124 U	0.129 U	0.121 U	0.262 J	0.133 U
SODIUM	--	--	--	--	--	--	--	--
THALLIUM	0.31 UL	0.298 UL	0.242 UL	0.247 UL	0.258 UL	0.303 UL	0.664 J	0.266 UL
VANADIUM	32.7	22.4	32.4	20.2	34.6	13.3	44.6	34
ZINC	19.4 J	20.8 J	19.7 J	21.2 J	23.8 J	16.5 J	402 J	31 J

APPENDIX P
MONITORING WELL ANALYTICAL RESULTS
SITE 43 - TOLUENE DISPOSAL AREA
NAVAL SUPPORT FACILITY INDIAN HEAD
INDIAN HEAD, MARYLAND

LOCATION	S43MW001									S43MW002					
SAMPLE ID	S43MW00101	S43MW00101-D	S43MW00102	S43MW00102-D	S43MW00103	S43MW00105	S43MW00105-D	S43MW0104	S43MW0104-D	S43MW0020101	S43MW0020102	S43MW00203	S43MW00205	S43MW0204	S43MW0204-D
SAMPLE DATE	20050725	20050725	20071111	20071111	20110617	20130508	20130508	20120722	20120722	20050727	20071111	20110617	20130519	20120722	20120722
SAMPLE CODE	ORIG	DUP	ORIG	DUP	NORMAL	ORIG	DUP	ORIG	DUP	NORMAL	NORMAL	NORMAL	NORMAL	ORIG	DUP
MATRIX	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW
VOLATILES (UG/L)															
1,1,1-TRICHLOROETHANE	500 U	500 U	800 U	800 U	--	--	--	50 U	50 U	0.51	1.3	--	--	--	--
1,1,2,2-TETRACHLOROETHANE	500 U	500 U	800 U	800 U	25 U	--	--	50 U	50 U	0.5 U	0.5 U	--	--	--	--
1,1,2-TRICHLOROETHANE	500 U	500 U	800 U	800 U	25 U	--	--	50 U	50 U	0.5 U	0.5 U	--	--	--	--
1,1,2-TRICHLOROTRIFLUOROETHANE	500 U	500 U	800 U	800 U	25 U	--	--	50 U	50 U	0.5 U	0.5 U	--	--	--	--
1,1-DICHLOROETHANE	500 U	500 U	800 U	800 U	25 U	50 U	50 U	50 U	50 U	2.7	15	--	5.06	--	--
1,1-DICHLOROETHENE	500 U	500 U	800 U	800 U	25 U	50 U	50 U	50 U	50 U	1.1	3.9	--	0.52 J	--	--
1,2,3-TRICHLOROBENZENE	500 U	500 U	800 U	800 U	25 U	--	--	50 U	50 U	0.5 U	0.5 U	--	--	--	--
1,2,4-TRICHLOROBENZENE	500 U	500 U	800 U	800 U	25 U	--	--	50 U	50 U	0.5 U	0.5 U	--	--	--	--
1,2-DIBROMO-3-CHLOROPROPANE	500 U	500 U	800 U	800 U	25 U	--	--	50 U	50 U	0.5 U	0.5 U	--	--	--	--
1,2-DIBROMOETHANE	500 U	500 U	800 U	800 U	25 U	--	--	50 U	50 U	0.5 U	0.5 U	--	--	--	--
1,2-DICHLOROBENZENE	500 U	500 U	800 U	800 U	25 U	--	--	50 U	50 U	0.5 U	0.5 U	--	--	--	--
1,2-DICHLOROETHANE	500 U	500 U	800 U	800 U	25 U	50 U	50 U	50 U	50 U	0.5 U	0.5 U	--	0.5 U	--	--
1,2-DICHLOROPROPANE	500 U	500 UJ	800 U	800 U	25 U	--	--	50 U	50 U	0.5 U	0.5 U	--	--	--	--
1,3-DICHLOROBENZENE	500 U	500 U	800 U	800 U	--	--	--	--	--	0.5 U	0.5 U	--	--	--	--
1,3-DICHLOROPROPANE	--	--	--	--	25 U	--	--	50 U	50 U	--	--	--	--	--	--
1,4-DICHLOROBENZENE	500 U	500 U	800 U	800 U	25 U	--	--	50 U	50 U	0.5 U	0.5 U	--	--	--	--
1,4-DIOXANE	--	--	--	--	500 UR	--	--	1000 UR	1000 UR	--	--	--	--	--	--
2-BUTANONE	5000 U	5000 U	8000 U	8000 U	250 U	--	--	500 U	500 U	5 U	5 U	--	--	--	--
2-HEXANONE	5000 U	5000 U	8000 U	8000 U	125 U	--	--	250 U	250 U	5 U	5 U	--	--	--	--
4-METHYL-2-PENTANONE	5000 U	5000 U	8000 U	8000 U	125 U	--	--	250 U	250 U	5 U	5 U	--	--	--	--
ACETONE	5000 U	5000 U	8000 U	8000 U	250 U	--	--	500 U	500 U	5 U	5 U	--	--	--	--
BENZENE	500 U	500 U	800 U	800 U	25 U	--	--	50 U	50 U	0.5 U	0.5 U	--	--	--	--
BROMOCHLOROMETHANE	500 U	500 U	800 U	800 U	--	--	--	--	--	0.5 U	0.5 U	--	--	--	--
BROMODICHLOROMETHANE	500 U	500 UJ	800 U	800 U	25 U	--	--	50 U	50 U	0.5 U	0.5 U	--	--	--	--
BROMOFORM	500 U	500 U	800 U	960	25 U	50 U	50 U	50 U	50 U	0.5 U	0.5 U	--	0.5 U	--	--
BROMOMETHANE	500 U	500 U	800 U	800 U	50 U	--	--	100 U	100 U	0.5 U	0.5 U	--	--	--	--
CARBON DISULFIDE	500 U	500 U	800 U	800 U	25 U	--	--	50 U	50 U	0.5 U	0.5 U	--	--	--	--
CARBON TETRACHLORIDE	500 U	500 U	800 U	800 U	25 U	--	--	50 U	50 U	0.5 U	0.5 U	--	--	--	--
CHLOROBENZENE	500 U	500 U	800 U	800 U	25 U	--	--	50 U	50 U	0.5 U	0.5 U	--	--	--	--
CHLORODIBROMOMETHANE	500 U	500 U	800 U	800 U	25 U	--	--	50 U	50 U	0.5 U	0.5 U	--	--	--	--
CHLOROETHANE	500 U	500 U	800 U	800 U	50 U	--	--	100 U	100 U	0.5 U	0.5 U	--	--	--	--
CHLOROFORM	500 U	500 U	800 U	800 U	8.32 J	50 U	50 U	50 U	50 U	0.5 U	0.5 U	--	0.5 U	--	--
CHLOROMETHANE	500 U	500 U	800 U	800 U	25 U	--	--	50 U	50 U	0.5 U	0.5 U	--	--	--	--
CIS-1,2-DICHLOROETHENE	580	480 J	800 U	800 U	284	148	151	400	355	0.5 U	0.5 U	--	0.5 U	--	--
CIS-1,3-DICHLOROPROPENE	500 U	500 U	800 U	800 U	--	--	--	--	--	0.5 U	0.5 U	--	--	--	--
CYCLOHEXANE	500 U	500 UJ	800 U	800 U	25 U	--	--	50 U	50 U	0.5 U	0.5 U	--	--	--	--
DICHLORODIFLUOROMETHANE	500 U	500 U	800 UR	800 UR	50 U	--	--	100 U	100 U	0.5 U	0.5 UR	--	--	--	--
ETHYLBENZENE	500 U	500 U	800 U	800 U	25 U	--	--	50 U	50 U	0.5 U	0.5 U	--	--	--	--
ISOPROPYLBENZENE	500 U	500 U	800 U	800 U	25 U	--	--	50 U	50 U	0.5 U	0.5 U	--	--	--	--
METHYL ACETATE	500 U	500 U	800 UJ	800 UJ	50 U	--	--	100 U	100 U	0.5 U	0.5 UJ	--	--	--	--
METHYL CYCLOHEXANE	500 U	500 UJ	800 U	800 U	--	--	--	--	--	0.5 U	0.5 U	--	--	--	--
METHYL TERT-BUTYL ETHER	500 U	500 U	800 U	800 U	25 U	--	--	50 U	50 U	0.5 U	0.5 U	--	--	--	--
METHYLENE CHLORIDE	500 U	730 B	800 U	800 U	50 U	100 U	100 U	100 U	100 U	0.5 U	0.5 U	--	1 U	--	--
STYRENE	500 U	500 U	800 U	800 U	25 U	--	--	50 U	50 U	0.5 U	0.5 U	--	--	--	--
TETRACHLOROETHENE	500 U	500 U	800 U	800 U	25 U	--	--	50 U	50 U	0.5 U	0.5 U	--	--	--	--
TOLUENE	500 U	500 U	800 U	800 U	25 U	--	--	50 U	50 U	0.5 U	0.5 U	--	--	--	--
TOTAL XYLENES	500 U	500 U	800 U	800 U	50 U	--	--	100 U	100 U	0.5 U	0.5 U	--	--	--	--
TRANS-1,2-DICHLOROETHENE	500 U	500 U	800 U	800 U	25 U	50 U	50 U	50 U	50 U	0.5 U	0.5 U	--	0.5 U	--	--
TRANS-1,3-DICHLOROPROPENE	500 U	500 U	800 U	800 U	--	--	--	--	--	0.5 U	0.5 U	--	--	--	--
TRICHLOROETHENE	53000 J	55000 J	36000	36000	10900	8330	9060	17500	16200	1.3 J	3.2	0.398 J	0.26 J	0.5 U	0.5 U
TRICHLOROFLUOROMETHANE	500 U	500 U	800 U	800 U	50 U	--	--	100 U	100 U	0.5 U	0.5 U	--	--	--	--
VINYL CHLORIDE	500 U	500 U	800 U	800 U	25 U	50 U	50 U	50 U	50 U	0.5 U	0.5 U	--	0.5 U	--	--
VOLATILE GASES (UG/L)															
ETHANE	--	--	--	--	15.8	--	--	--	--	--	--	2 UJ	--	--	--
ETHENE	--	--	--	--	2 U	--	--	--	--	--	--	2 UJ	--	--	--
METHANE	--	--	--	--	687 J	--	--	--	--	--	--	2 UJ	--	--	--
EXPLOSIVES (UG/L)															
1,3,5-TRINITROBENZENE	0.1 U	0.1 U	--	--	0.15 U	--	--	0.152 U	0.168 U	0.1 U	--	--	--	--	--
1,3-DINITROBENZENE	0.1 U	0.1 U	--	--	0.15 J	--	--	0.152 U	0.168 U	0.1 U	--	--	--	--	--
2,4,6-TRINITROTOLUENE	0.1 U	0.1 U	--	--	0.15 U	--	--	0.152 U	0.168 U	0.1 U	--	--	--	--	--
2,4-DINITROTOLUENE	0.1 U	0.1 U	--	--	0.15 U	--	--	0.152 U	0.168 U	0.1 U	--	--	--	--	--
2,6-DINITROTOLUENE	0.1 U	0.1 U	--	--	0.15 U	--	--	0.185 J	0.168 U	0.1 U	--	--	--	--	--
2-AMINO-4,6-DINITROTOLUENE	0.1 U	0.1 U	--	--	0.274 J	--	--	0.152 U	0.168 U	0.1 U	--	--	--	--	--
2-NITROTOLUENE	0.5 U	0.5 U	--	--	0.236 J	--	--	0.152 U	0.168 U	0.5 U	--	--	--	--	--
3-NITROTOLUENE	0.5 U	0.5 U	--	--	0.723 J	--	--	0.511 J	0.609 J	0.5 U	--	--	--	--	--
4-AMINO-2,6-DINITROTOLUENE	0.1 U	0.1 U	--	--	0.15 U	--	--	0.152 U	0.168 U	0.1 U	--	--	--	--	--
4-NITROTOLUENE	0.5 U	0.5 U	--	--	0.15 U	--	--	0.394 J	0.173 J	0.5 U	--	--	--	--	--
HMX	0.1 U	0.1 U	--	--	0.15 U	--	--	0.152 U	0.168 U	3.4	--	--	--	--	--
NITROBENZENE	0.1 U	0.1 U	--	--	0.15 U	--	--	0.152 U	0.168 U	0.1 U	--	--	--	--	--
NITROCELLULOSE	500 U	120 B	--	--	--	--	--	--	--	500 U	--	--	--	--	--
NITROGLYCERIN	0.65 U	0.65 U	--	--	25.2 J	--	--	0.381 U	0.421 U	0.65 U	--	--	--	--	--
NITROGUANIDINE	20 U	20 U	--	--	72 UJ	--	--	10 U	10 U	20 U	--	--	--	--	--
RDX	0.17	0.22	--	--	0.15 U	--	--	0.215 B	0.225 B	0.11	--	--	--	--	--
TETRYL	0.1 U	0.1 U	--	--	0.15 U	--	--	0.152 U	0.168 U	0.1 U	--	--	--	--	--
MISCELLANEOUS PARAMETERS (UG/L)															
PERCHLORATE	--	--	--	--	0.251 J	--	--	--	--	--	--	--	--	--	--

APPENDIX P
MONITORING WELL ANALYTICAL RESULTS
SITE 43 - TOLUENE DISPOSAL AREA
NAVAL SUPPORT FACILITY INDIAN HEAD
INDIAN HEAD, MARYLAND

LOCATION	S43MW001									S43MW002					
SAMPLE ID	S43MW00101	S43MW00101-D	S43MW00102	S43MW00102-D	S43MW00103	S43MW00105	S43MW00105-D	S43MW0104	S43MW0104-D	S43MW0020101	S43MW0020102	S43MW00203	S43MW00205	S43MW0204	S43MW0204-D
SAMPLE DATE	20050725	20050725	20071111	20071111	20110617	20130508	20130508	20120722	20120722	20050727	20071111	20110617	20130519	20120722	20120722
SAMPLE CODE	ORIG	DUP	ORIG	DUP	NORMAL	ORIG	DUP	ORIG	DUP	NORMAL	NORMAL	NORMAL	NORMAL	ORIG	DUP
MATRIX	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW
MISCELLANEOUS PARAMETERS (MG/L)															
CHLORIDE	--	--	--	--	32.3	--	--	--	--	--	--	125	--	--	--
CYANIDE	--	--	--	--	0.01 U	--	--	--	--	--	--	0.01 U	--	--	--
DISSOLVED ORGANIC CARBON	--	--	--	--	9.41	--	--	--	--	--	--	1.77	--	--	--
NITRATE-N	--	--	--	--	0.845 J	--	--	--	--	--	--	0.388 J	--	--	--
NITRITE-N	--	--	--	--	0.059 J	--	--	--	--	--	--	0.10 UJ	--	--	--
SULFATE	--	--	--	--	34.2	--	--	--	--	--	--	14	--	--	--
SULFIDE	--	--	--	--	1.82 U	--	--	--	--	--	--	1.82 U	--	--	--
METALS (UG/L)															
ALUMINUM	134 B	153	--	--	1550	--	--	156	143	215	--	--	--	--	--
ANTIMONY	2.0 L	2.0 UL	--	--	2 U	--	--	2 U	2 U	2.1 L	--	--	--	--	--
ARSENIC	2.0 UL	2.0 UL	--	--	2.65	1.5 UL	1.5 UL	1.18 J	1.15 J	2.0 UL	--	--	1.5 UL	--	--
BARIUM	203	197	--	--	30.8	--	--	27.1	27	354	--	--	--	--	--
BERYLLIUM	0.69	0.66	--	--	0.385 J	--	--	0.321 J	0.306 J	4.6	--	--	--	--	--
CADMIUM	0.30	0.26	--	--	0.558 J	--	--	0.5 U	0.383 J	0.61	--	--	--	--	--
CALCIUM	3890	3760	--	--	--	--	--	--	--	3450	--	--	--	--	--
CHROMIUM	0.71	0.59	--	--	11.6	--	--	0.927 J	0.841 J	0.50 U	--	--	--	--	--
COBALT	35.2	34.2	--	--	9.03	3.42	3.46	13.3	13.2	96.4	--	70.4	42.8	33.6	34.3
COPPER	9.3 B	5.9 B	--	--	14.3	--	--	1.2 J	1.33 J	8.2 B	--	--	--	--	--
CYANIDE	2.0 U	2.0 U	--	--	--	--	--	--	--	2.0 U	--	--	--	--	--
IRON	4230	4030	--	--	2420 K	966	981	5360 K	5150 K	37.3 B	--	--	16.4 J	--	--
LEAD	2.8 K	2.2 K	--	--	4.57	--	--	0.785	1.08	0.90 U	--	--	--	--	--
MAGNESIUM	2340	2270	--	--	--	--	--	--	--	4640	--	--	--	--	--
MANGANESE	306	296	--	--	101	33.3	33.3	106	106	270	--	--	239	--	--
MERCURY	0.13 U	0.13 U	--	--	--	--	--	0.16 U	0.16 U	0.13 U	--	--	--	--	--
NICKEL	40.6 J	39.5 J	--	--	11.7	--	--	13.4	13.5	78.3 J	--	--	--	--	--
POTASSIUM	1660	1680	--	--	--	--	--	--	--	1690	--	--	--	--	--
SELENIUM	3.0 U	3.0 U	--	--	0.786 J	--	--	1.25 U	1.25 U	3.0 U	--	--	--	--	--
SILVER	0.70 U	0.70 U	--	--	0.50 U	--	--	0.5 UL	0.5 UL	0.70 U	--	--	--	--	--
SODIUM	40100	39100	--	--	--	--	--	--	--	60500	--	--	--	--	--
THALLIUM	3.7 B	2.7 B	--	--	1 UL	--	--	1 U	1 U	2.0 U	--	--	--	--	--
VANADIUM	0.49	0.72	--	--	14.2	--	--	2.29 J	2.23 J	0.40 U	--	--	--	--	--
ZINC	51.9 J	49.9 J	--	--	102	--	--	38.6	38.9	134 J	--	--	--	--	--
DISSOLVED METALS (UG/L)															
ALUMINUM	--	--	--	--	195	--	--	51.6	49.4 J	--	--	--	--	--	--
ANTIMONY	--	--	--	--	2 U	--	--	2 U	2 U	--	--	--	--	--	--
ARSENIC	--	--	--	--	2.13 J	--	--	1.23 J	0.807 J	--	--	--	--	--	--
BARIUM	--	--	--	--	25.3	--	--	27.8	26.3	--	--	--	--	--	--
BERYLLIUM	--	--	--	--	0.50 U	--	--	0.305 J	0.276 J	--	--	--	--	--	--
CADMIUM	--	--	--	--	0.427 J	--	--	0.5 U	0.5 U	--	--	--	--	--	--
CHROMIUM	--	--	--	--	6.58	--	--	0.581 J	1 U	--	--	--	--	--	--
COBALT	--	--	--	--	8.28	--	--	13.7	13.1	--	--	73.5	--	33.8	33.7
COPPER	--	--	--	--	8.94	--	--	2 U	1.04 J	--	--	--	--	--	--
IRON	--	--	--	--	768 K	--	--	5370 K	4820 K	--	--	--	--	--	--
LEAD	--	--	--	--	0.444 J	--	--	0.75 U	0.75 U	--	--	--	--	--	--
MANGANESE	--	--	--	--	90	--	--	109 L	103 L	--	--	--	--	--	--
MERCURY	--	--	--	--	--	--	--	0.16 U	0.16 U	--	--	--	--	--	--
NICKEL	--	--	--	--	10.2	--	--	13.8	13.2	--	--	--	--	--	--
SELENIUM	--	--	--	--	0.916 J	--	--	1.25 U	1.25 U	--	--	--	--	--	--
SILVER	--	--	--	--	0.50 U	--	--	0.5 UL	0.5 UL	--	--	--	--	--	--
THALLIUM	--	--	--	--	1 UL	--	--	1 U	1 U	--	--	--	--	--	--
VANADIUM	--	--	--	--	9.48	--	--	1.6 J	1.55 J	--	--	--	--	--	--
ZINC	--	--	--	--	60.6	--	--	38.8	38.2	--	--	--	--	--	--

APPENDIX P
MONITORING WELL ANALYTICAL RESULTS
SITE 43 - TOLUENE DISPOSAL AREA
NAVAL SUPPORT FACILITY INDIAN HEAD
INDIAN HEAD, MARYLAND

LOCATION	S43MW003			S43MW004				S43MW005			S43MW006			S43MW007	
SAMPLE ID	S43MW00301	S43MW00303	S43MW0302	S43MW00401	S43MW00401-D	S43MW00403	S43MW0402	S43MW00501	S43MW00503	S43MW0502	S43MW00601	S43MW00603	S43MW0602	S43MW00702	S43MW0701
SAMPLE DATE	20110617	20130509	20120722	20110617	20110617	20130513	20120722	20110617	20130509	20120722	20110617	20130509	20120721	20130513	20120722
SAMPLE CODE	NORMAL	NORMAL	NORMAL	ORIG	DUP	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
MATRIX	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW
VOLATILES (UG/L)															
1,1,1-TRICHLOROETHANE	0.50 U	--	0.5 U	2.5 U	2.5 U	--	2.5 U	0.50 U	--	0.5 U	5 U	--	12.5 U	--	0.5 U
1,1,2,2-TETRACHLOROETHANE	0.50 U	--	0.5 U	2.5 U	2.5 U	--	2.5 U	0.50 U	--	0.5 U	5 U	--	12.5 U	--	0.5 U
1,1,2-TRICHLOROETHANE	0.50 U	--	0.5 U	2.5 U	2.5 U	--	2.5 U	0.50 U	--	0.5 U	5 U	--	12.5 U	--	0.5 U
1,1,2-TRICHLOROTRIFLUOROETHANE	0.50 U	--	0.5 U	2.5 U	2.5 U	--	2.5 U	0.50 U	--	0.5 U	5 U	--	12.5 U	--	0.5 U
1,1-DICHLOROETHANE	0.50 U	0.5 U	0.5 U	2.5 U	2.5 U	5 U	2.5 U	0.50 U	0.5 U	0.5 U	5 U	25 U	12.5 U	0.5 U	0.5 U
1,1-DICHLOROETHENE	0.50 U	0.5 U	0.5 U	2.56 J	2.43 J	5 U	2.95 J	0.50 U	0.5 U	0.5 U	5 U	25 U	12.5 U	0.5 U	0.5 U
1,2,3-TRICHLOROBENZENE	0.50 U	--	0.5 U	2.5 U	2.5 U	--	2.5 U	0.50 U	--	0.5 U	5 U	--	12.5 U	--	0.5 U
1,2,4-TRICHLOROBENZENE	0.50 U	--	0.5 U	2.5 U	2.5 U	--	2.5 U	0.50 U	--	0.5 U	5 U	--	12.5 U	--	0.5 U
1,2-DIBROMO-3-CHLOROPROPANE	0.50 U	--	0.5 U	2.5 U	2.5 U	--	2.5 U	0.50 U	--	0.5 U	5 U	--	12.5 U	--	0.5 U
1,2-DIBROMOETHANE	0.50 U	--	0.5 U	2.5 U	2.5 U	--	2.5 U	0.50 U	--	0.5 U	5 U	--	12.5 U	--	0.5 U
1,2-DICHLOROBENZENE	0.50 U	--	0.5 U	2.5 U	2.5 U	--	2.5 U	0.50 U	--	0.5 U	5 U	--	12.5 U	--	0.5 U
1,2-DICHLOROETHANE	0.50 U	0.5 U	0.5 U	2.5 U	2.5 U	5 U	2.5 U	0.50 U	0.5 U	0.5 U	5 U	25 U	12.5 U	0.5 U	0.5 U
1,2-DICHLOROPROPANE	0.50 U	--	0.5 U	2.5 U	2.5 U	--	2.5 U	0.50 U	--	0.5 U	5 U	--	12.5 U	--	0.5 U
1,3-DICHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-DICHLOROPROPANE	0.50 U	--	0.5 U	2.5 U	2.5 U	--	2.5 U	0.50 U	--	0.5 U	5 U	--	12.5 U	--	0.5 U
1,4-DICHLOROBENZENE	0.50 U	--	0.5 U	2.5 U	2.5 U	--	2.5 U	0.50 U	--	0.5 U	5 U	--	12.5 U	--	0.5 U
1,4-DIOXANE	10 UR	--	10 UR	50 UR	50 UR	--	50 UR	10 UR	--	10 UR	100 UR	--	250 UR	--	10 UR
2-BUTANONE	5 U	--	5 U	25 U	25 U	--	25 U	5 U	--	5 U	50 U	--	125 U	--	5 U
2-HEXANONE	2.5 U	--	2.5 U	12.5 U	12.5 U	--	12.5 U	2.5 U	--	2.5 U	25 U	--	62.5 U	--	2.5 U
4-METHYL-2-PENTANONE	2.5 U	--	2.5 U	12.5 U	12.5 U	--	12.5 U	2.5 U	--	2.5 U	25 U	--	62.5 U	--	2.5 U
ACETONE	5 U	--	5 U	25 U	25 U	--	25 U	5 U	--	5 U	50 U	--	125 U	--	5 U
BENZENE	0.50 U	--	0.5 U	2.5 U	2.5 U	--	2.5 U	0.50 U	--	0.5 U	5 U	--	12.5 U	--	0.5 U
BROMOCHLOROMETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BROMODICHLOROMETHANE	0.50 U	--	0.5 U	2.5 U	2.5 U	--	2.5 U	0.50 U	--	0.5 U	5 U	--	12.5 U	--	0.5 U
BROMOFORM	0.50 U	0.5 U	0.5 U	2.5 U	2.5 U	5 U	2.5 U	0.50 U	0.5 U	0.5 U	5 U	25 U	12.5 U	0.5 U	0.5 U
BROMOMETHANE	1 U	--	1 U	5 U	5 U	--	5 U	1 U	--	1 U	10 U	--	25 U	--	1 U
CARBON DISULFIDE	0.50 U	--	0.5 U	2.5 U	2.5 U	--	2.25 J	0.50 U	--	0.5 U	5 U	--	12.5 U	--	0.5 U
CARBON TETRACHLORIDE	0.50 U	--	0.5 U	2.5 U	2.5 U	--	2.5 U	0.50 U	--	0.5 U	5 U	--	12.5 U	--	0.5 U
CHLOROBENZENE	0.50 U	--	0.5 U	2.5 U	2.5 U	--	2.5 U	0.50 U	--	0.5 U	5 U	--	12.5 U	--	0.5 U
CHLORODIBROMOMETHANE	0.50 U	--	0.5 U	2.5 U	2.5 U	--	2.5 U	0.50 U	--	0.5 U	5 U	--	12.5 U	--	0.5 U
CHLOROETHANE	1 U	--	1 U	5 U	5 U	--	5 U	1 U	--	1 U	10 U	--	25 U	--	1 U
CHLOROFORM	0.50 U	0.5 U	0.5 U	2.5 U	2.5 U	5 U	2.5 U	0.50 U	0.5 U	0.5 U	5 U	25 U	12.5 U	0.5 U	0.5 U
CHLOROMETHANE	6.35	--	0.5 U	5.05	2.5 U	--	2.5 U	3.41	--	0.5 U	5 U	--	12.5 U	--	0.5 U
CIS-1,2-DICHLOROETHENE	0.896 J	1.28	0.77 J	152	156	164	203	0.50 U	0.5 U	0.5 U	41.6	110	153 J	0.5 U	0.5 U
CIS-1,3-DICHLOROPROPENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CYCLOHEXANE	0.50 U	--	0.5 U	2.5 U	2.5 U	--	2.5 U	0.50 U	--	0.5 U	5 U	--	12.5 U	--	0.5 U
DICHLORODIFLUOROMETHANE	1 U	--	1 UJ	5 U	5 U	--	5 U	1 U	--	1 UJ	10 U	--	25 UJ	--	1 U
ETHYLBENZENE	0.50 U	--	0.5 U	2.5 U	2.5 U	--	2.5 U	0.50 U	--	0.5 U	5 U	--	12.5 U	--	0.5 U
ISOPROPYLBENZENE	0.50 U	--	0.5 U	2.5 U	2.5 U	--	2.5 U	0.50 U	--	0.5 U	5 U	--	12.5 U	--	0.5 U
METHYL ACETATE	1 U	--	1 U	5 U	5 U	--	5 U	1 U	--	1 U	10 U	--	25 U	--	1 U
METHYL CYCLOHEXANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METHYL TERT-BUTYL ETHER	0.50 U	--	0.5 U	2.5 U	2.5 U	--	2.5 U	0.50 U	--	0.5 U	5 U	--	12.5 U	--	0.5 U
METHYLENE CHLORIDE	1 U	0.72 J	1 U	5 U	5 U	5.3 J	5 U	1 U	1 U	0.53 J	10 U	50 U	25 U	0.58 J	1 U
STYRENE	0.50 U	--	0.5 U	2.5 U	2.5 U	--	2.5 U	0.50 U	--	0.5 U	5 U	--	12.5 U	--	0.5 U
TETRACHLOROETHENE	0.50 U	--	0.5 U	2.5 U	2.5 U	--	2.5 U	0.50 U	--	0.5 U	5 U	--	12.5 U	--	0.5 U
TOLUENE	0.50 U	--	0.5 U	2.5 U	2.5 U	--	2.5 U	0.50 U	--	0.5 U	5 U	--	12.5 U	--	0.5 U
TOTAL XYLENES	1 U	--	1 U	5 U	5 U	--	5 U	1 U	--	1 U	10 U	--	25 U	--	1 U
TRANS-1,2-DICHLOROETHENE	0.50 U	0.5 U	0.5 U	2.5 U	2.5 U	5 U	1.4 J	0.50 U	0.5 U	0.5 U	5 U	25 U	12.5 U	0.5 U	0.5 U
TRANS-1,3-DICHLOROPROPENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TRICHLOROETHENE	1.74	1	0.66 J	699	682	903	644 J	0.50 U	1.45	0.5 U	1130	3230	4420	0.5 U	0.31 J
TRICHLOROFLUOROMETHANE	1 U	--	1 U	5 U	5 U	--	5 U	1 U	--	1 U	10 U	--	25 U	--	1 U
VINYL CHLORIDE	1.16	2.85	1.23	15.7	14.1	15.2	37.9 J	0.50 U	0.5 U	0.5 U	5 U	25 U	7.5 J	0.5 U	0.5 U
VOLATILE GASES (UG/L)															
ETHANE	--	--	--	60.6 J	2 UJ	--	--	--	--	--	2.94 J	--	--	--	--
ETHENE	--	--	--	11.5 J	2 UJ	--	--	--	--	--	2 UJ	--	--	--	--
METHANE	--	--	--	623 J	5.14 J	--	--	--	--	--	257 J	--	--	--	--
EXPLOSIVES (UG/L)															
1,3,5-TRINITROBENZENE	0.15 U	--	0.168 U	0.15 U	0.16 U	--	0.155 U	0.157 U	--	0.168 U	0.168 U	--	0.158 U	--	0.155 U
1,3-DINITROBENZENE	0.15 U	--	0.168 U	0.15 U	0.16 U	--	0.155 U	0.131 J	--	0.168 U	0.244 J	--	0.158 U	--	0.155 U
2,4,6-TRINITROTOLUENE	0.15 U	--	0.168 U	0.15 U	0.16 U	--	0.155 U	0.157 U	--	0.168 U	0.168 U	--	0.158 U	--	0.155 U
2,4-DINITROTOLUENE	0.15 U	--	0.168 U	0.15 U	0.16 U	--	0.155 U	0.157 U	--	0.168 U	0.168 U	--	0.158 U	--	0.155 U
2,6-DINITROTOLUENE	0.15 U	--	0.168 U	0.15 U	0.16 U	--	0.155 U	0.157 U	--	0.168 U	0.168 U	--	0.158 U	--	0.155 U
2-AMINO-4,6-DINITROTOLUENE	0.15 U	--	0.168 U	0.15 U	0.16 U	--	0.155 U	0.157 U	--	0.168 U	0.168 U	--	0.158 U	--	0.155 U
2-NITROTOLUENE	0.15 U	--	0.168 U	0.15 U	0.16 U	--	0.155 U	0.157 U	--	0.168 U	0.168 U	--	0.158 U	--	0.155 U
3-NITROTOLUENE	0.15 U	--	0.168 U	2.91	3.57 J	--	0.28 J	0.157 U	--	0.439 J	0.168 U	--	0.871	--	0.227 J
4-AMINO-2,6-DINITROTOLUENE	0.15 U	--	0.168 U	0.15 U	0.16 U	--	0.155 U	0.0929 J	--	0.168 U	0.128 J	--	0.158 U	--	0.155 U
4-NITROTOLUENE	0.15 U	--	0.291 J	0.15 U	0.16 U	--	0.148 J	0.157 U	--	0.168 U	0.195 J	--	0.142 J	--	0.0861 J
HMX	0.15 U	--	0.168 U	0.125 J	0.125 J	--	0.155 U	0.157 U	--	0.168 U	0.904	--	0.158 U	--	0.155 U
NITROBENZENE	0.15 U	--	0.168 U	0.15 U	0.16 U	--	0.155 U	0.157 U	--	0.168 U	0.168 U	--	0.158 U	--	0.155 U
NITROCELLULOSE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NITROGLYCERIN	0.262 J	--	0.421 U	0.374 U	0.40 U	--	0.388 U	0.392 U	--	0.421 U	32.3 J	--	0.396 U	--	0.388 U
NITROGUANIDINE	5 U	--	10 U	5 U	5 U	--	10 UJ	5 U	--	10 U	5 U	--	10 U	--	10 U
RDX	0.15 U	--	0.168 U	0.212 J	0.415 J	--	0.546 B	0.0886 J	--	0.305 B	1.7 J	--	0.398 B	--	0.217 B
TETRYL	0.15 U	--	0.168 U	0.15 U	0.16 U	--	0.155 U	0.157 U	--	0.168 U	0.168 U	--	0.158 U	--	0.155 U
MISCELLANEOUS PARAMETERS (UG/L)															
PERCHLORATE	0.20 U	--	--	0.244 J	0.20 U	--	--	0.20 U	--	--	0.20 U	--	--	--	--

LOCATION	S43MW003			S43MW004				S43MW005			S43MW006			S43MW007	
SAMPLE ID	S43MW00301	S43MW00303	S43MW0302	S43MW00401	S43MW00401-D	S43MW00403	S43MW0402	S43MW00501	S43MW00503	S43MW0502	S43MW00601	S43MW00603	S43MW0602	S43MW00702	S43MW0701
SAMPLE DATE	20110617	20130509	20120722	20110617	20110617	20130513	20120722	20110617	20130509	20120722	20110617	20130509	20120721	20130513	20120722
SAMPLE CODE	NORMAL	NORMAL	NORMAL	ORIG	DUP	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
MATRIX	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW
MISCELLANEOUS PARAMETERS (MG/L)															
CHLORIDE	--	--	--	39.2	39.4	--	--	--	--	--	57	--	--	--	--
CYANIDE	0.01 U	--	--	0.01 U	0.01 U	--	--	0.01 U	--	--	0.01 U	--	--	--	--
DISSOLVED ORGANIC CARBON	--	--	--	1.71	1.76	--	--	--	--	--	3.08	--	--	--	--
NITRATE-N	--	--	--	0.10 UJ	0.10 UJ	--	--	--	--	--	0.10 UJ	--	--	--	--
NITRITE-N	--	--	--	0.10 UJ	0.10 UJ	--	--	--	--	--	0.10 UJ	--	--	--	--
SULFATE	--	--	--	5.82	5.93	--	--	--	--	--	4.96	--	--	--	--
SULFIDE	--	--	--	1.82 U	1.82 U	--	--	--	--	--	1.82 U	--	--	--	--
METALS (UG/L)															
ALUMINUM	22.5 J	--	14.8 J	18.2 J	14.1 J	--	16.5 J	1090	--	129	4050	--	1190	--	16.2 J
ANTIMONY	2 U	--	2 U	2 U	2 U	--	2 U	2 U	--	2 U	2 U	--	2 U	--	2 U
ARSENIC	16.9	12	12.2	1.72 J	1.7 J	1.02 J	1.31 J	1.58 J	5.75	2.11 J	2.76	3.44	6.47	1.5 UL	1.5 U
BARIUM	132	--	91.8	96.6	90.9	--	69.5	106	--	88.4	138	--	167	--	109
BERYLLIUM	0.50 U	--	0.5 U	0.50 U	0.50 U	--	0.355 J	0.386 J	--	0.911 J	0.536 J	--	0.311 J	--	1.11 J
CADMIUM	0.50 U	--	0.5 U	0.50 U	0.50 U	--	0.5 U	0.50 U	--	0.5 U	0.50 U	--	0.5 U	--	0.5 U
CALCIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHROMIUM	1 U	--	1 U	1 U	1 U	--	1 U	2.76	--	1 U	9.79	--	3.13	--	1 U
COBALT	4.25	7.5	6.96	24.7	23.4	34.8	24.3	31.1	64.9	50.3	40.7	29.3	26.4	72.3	60
COPPER	2 U	--	2 U	2 U	2 U	--	2 U	2.92	--	1.09 J	9.93	--	2.87	--	1.02 J
CYANIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
IRON	42600 K	39800	42200 K	16600 K	16200 K	11200	12400 K	10400	7510	8510 K	35800 K	41300	54900 K	4190	11600
LEAD	0.75 UL	--	0.75 U	0.75 UL	0.75 UL	--	0.75 UL	1.41 L	--	0.75 UL	3.73	--	0.69 J	--	0.75 U
MAGNESIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MANGANESE	602	805	763	409	383	384	352	345	275	298	611	793	713	324	423
MERCURY	--	--	0.16 UL	--	--	--	0.16 U	--	--	0.16 UL	--	--	0.16 UL	--	0.16 U
NICKEL	0.875 J	--	2.05 J	14.3	14	--	14.3	25.5	--	45.5	28.8	--	15.1	--	46.5
POTASSIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SELENIUM	1.25 U	--	1.25 U	1.25 U	1.25 U	--	1.25 U	1.25 U	--	1.25 U	1.25 U	--	1.25 U	--	1.25 U
SILVER	0.50 U	--	0.5 UL	0.50 U	0.50 U	--	0.5 U	0.50 U	--	0.5 U	0.50 U	--	0.5 U	--	0.5 U
SODIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
THALLIUM	1 UL	--	1 U	1 UL	1 UL	--	1 U	1 UL	--	1 U	1 UL	--	1 U	--	1 U
VANADIUM	2.5 U	--	2.19 J	2.5 U	2.5 U	--	1.33 J	4.61	--	1.69 J	15.7	--	6.68	--	1.59 J
ZINC	11.6	--	4.1 J	14.8	13.2	--	15.8	38.3	--	57.9	33.2	--	16.4	--	53.2
DISSOLVED METALS (UG/L)															
ALUMINUM	16.2 J	--	25 U	25 U	25 U	--	25 U	26.5 J	--	15.6 J	17 J	--	21 J	--	18.5 J
ANTIMONY	2 U	--	2 U	2 U	2 U	--	2 U	2 U	--	2 U	2 U	--	2 U	--	2 U
ARSENIC	15.2	--	12.3	1.67 J	1.53 J	--	1.65 J	1.22 J	1.5 U	1.65 J	2.09 J	3.24	3.61	--	1.5 U
BARIUM	129	--	94.8	91.9	94.1	--	68.5	110	--	86.6	126	--	163	--	112
BERYLLIUM	0.50 U	--	0.5 U	0.50 U	0.50 U	--	0.344 J	0.50 U	--	0.838 J	0.50 U	--	0.5 U	--	1.15 J
CADMIUM	0.50 U	--	0.5 U	0.50 U	0.50 U	--	0.5 U	0.50 U	--	0.5 U	0.50 U	--	0.5 U	--	0.262 J
CHROMIUM	1 U	--	1 U	1 U	1 U	--	1 U	1 U	--	1 U	1 U	--	1 U	--	1 U
COBALT	4.21	--	7.1	23.9	24.5	--	23.5	33.5	60.1	48.9	35.4	26.3	25.9	--	61.2
COPPER	2 U	--	2 U	2 U	2 U	--	2 U	2 U	--	2 U	2 U	--	2 U	--	2 U
IRON	38600	--	43800 K	15900 K	16400 K	--	12500	10900	5070	8400 K	34800 K	39300	44500 K	--	11800
LEAD	0.75 UL	--	0.75 U	0.75 UL	0.75 UL	--	0.75 U	0.75 UL	--	1.5 UL	1.5 UL	--	1.5 U	--	0.75 U
MANGANESE	572	--	795 L	394	396	--	335 L	383	273	294	616	765	753	--	430 L
MERCURY	--	--	0.16 U	--	--	--	0.16 U	--	--	0.16 UL	--	--	0.16 UL	--	0.16 U
NICKEL	1.5 U	--	2.13 J	14.4	14.5	--	14.4	27.7	--	44.3	24.9	--	14.4	--	47
SELENIUM	1.25 U	--	1.25 U	1.25 U	1.25 U	--	1.25 U	1.25 U	--	1.25 U	1.25 U	--	1.25 U	--	1.25 U
SILVER	0.50 U	--	0.5 UL	0.50 U	0.50 U	--	0.5 UL	0.50 U	--	0.5 U	0.50 U	--	0.5 U	--	0.5 U
THALLIUM	1 UL	--	1 U	1 UL	1 UL	--	1 U	1 UL	--	1 U	1 UL	--	1 U	--	1 U
VANADIUM	2.5 U	--	2.23 J	2.5 U	2.5 U	--	2.5 U	2.5 U	--	2.5 U	2.5 U	--	2.24 J	--	1.67 J
ZINC	11.5	--	5.06	14.1	13.9	--	15.3	36	--	56.3	13.9	--	10.7	--	56.3

APPENDIX P
MONITORING WELL ANALYTICAL RESULTS
SITE 43 - TOLUENE DISPOSAL AREA
NAVAL SUPPORT FACILITY INDIAN HEAD
INDIAN HEAD, MARYLAND

LOCATION	S43MW008		S43MW009D			S43MW009S				S43MW010		S43MW011		S43MW012		
SAMPLE ID	S43MW00802	S43MW0801	S43MW009D02	S43MW09D01	S43MW09D-Grab	S43MW009S02	S43MW009S02-D	S43MW09S01	S43MW09S-Grab	S43MW01002	S43MW1001	S43MW01102	S43MW1101	S43MW01202	S43MW1201	S43MW12-Grab
SAMPLE DATE	20130509	20120721	20130513	20120722	20120602	20130513	20130513	20120722	20120602	20130509	20120722	20130509	20120721	20130514	20120722	20120603
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	ORIG	DUP	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
MATRIX	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW
VOLATILES (UG/L)																
1,1,1-TRICHLOROETHANE	--	0.5 U	--	0.5 U	0.5 U	--	--	1 U	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U	0.5 U
1,1,2,2-TETRACHLOROETHANE	--	0.5 U	--	0.5 U	0.5 U	--	--	1 U	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U	0.5 U
1,1,2-TRICHLOROETHANE	--	0.5 U	--	0.5 U	0.5 U	--	--	1 U	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U	0.5 U
1,1,2-TRICHLOROTRIFLUOROETHANE	--	0.5 U	--	0.5 U	0.5 U	--	--	1 U	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U	0.5 U
1,1-DICHLOROETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1-DICHLOROETHENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	3.08	3.34	4.36	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.42 J
1,2,3-TRICHLOROBENZENE	--	0.5 U	--	0.5 U	0.5 U	--	--	1 U	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U	0.5 U
1,2,4-TRICHLOROBENZENE	--	0.5 U	--	0.5 U	0.5 U	--	--	1 U	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U	0.5 U
1,2-DIBROMO-3-CHLOROPROPANE	--	0.5 U	--	0.5 U	0.5 U	--	--	1 U	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U	0.5 U
1,2-DIBROMOETHANE	--	0.5 U	--	0.5 U	0.5 U	--	--	1 U	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U	0.5 U
1,2-DICHLOROBENZENE	--	0.5 U	--	0.5 U	0.5 U	--	--	1 U	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U	0.5 U
1,2-DICHLOROETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-DICHLOROPROPANE	--	0.5 U	--	0.5 U	0.5 U	--	--	1 U	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U	0.5 U
1,3-DICHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-DICHLOROPROPANE	--	0.5 U	--	0.5 U	0.5 U	--	--	1 U	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U	0.5 U
1,4-DICHLOROBENZENE	--	0.5 U	--	0.5 U	0.5 U	--	--	1 U	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U	0.5 U
1,4-DIOXANE	--	10 UR	--	10 UR	10 UR	--	--	20 UR	10 UR	--	10 UR	--	10 UR	--	10 UR	10 UR
2-BUTANONE	--	5 U	--	5 U	5 U	--	--	10 U	5 U	--	5 U	--	5 U	--	5 U	5 U
2-HEXANONE	--	2.5 U	--	2.5 U	2.5 U	--	--	5 U	2.5 U	--	2.5 U	--	2.5 U	--	2.5 U	2.5 U
4-METHYL-2-PENTANONE	--	2.5 U	--	2.5 U	2.5 U	--	--	5 U	2.5 U	--	2.5 U	--	2.5 U	--	2.5 U	2.5 U
ACETONE	--	5 U	--	5 U	5.61 B	--	--	10 U	5 U	--	5 U	--	5 U	--	5 U	5 U
BENZENE	--	0.5 U	--	0.5 U	0.5 U	--	--	1 U	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U	0.5 U
BROMOCHLOROMETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BROMODICHLOROMETHANE	--	0.5 U	--	0.5 U	0.5 U	--	--	1 U	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U	0.5 U
BROMOFORM	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
BROMOMETHANE	--	1 U	--	1 U	1 U	--	--	2 U	1 U	--	1 U	--	1 U	--	1 U	1 U
CARBON DISULFIDE	--	0.5 U	--	0.5 U	0.53 J	--	--	2.36	0.5 U	--	2.65	--	0.5 U	--	0.55 J	0.5 U
CARBON TETRACHLORIDE	--	0.5 U	--	0.5 U	0.5 U	--	--	1 U	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U	0.5 U
CHLOROBENZENE	--	0.5 U	--	0.5 U	0.5 U	--	--	1 U	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U	0.5 U
CHLORODIBROMOMETHANE	--	0.5 U	--	0.5 U	0.5 U	--	--	1 U	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U	0.5 U
CHLOROETHANE	--	1 U	--	1 U	1 U	--	--	2 U	1 U	--	1 U	--	1 U	--	1 U	1 U
CHLOROFORM	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CHLOROMETHANE	--	0.5 U	--	0.5 U	0.5 U	--	--	1 U	0.48 J	--	0.5 U	--	0.5 U	--	0.5 U	0.5 U
CIS-1,2-DICHLOROETHENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	17.2	16.5	26.4	0.66 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	4.2
CIS-1,3-DICHLOROPROPENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CYCLOHEXANE	--	0.5 U	--	0.5 U	0.5 U	--	--	1 U	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U	0.5 U
DICHLORODIFLUOROMETHANE	--	1 UJ	--	1 UJ	1 U	--	--	2 U	1 U	--	1 UJ	--	1 U	--	1 U	1 U
ETHYLBENZENE	--	0.5 U	--	0.5 U	0.5 U	--	--	1 U	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U	0.5 U
ISOPROPYLBENZENE	--	0.5 U	--	0.5 U	0.5 U	--	--	1 U	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U	0.5 U
METHYL ACETATE	--	1 U	--	1 U	1 U	--	--	2 U	1 U	--	1 U	--	1 U	--	1 U	1 U
METHYL CYCLOHEXANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METHYL TERT-BUTYL ETHER	--	0.5 U	--	0.5 U	0.5 U	--	--	1 U	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U	0.5 U
METHYLENE CHLORIDE	1 U	1 U	1 U	0.51 J	1 U	1 U	1 U	2 U	1 U	0.54 J	1 U	1 U	1 U	1 U	1 U	1 U
STYRENE	--	0.5 U	--	0.5 U	0.5 U	--	--	1 U	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U	0.5 U
TETRACHLOROETHENE	--	0.5 U	--	0.5 U	0.5 U	--	--	1 U	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U	0.5 U
TOLUENE	--	0.5 U	--	0.5 U	0.5 U	--	--	1 U	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U	0.5 U
TOTAL XYLENES	--	1 U	--	1 U	1 U	--	--	2 U	1 U	--	1 U	--	1 U	--	1 U	1 U
TRANS-1,2-DICHLOROETHENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.42 J	0.34 J	0.58 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.58 J
TRANS-1,3-DICHLOROPROPENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TRICHLOROETHENE	0.5 U	0.5 U	0.41 J	0.5 U	0.45 J	63.2	61.2	100	1.84	1.06	0.5 U	0.5 U	0.5 U	1.37	1.77	24.4
TRICHLOROFLUOROMETHANE	--	1 U	--	1 U	1 U	--	--	2 U	1 U	--	1 U	--	1 U	--	1 U	1 U
VINYL CHLORIDE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1.15	1.18	2.7 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
VOLATILE GASES (UG/L)																
ETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ETHENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
EXPLOSIVES (UG/L)																
1,3,5-TRINITROBENZENE	--	0.155 U	--	0.168 U	--	--	--	0.154 U	--	--	0.168 U	--	0.164 U	--	0.168 U	--
1,3-DINITROBENZENE	--	0.155 U	--	0.168 U	--	--	--	0.154 U	--	--	0.168 U	--	0.164 U	--	0.168 U	--
2,4,6-TRINITROTOLUENE	--	0.155 U	--	0.168 U	--	--	--	0.154 U	--	--	0.168 U	--	0.164 U	--	0.168 U	--
2,4-DINITROTOLUENE	--	0.155 U	--	0.168 U	--	--	--	0.154 U	--	--	0.168 U	--	0.164 U	--	0.168 U	--
2,6-DINITROTOLUENE	--	0.155 U	--	0.168 U	--	--	--	0.154 U	--	--	0.504 J	--	0.164 U	--	0.168 U	--
2-AMINO-4,6-DINITROTOLUENE	--	0.155 U	--	0.168 U	--	--	--	0.154 U	--	--	0.168 U	--	0.164 U	--	0.168 U	--
2-NITROTOLUENE	--	0.155 U	--	0.168 U	--	--	--	0.154 U	--	--	0.168 U	--	0.164 U	--	0.168 U	--
3-NITROTOLUENE	--	0.107 J	--	0.168 U	--	--	--	0.365 J	--	--	0.168 U	--	0.418 J	--	0.507	--
4-AMINO-2,6-DINITROTOLUENE	--	0.155 U	--	0.168 U	--	--	--	0.154 U	--	--	0.168 U	--	0.164 U	--	0.168 U	--
4-NITROTOLUENE	--	0.155 U	--	0.168 U	--	--	--	0.381	--	--	0.101 J	--	0.164 U	--	0.174 J	--
HMX	--	0.155 U	--	0.168 U	--	--	--	0.154 U	--	--	0.168 U	--	0.164 U	--	0.168 U	--
NITROBENZENE	--	0.155 U	--	0.168 U	--	--	--	0.154 U	--	--	0.234 B	--	0.164 U	--	0.168 U	--
NITROCELLULOSE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NITROGLYCERIN	--	0.388 U	--	0.421 U	--	--	--	0.385 U	--	--	0.421 U	--	0.318 B	--	0.421 U	--
NITROGUANIDINE	--	10 U	--	10 U	--	--	--	10 U	--	--	10 U	--	10 U	--	10 U	--
RDX	--	0.229 B	--	0.168 U	--	--	--	0.583 B	--	--	0.791 B	--	0.164 U	--	0.168 U	--
TETRYL	--	0.155 U	--	0.168 U	--	--	--	0.154 U	--	--	0.168 U	--	0.164 U	--	0.168 U	--
MISCELLANEOUS PARAMETERS (UG/L)																
PERCHLORATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

LOCATION	S43MW008		S43MW009D			S43MW009S				S43MW010		S43MW011		S43MW012		
SAMPLE ID	S43MW00802	S43MW0801	S43MW009D02	S43MW09D01	S43MW09D-Grab	S43MW009S02	S43MW009S02-D	S43MW09S01	S43MW09S-Grab	S43MW01002	S43MW1001	S43MW01102	S43MW1101	S43MW01202	S43MW1201	S43MW12-Grab
SAMPLE DATE	20130509	20120721	20130513	20120722	20120602	20130513	20130513	20120722	20120602	20130509	20120722	20130509	20120721	20130514	20120722	20120603
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	ORIG	DUP	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
MATRIX	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW
MISCELLANEOUS PARAMETERS (MG/L)																
CHLORIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CYANIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DISSOLVED ORGANIC CARBON	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NITRATE-N	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NITRITE-N	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SULFATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SULFIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METALS (UG/L)																
ALUMINUM	--	19.3 J	--	290	--	--	--	358	--	--	121	--	25 U	--	321	--
ANTIMONY	--	2 U	--	2 U	--	--	--	2 U	--	--	2 U	--	2 U	--	2 U	--
ARSENIC	1.5 U	1.5 U	7.04	5.71	--	1.5 UL	1.5 UL	1.5 U	--	4.49	5.86	1.55 J	1.56 J	5.37	5.11	--
BARIUM	--	56.3	--	167	--	--	--	352	--	--	116	--	51.9	--	102	--
BERYLLIUM	--	0.323 J	--	0.5 U	--	--	--	1.91	--	--	0.5 U	--	0.5 U	--	0.5 U	--
CADMIUM	--	0.5 U	--	0.5 U	--	--	--	0.5 U	--	--	0.5 U	--	0.5 U	--	0.5 U	--
CALCIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHROMIUM	--	1.43 J	--	0.906 J	--	--	--	1 U	--	--	1 U	--	1 U	--	0.842 J	--
COBALT	11.5	14.2	2.5 U	2.5 U	--	41.4	42.7	54.8	--	2.5 U	2.5 U	3.22	2.22 J	10.4	8.32	--
COPPER	--	1.04 J	--	1.01 J	--	--	--	1.38 J	--	--	2 U	--	2 U	--	2 U	--
CYANIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
IRON	1080	5000 K	29100	29800 K	--	9790	9940	7640 K	--	24500	33600 K	21700	20900	32300	33000 K	--
LEAD	--	0.75 UL	--	0.75 UL	--	--	--	0.75 UL	--	--	0.75 U	--	0.75 U	--	0.75 U	--
MAGNESIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MANGANESE	95.4	206	176	185	--	409	417	405	--	189	196	516	497	520	456	--
MERCURY	--	0.16 UL	--	0.16 UL	--	--	--	0.16 UL	--	--	0.16 U	--	0.16 UL	--	0.16 U	--
NICKEL	--	8.2	--	0.761 J	--	--	--	40.2	--	--	1.5 U	--	1.5 U	--	4.65	--
POTASSIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SELENIUM	--	1.25 U	--	1.25 U	--	--	--	1.25 U	--	--	1.25 U	--	1.25 U	--	1.25 U	--
SILVER	--	0.5 U	--	0.5 U	--	--	--	0.5 U	--	--	0.5 UL	--	0.5 U	--	0.5 UL	--
SODIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
THALLIUM	--	1 U	--	1 U	--	--	--	1 U	--	--	1 U	--	1 U	--	1 U	--
VANADIUM	--	2.5 U	--	1.64 J	--	--	--	1.38 J	--	--	2.5 U	--	1.47 J	--	2.19 J	--
ZINC	--	12	--	2.06 J	--	--	--	86.9	--	--	1.65 J	--	1.34 J	--	6.34	--
DISSOLVED METALS (UG/L)																
ALUMINUM	--	25 U	--	46.5 J	--	--	--	357	--	--	31.4 J	--	25 U	--	63.7	--
ANTIMONY	--	2 U	--	2 U	--	--	--	2 U	--	--	2 U	--	2 U	--	2 U	--
ARSENIC	--	1.5 U	7.27	5.76	--	--	--	1.5 U	--	3.83	4.91 K	--	1.49 J	--	5.58	--
BARIUM	--	52.2	--	163	--	--	--	347	--	--	104	--	54.5	--	100	--
BERYLLIUM	--	0.297 J	--	0.5 U	--	--	--	1.9	--	--	0.5 U	--	0.5 U	--	0.5 U	--
CADMIUM	--	0.5 U	--	0.5 U	--	--	--	0.5 U	--	--	0.5 U	--	0.5 U	--	0.5 U	--
CHROMIUM	--	1.25 J	--	1 U	--	--	--	1 U	--	--	1 U	--	1 U	--	1 U	--
COBALT	--	12.8	2.5 U	2.5 U	--	--	--	54.2	--	2.5 U	2.5 U	--	2.39 J	--	8.11	--
COPPER	--	2 U	--	2 U	--	--	--	2.17 J	--	--	2 U	--	2 U	--	2 U	--
IRON	--	5100 K	29400	29000 K	--	--	--	7470 K	--	20400	30600 K	--	21400	--	33200 K	--
LEAD	--	0.75 UL	--	1.5 U	--	--	--	0.75 UL	--	--	0.75 U	--	0.75 U	--	0.75 U	--
MANGANESE	--	192	181	180	--	--	--	406	--	186	187 L	--	503	--	445 L	--
MERCURY	--	0.16 UL	--	0.16 UL	--	--	--	0.16 UL	--	--	0.16 U	--	0.16 UL	--	0.16 U	--
NICKEL	--	7.43	--	1.5 U	--	--	--	39.7	--	--	1.5 U	--	1.5 U	--	4.41	--
SELENIUM	--	1.25 U	--	1.25 UL	--	--	--	1.25 U	--	--	1.25 U	--	1.25 U	--	1.25 U	--
SILVER	--	0.5 U	--	0.5 UL	--	--	--	0.5 U	--	--	0.5 UL	--	0.5 U	--	0.5 UL	--
THALLIUM	--	1 U	--	1 U	--	--	--	1 U	--	--	1 U	--	1 U	--	1 U	--
VANADIUM	--	2.5 U	--	2.5 U	--	--	--	1.34 J	--	--	2.5 U	--	1.47 J	--	1.41 J	--
ZINC	--	11.6	--	2.14 J	--	--	--	88.2	--	--	2.08 J	--	2.5 U	--	6.61	--

APPENDIX P
MONITORING WELL ANALYTICAL RESULTS
SITE 43 - TOLUENE DISPOSAL AREA
NAVAL SUPPORT FACILITY INDIAN HEAD
INDIAN HEAD, MARYLAND

LOCATION	S43MW013		S43MW014		S43MW015		S43MW016		S43MW017D			S43MW017S		S43MW018	
SAMPLE ID	S43MW01302	S43MW1301	S43MW01402	S43MW1401	S43MW01502	S43MW1501	S43MW01602_20130	S43MW1601	S43MW017D02	S43MW017D02-D	S43MW17D01	S43MW017S02	S43MW17S01	S43MW01802	S43MW1801
SAMPLE DATE	20130519	20120722	20130519	20120722	20130519	20120722	20130519	20120722	20130509	20130509	20120721	20130509	20120721	20130508	20120721
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	ORIG	DUP	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
MATRIX	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW
VOLATILES (UG/L)															
1,1,1-TRICHLOROETHANE	--	--	--	--	--	--	--	--	--	--	10 U	--	10 U	--	0.5 U
1,1,2,2-TETRACHLOROETHANE	--	--	--	--	--	--	--	--	--	--	10 U	--	10 U	--	0.5 U
1,1,2-TRICHLOROETHANE	--	--	--	--	--	--	--	--	--	--	10 U	--	10 U	--	0.5 U
1,1,2-TRICHLOROTRIFLUOROETHANE	--	--	--	--	--	--	--	--	--	--	10 U	--	10 U	--	0.5 U
1,1-DICHLOROETHANE	20.5	--	6.98	--	5.14	--	0.34 J	--	12.5 U	10 U	10 U	12.5 U	10 U	0.5 U	0.5 U
1,1-DICHLOROETHENE	3.36	--	0.68 J	--	0.51 J	--	0.5 U	--	12.5 U	5.6 J	6.2 J	12.5 U	6.6 J	0.5 U	0.5 U
1,2,3-TRICHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	10 U	--	10 U	--	0.5 U
1,2,4-TRICHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	10 U	--	10 U	--	0.5 U
1,2-DIBROMO-3-CHLOROPROPANE	--	--	--	--	--	--	--	--	--	--	10 U	--	10 U	--	0.5 U
1,2-DIBROMOETHANE	--	--	--	--	--	--	--	--	--	--	10 U	--	10 U	--	0.5 U
1,2-DICHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	10 U	--	10 U	--	0.5 U
1,2-DICHLOROETHANE	0.36 J	--	0.5 U	--	0.5 U	--	0.5 U	--	12.5 U	10 U	10 U	12.5 U	10 U	0.5 U	0.5 U
1,2-DICHLOROPROPANE	--	--	--	--	--	--	--	--	--	--	10 U	--	10 U	--	0.5 U
1,3-DICHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-DICHLOROPROPANE	--	--	--	--	--	--	--	--	--	--	10 U	--	10 U	--	0.5 U
1,4-DICHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	10 U	--	10 U	--	0.5 U
1,4-DIOXANE	--	--	--	--	--	--	--	--	--	--	200 UR	--	200 UR	--	10 UR
2-BUTANONE	--	--	--	--	--	--	--	--	--	--	100 U	--	100 U	--	5 U
2-HEXANONE	--	--	--	--	--	--	--	--	--	--	50 U	--	50 U	--	2.5 U
4-METHYL-2-PENTANONE	--	--	--	--	--	--	--	--	--	--	50 U	--	50 U	--	2.5 U
ACETONE	--	--	--	--	--	--	--	--	--	--	100 U	--	100 U	--	5 U
BENZENE	--	--	--	--	--	--	--	--	--	--	10 U	--	10 U	--	0.5 U
BROMOCHLOROMETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BROMODICHLOROMETHANE	--	--	--	--	--	--	--	--	--	--	10 U	--	10 U	--	0.5 U
BROMOFORM	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U	--	12.5 U	10 U	10 U	12.5 U	10 U	0.5 U	0.5 U
BROMOMETHANE	--	--	--	--	--	--	--	--	--	--	20 U	--	20 U	--	1 U
CARBON DISULFIDE	--	--	--	--	--	--	--	--	--	--	10 U	--	10 U	--	0.5 U
CARBON TETRACHLORIDE	--	--	--	--	--	--	--	--	--	--	10 U	--	10 U	--	0.5 U
CHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	10 U	--	10 U	--	0.5 U
CHLORODIBROMOMETHANE	--	--	--	--	--	--	--	--	--	--	10 U	--	10 U	--	0.5 U
CHLOROETHANE	--	--	--	--	--	--	--	--	--	--	20 U	--	20 U	--	1 U
CHLOROFORM	0.5 U	--	0.5 U	--	0.5 U	--	0.14 J	--	12.5 U	10 U	10 U	12.5 U	10 U	0.5 U	0.5 U
CHLOROMETHANE	--	--	--	--	--	--	--	--	--	--	10 U	--	10 U	--	0.5 U
CIS-1,2-DICHLOROETHENE	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U	--	214	217	255	176	212	1.02	1.59
CIS-1,3-DICHLOROPROPENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CYCLOHEXANE	--	--	--	--	--	--	--	--	--	--	10 U	--	10 U	--	0.5 U
DICHLORODIFLUOROMETHANE	--	--	--	--	--	--	--	--	--	--	20 U	--	20 U	--	1 U
ETHYLBENZENE	--	--	--	--	--	--	--	--	--	--	10 U	--	10 U	--	0.5 U
ISOPROPYLBENZENE	--	--	--	--	--	--	--	--	--	--	10 U	--	10 U	--	0.5 U
METHYL ACETATE	--	--	--	--	--	--	--	--	--	--	20 U	--	20 U	--	1 U
METHYL CYCLOHEXANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METHYL TERT-BUTYL ETHER	--	--	--	--	--	--	--	--	--	--	10 U	--	10 U	--	0.5 U
METHYLENE CHLORIDE	1 U	--	1 U	--	1 U	--	1 U	--	25 U	20 U	20 U	25 U	20 U	1 U	1 U
STYRENE	--	--	--	--	--	--	--	--	--	--	10 U	--	10 U	--	0.5 U
TETRACHLOROETHENE	--	--	--	--	--	--	--	--	--	--	10 U	--	10 U	--	0.5 U
TOLUENE	--	--	--	--	--	--	--	--	--	--	10 U	--	10 U	--	0.5 U
TOTAL XYLENES	--	--	--	--	--	--	--	--	--	--	20 U	--	20 U	--	1 U
TRANS-1,2-DICHLOROETHENE	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U	--	12.5 U	10 U	10 U	12.5 U	10 U	0.5 U	0.5 U
TRANS-1,3-DICHLOROPROPENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TRICHLOROETHENE	0.78 J	1.18	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1100	1290	2660	1280	2740	2.36	2.78
TRICHLOROFLUOROMETHANE	--	--	--	--	--	--	--	--	--	--	20 U	--	20 U	--	1 U
VINYL CHLORIDE	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U	--	22.8 J	56 J	65.6	18.5 J	45.2	0.5 U	0.5 U
VOLATILE GASES (UG/L)															
ETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ETHENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
EXPLOSIVES (UG/L)															
1,3,5-TRINITROBENZENE	--	--	--	--	--	--	--	--	--	--	0.168 U	--	0.151 U	--	0.168 U
1,3-DINITROBENZENE	--	--	--	--	--	--	--	--	--	--	0.168 U	--	0.151 U	--	0.168 U
2,4,6-TRINITROTOLUENE	--	--	--	--	--	--	--	--	--	--	0.168 U	--	0.151 U	--	0.168 U
2,4-DINITROTOLUENE	--	--	--	--	--	--	--	--	--	--	0.168 U	--	0.151 U	--	0.168 U
2,6-DINITROTOLUENE	--	--	--	--	--	--	--	--	--	--	0.168 U	--	0.151 U	--	0.168 U
2-AMINO-4,6-DINITROTOLUENE	--	--	--	--	--	--	--	--	--	--	0.168 U	--	0.151 U	--	0.168 U
2-NITROTOLUENE	--	--	--	--	--	--	--	--	--	--	0.168 U	--	0.151 U	--	0.168 U
3-NITROTOLUENE	--	--	--	--	--	--	--	--	--	--	0.168 U	--	0.419	--	0.168 U
4-AMINO-2,6-DINITROTOLUENE	--	--	--	--	--	--	--	--	--	--	0.168 U	--	0.151 U	--	0.168 U
4-NITROTOLUENE	--	--	--	--	--	--	--	--	--	--	2.13 J	--	0.6 J	--	0.168 U
HMX	--	--	--	--	--	--	--	--	--	--	0.135 J	--	0.236 J	--	0.123 J
NITROBENZENE	--	--	--	--	--	--	--	--	--	--	0.168 U	--	0.151 U	--	0.168 U
NITROCELLULOSE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NITROGLYCERIN	--	--	--	--	--	--	--	--	--	--	0.421 U	--	0.377 U	--	0.421 U
NITROGUANIDINE	--	--	--	--	--	--	--	--	--	--	10 U	--	10 U	--	10 U
RDX	--	--	--	--	--	--	--	--	--	--	0.103 B	--	0.499 B	--	0.348 B
TETRYL	--	--	--	--	--	--	--	--	--	--	0.168 U	--	0.151 U	--	0.168 U
MISCELLANEOUS PARAMETERS (UG/L)															
PERCHLORATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

LOCATION	S43MW013		S43MW014		S43MW015		S43MW016		S43MW017D			S43MW017S		S43MW018	
SAMPLE ID	S43MW01302	S43MW1301	S43MW01402	S43MW1401	S43MW01502	S43MW1501	S43MW01602_20130	S43MW1601	S43MW017D02	S43MW017D02-D	S43MW17D01	S43MW017S02	S43MW17S01	S43MW01802	S43MW1801
SAMPLE DATE	20130519	20120722	20130519	20120722	20130519	20120722	20130519	20120722	20130509	20130509	20120721	20130509	20120721	20130508	20120721
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	ORIG	DUP	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
MATRIX	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW
MISCELLANEOUS PARAMETERS (MG/L)															
CHLORIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CYANIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DISSOLVED ORGANIC CARBON	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NITRATE-N	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NITRITE-N	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SULFATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SULFIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METALS (UG/L)															
ALUMINUM	--	--	--	--	--	--	--	--	--	--	25 B	--	30.5 J	--	92.7
ANTIMONY	--	--	--	--	--	--	--	--	--	--	2 U	--	2 U	--	2 U
ARSENIC	1.5 UL	--	1.5 UL	--	1.5 UL	--	1.5 UL	--	2.44 J	2.06 J	2.21 J	2.32 J	2.01 J	1.5 U	1.5 U
BARIUM	--	--	--	--	--	--	--	--	--	--	109	--	80.9	--	143
BERYLLIUM	--	--	--	--	--	--	--	--	--	--	0.5 U	--	0.5 U	--	0.701 J
CADMIUM	--	--	--	--	--	--	--	--	--	--	0.5 U	--	0.5 U	--	0.909 J
CALCIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHROMIUM	--	--	--	--	--	--	--	--	--	--	1 U	--	1 U	--	1 U
COBALT	113	130	37.3	36	14.4	5.1	122	108	11.3	10.9	6.2	15.6	15.4	26.8	43.1
COPPER	--	--	--	--	--	--	--	--	--	--	2 U	--	2 U	--	1.1 J
CYANIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
IRON	65.4	--	2930	--	403	--	12.4 J	--	30000	29100	32900	29300	34900 K	90.2	192 K
LEAD	--	--	--	--	--	--	--	--	--	--	0.75 U	--	0.75 UL	--	0.75 UL
MAGNESIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MANGANESE	491	--	263	--	451	--	95.1	--	495	487	498	471	561	190	326
MERCURY	--	--	--	--	--	--	--	--	--	--	0.16 UL	--	0.16 UL	--	0.16 UL
NICKEL	--	--	--	--	--	--	--	--	--	--	1.35 J	--	4.47	--	52.9
POTASSIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SELENIUM	--	--	--	--	--	--	--	--	--	--	1.25 U	--	1.25 U	--	1.25 U
SILVER	--	--	--	--	--	--	--	--	--	--	0.5 U	--	0.5 U	--	0.5 U
SODIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
THALLIUM	--	--	--	--	--	--	--	--	--	--	1 U	--	1 U	--	1 U
VANADIUM	--	--	--	--	--	--	--	--	--	--	1.49 J	--	1.83 J	--	1.27 J
ZINC	--	--	--	--	--	--	--	--	--	--	4.06 J	--	13.4	--	71.7
DISSOLVED METALS (UG/L)															
ALUMINUM	--	--	--	--	--	--	--	--	--	--	25 B	--	25 U	--	79.6
ANTIMONY	--	--	--	--	--	--	--	--	--	--	2 U	--	2 U	--	2 U
ARSENIC	--	--	--	--	--	--	--	--	--	--	2.3 J	--	2.11 J	--	1.5 U
BARIUM	--	--	--	--	--	--	--	--	--	--	111	--	82.9	--	144
BERYLLIUM	--	--	--	--	--	--	--	--	--	--	0.5 U	--	0.5 U	--	0.734 J
CADMIUM	--	--	--	--	--	--	--	--	--	--	0.5 U	--	0.5 U	--	0.942 J
CHROMIUM	--	--	--	--	--	--	--	--	--	--	1 U	--	1 U	--	1 U
COBALT	--	127	--	34.8	--	5.1	--	108	--	--	6.24	--	15.7	--	44.2
COPPER	--	--	--	--	--	--	--	--	--	--	2 U	--	1.2 J	--	1.52 J
IRON	--	--	--	--	--	--	--	--	--	--	32100	--	36100 K	--	192 K
LEAD	--	--	--	--	--	--	--	--	--	--	0.75 U	--	0.75 UL	--	0.75 UL
MANGANESE	--	--	--	--	--	--	--	--	--	--	500	--	572	--	326
MERCURY	--	--	--	--	--	--	--	--	--	--	0.16 UL	--	0.16 UL	--	0.16 UL
NICKEL	--	--	--	--	--	--	--	--	--	--	1.55 J	--	4.63	--	54.4
SELENIUM	--	--	--	--	--	--	--	--	--	--	1.25 U	--	1.25 U	--	1.25 U
SILVER	--	--	--	--	--	--	--	--	--	--	0.5 U	--	0.5 U	--	0.5 U
THALLIUM	--	--	--	--	--	--	--	--	--	--	1 U	--	1 U	--	1 U
VANADIUM	--	--	--	--	--	--	--	--	--	--	1.46 J	--	1.73 J	--	2.5 U
ZINC	--	--	--	--	--	--	--	--	--	--	5.51	--	16.2	--	74.4

LOCATION	S43MW019D		S43MW019S			S43MW020		S43MW021		S43MW022		S43MW023		S43MW024	
SAMPLE ID	S43MW019D02	S43MW19D01	S43MW019S02	S43MW19S01	S43MW19S01-D	S43MW02002	S43MW2001	S43MW02102	S43MW2101	S43MW02202	S43MW2201	S43MW02302	S43MW2301	S43MW02402	S43MW2401
SAMPLE DATE	20130508	20120721	20130508	20120721	20120721	20130509	20120719	20130508	20120721	20130509	20120719	20130509	20120720	20130508	20120720
SAMPLE CODE	NORMAL	NORMAL	NORMAL	ORIG	DUP	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
MATRIX	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW
VOLATILES (UG/L)															
1,1,1-TRICHLOROETHANE	--	1 U	--	12.5 U	12.5 U	--	11.1	--	0.5 U	--	0.37 J	--	0.5 U	--	3.67
1,1,2,2-TETRACHLOROETHANE	--	1 U	--	12.5 U	12.5 U	--	5 U	--	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U
1,1,2-TRICHLOROETHANE	--	1 U	--	12.5 U	12.5 U	--	5 U	--	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U
1,1,2-TRICHLOROTRIFLUOROETHANE	--	1 U	--	12.5 U	12.5 U	--	5 U	--	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U
1,1-DICHLOROETHANE	0.5 U	1 U	12.5 U	9.75 J	10.2 J	5 U	5 U	0.5 U	0.5 U	0.58 J	3.49	13.2	0.4 J	41.9	39.6
1,1-DICHLOROETHENE	0.52 J	1 U	16 J	57	70	5 U	5 U	0.5 U	0.5 U	0.57 J	2.04	2.68	0.5 U	7.6	8.6
1,2,3-TRICHLOROBENZENE	--	1 U	--	12.5 U	12.5 U	--	5 U	--	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U
1,2,4-TRICHLOROBENZENE	--	1 U	--	12.5 U	12.5 U	--	5 U	--	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U
1,2-DIBROMO-3-CHLOROPROPANE	--	1 U	--	12.5 U	12.5 U	--	5 U	--	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U
1,2-DIBROMOETHANE	--	1 U	--	12.5 U	12.5 U	--	5 U	--	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U
1,2-DICHLOROBENZENE	--	1 U	--	12.5 U	12.5 U	--	5 U	--	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U
1,2-DICHLOROETHANE	0.5 U	1 U	12.5 U	12.5 U	12.5 U	5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-DICHLOROPROPANE	--	1 U	--	12.5 U	12.5 U	--	5 U	--	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U
1,3-DICHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-DICHLOROPROPANE	--	1 U	--	12.5 U	12.5 U	--	5 U	--	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U
1,4-DICHLOROBENZENE	--	1 U	--	12.5 U	12.5 U	--	5 U	--	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U
1,4-DIOXANE	--	20 UR	--	250 UR	250 UR	--	100 UR	--	10 UR	--	10 UR	--	10 UR	--	10 UR
2-BUTANONE	--	10 U	--	125 U	125 U	--	50 U	--	5 U	--	5 U	--	5 U	--	4.04 J
2-HEXANONE	--	5 U	--	62.5 U	62.5 U	--	25 U	--	2.5 U	--	2.5 U	--	2.5 U	--	2.5 U
4-METHYL-2-PENTANONE	--	5 U	--	62.5 U	62.5 U	--	25 U	--	2.5 U	--	2.5 U	--	2.5 U	--	2.5 U
ACETONE	--	10 U	--	125 U	125 U	--	50 U	--	5 U	--	5 U	--	5 U	--	7.56 J
BENZENE	--	1 U	--	12.5 U	12.5 U	--	5 U	--	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U
BROMOCHLOROMETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BROMODICHLOROMETHANE	--	1 U	--	12.5 U	12.5 U	--	5 U	--	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U
BROMOFORM	0.5 U	1 U	12.5 U	12.5 U	12.5 U	5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
BROMOMETHANE	--	2 U	--	25 U	25 U	--	10 U	--	1 U	--	1 U	--	1 U	--	1 U
CARBON DISULFIDE	--	1 U	--	12.5 U	12.5 U	--	5 U	--	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U
CARBON TETRACHLORIDE	--	1 U	--	12.5 U	12.5 U	--	5 U	--	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U
CHLOROBENZENE	--	1 U	--	12.5 U	12.5 U	--	5 U	--	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U
CHLORODIBROMOMETHANE	--	1 U	--	12.5 U	12.5 U	--	5 U	--	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U
CHLOROETHANE	--	2 U	--	25 U	25 U	--	10 U	--	1 U	--	1 U	--	1 U	--	1 U
CHLOROFORM	0.5 U	1 U	12.5 U	12.5 U	12.5 U	5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CHLOROMETHANE	--	1 U	--	12.5 U	12.5 U	--	5 U	--	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U
CIS-1,2-DICHLOROETHENE	32	30.5	56.2	158	166	5 J	2.5 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CIS-1,3-DICHLOROPROPENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CYCLOHEXANE	--	1 U	--	12.5 U	12.5 U	--	5 U	--	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U
DICHLORODIFLUOROMETHANE	--	2 U	--	25 U	25 U	--	10 U	--	1 UJ	--	1 U	--	1 U	--	1 U
ETHYLBENZENE	--	1 U	--	12.5 U	12.5 U	--	5 U	--	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U
ISOPROPYLBENZENE	--	1 U	--	12.5 U	12.5 U	--	5 U	--	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U
METHYL ACETATE	--	2 U	--	25 U	25 U	--	10 U	--	1 U	--	1 U	--	1 U	--	1 U
METHYL CYCLOHEXANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METHYL TERT-BUTYL ETHER	--	1 U	--	12.5 U	12.5 U	--	5 U	--	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U
METHYLENE CHLORIDE	1 U	2 U	25 U	25 U	25 U	10 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
STYRENE	--	1 U	--	12.5 U	12.5 U	--	5 U	--	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U
TETRACHLOROETHENE	--	1 U	--	12.5 U	12.5 U	--	5 U	--	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U
TOLUENE	--	1 U	--	12.5 U	12.5 U	--	5 U	--	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U
TOTAL XYLENES	--	2 U	--	25 U	25 U	--	10 U	--	1 U	--	1 U	--	1 U	--	1 U
TRANS-1,2-DICHLOROETHENE	0.53 J	1 U	12.5 U	12.5 U	12.5 U	5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
TRANS-1,3-DICHLOROPROPENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TRICHLOROETHENE	92.3	72.8	1690	3620	4090	1800	1390	4.63	0.83 J	0.5 U	0.54 J	2.27	1.59	0.5 U	0.5 U
TRICHLOROFLUOROMETHANE	--	2 U	--	25 U	25 U	--	10 U	--	1 U	--	1 U	--	1 U	--	1 U
VINYL CHLORIDE	6.96	9.12	12.5 U	12.5 U	12.5 U	5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
VOLATILE GASES (UG/L)															
ETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ETHENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
EXPLOSIVES (UG/L)															
1,3,5-TRINITROBENZENE	--	0.16 U	--	0.157 U	0.157 U	--	0.151 U	--	0.168 U	--	0.16 U	--	0.16 U	--	0.16 U
1,3-DINITROBENZENE	--	0.16 U	--	0.157 U	0.157 U	--	0.151 U	--	0.168 U	--	0.16 U	--	0.16 U	--	0.212 J
2,4,6-TRINITROTOLUENE	--	0.16 U	--	0.157 U	0.157 U	--	0.151 U	--	0.168 U	--	0.16 U	--	0.16 U	--	0.16 U
2,4-DINITROTOLUENE	--	0.16 U	--	0.157 U	0.157 U	--	0.151 U	--	0.168 U	--	0.16 U	--	0.16 U	--	0.16 U
2,6-DINITROTOLUENE	--	0.16 U	--	0.157 U	0.157 U	--	0.151 U	--	0.168 U	--	0.16 U	--	0.16 U	--	0.16 U
2-AMINO-4,6-DINITROTOLUENE	--	0.16 U	--	0.157 U	0.157 U	--	0.151 U	--	0.168 U	--	0.16 U	--	0.16 U	--	0.118 B
2-NITROTOLUENE	--	0.16 U	--	0.0967 B	0.157 U	--	0.0797 B	--	0.168 U	--	0.16 U	--	0.16 U	--	0.371 B
3-NITROTOLUENE	--	0.366 J	--	0.222 J	0.157 U	--	0.151 U	--	0.168 U	--	0.16 U	--	0.16 U	--	0.642
4-AMINO-2,6-DINITROTOLUENE	--	0.16 U	--	0.157 U	0.157 U	--	0.151 U	--	0.168 U	--	0.16 U	--	0.16 U	--	0.473
4-NITROTOLUENE	--	0.0904 J	--	0.303 J	0.0968 J	--	0.137 J	--	0.168 U	--	0.179 J	--	0.16 U	--	0.115 J
HMX	--	0.16 U	--	0.13 J	0.125 J	--	0.151 U	--	0.168 U	--	0.965	--	0.16 U	--	0.16 U
NITROBENZENE	--	0.16 U	--	0.157 U	0.157 U	--	0.151 U	--	0.117 B	--	0.16 U	--	0.16 U	--	0.865 B
NITROCELLULOSE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NITROGLYCERIN	--	0.4 U	--	0.392 U	0.392 U	--	0.377 U	--	0.421 U	--	0.4 U	--	0.4 U	--	0.307 B
NITROGUANIDINE	--	10 U	--	10 U	10 U	--	10 U	--	10 U	--	10 U	--	10 U	--	10 U
RDX	--	0.239 B	--	0.497 B	0.369 B	--	0.151 U	--	0.168 U	--	0.16 U	--	0.223 B	--	0.16 U
TETRYL	--	0.16 U	--	0.157 U	0.157 U	--	0.151 U	--	0.168 U	--	0.16 U	--	0.16 U	--	0.198 J
MISCELLANEOUS PARAMETERS (UG/L)															
PERCHLORATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

APPENDIX P
MONITORING WELL ANALYTICAL RESULTS
SITE 43 - TOLUENE DISPOSAL AREA
NAVAL SUPPORT FACILITY INDIAN HEAD
INDIAN HEAD, MARYLAND

LOCATION	S43MW019D		S43MW019S			S43MW020		S43MW021		S43MW022		S43MW023		S43MW024	
SAMPLE ID	S43MW019D02	S43MW19D01	S43MW019S02	S43MW19S01	S43MW19S01-D	S43MW02002	S43MW2001	S43MW02102	S43MW2101	S43MW02202	S43MW2201	S43MW02302	S43MW2301	S43MW02402	S43MW2401
SAMPLE DATE	20130508	20120721	20130508	20120721	20120721	20130509	20120719	20130508	20120721	20130509	20120719	20130509	20120720	20130508	20120720
SAMPLE CODE	NORMAL	NORMAL	NORMAL	ORIG	DUP	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
MATRIX	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW
MISCELLANEOUS PARAMETERS (MG/L)															
CHLORIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CYANIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DISSOLVED ORGANIC CARBON	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NITRATE-N	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NITRITE-N	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SULFATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SULFIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METALS (UG/L)															
ALUMINUM	--	28 B	--	124 K	122 K	--	122	--	70.5	--	57.9	--	47.7 J	--	127
ANTIMONY	--	2 U	--	2 U	2 U	--	2 U	--	2 U	--	2 U	--	2 U	--	2 U
ARSENIC	1.5 U	1.2 J	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 UL	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U
BARIUM	--	123	--	248	246	--	84.5	--	86.8	--	170	--	47.9	--	48.9
BERYLLIUM	--	0.5 U	--	1.95	1.94	--	0.709 J	--	0.422 J	--	1.61	--	0.479 J	--	0.5 U
CADMIUM	--	0.5 U	--	0.652 J	0.614 J	--	0.368 J	--	0.5 U	--	0.29 J	--	0.5 U	--	0.5 U
CALCIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHROMIUM	--	1 U	--	1 U	1 U	--	1 U	--	1 U	--	1 U	--	1 U	--	4.45
COBALT	2.5 U	2.5 U	147	124	124	15.6	19.9	5.21	33	55.7	73.2	6.67	4.31	3.83	1.95 J
COPPER	--	2 U	--	1.4 J	1.29 J	--	2 U	--	2 U	--	1.35 J	--	2 U	--	8.18
CYANIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
IRON	23800	27000	1910	6210	5970	2680	1180	1920	5990 K	70.2	827	468	1660	52.2	115
LEAD	--	0.75 U	--	0.75 U	0.75 U	--	0.75 U	--	0.75 UL	--	0.75 U	--	0.75 U	--	0.75 U
MAGNESIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MANGANESE	541	522	1160	1140	1110	124	234	172	888	319	511	223	160	60.4	79.5
MERCURY	--	0.16 UL	--	0.16 UL	0.16 UL	--	0.16 U	--	0.16 UL	--	0.16 U	--	0.16 U	--	0.16 U
NICKEL	--	1.5 U	--	46.6	45.7	--	22.5	--	15.3	--	42.5	--	9.21	--	1.6 J
POTASSIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SELENIUM	--	1.25 U	--	1.25 U	1.25 U	--	1.25 U	--	1.25 U	--	1.25 U	--	1.25 U	--	1.25 U
SILVER	--	0.5 U	--	0.5 U	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U
SODIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
THALLIUM	--	1 U	--	0.799 J	0.803 J	--	1 U	--	1 U	--	1 U	--	1 U	--	1 U
VANADIUM	--	1.72 J	--	3.12	3.03 J	--	2.5 U	--	2.95 J	--	1.56 J	--	2.5 U	--	2.5 U
ZINC	--	1.32 J	--	92.4	91.1	--	35.6	--	22.2	--	57	--	12.1	--	7.21
DISSOLVED METALS (UG/L)															
ALUMINUM	--	25 B	--	101 B	108 B	--	49.9 B	--	17.3 J	--	73.2 B	--	30.8 B	--	67.7 B
ANTIMONY	--	2 U	--	2 U	2 U	--	2 U	--	2 U	--	2 U	--	2 U	--	2 U
ARSENIC	--	1.5 U	--	1.5 U	1.5 U	1.5 U	1.5 U	--	1.5 U	--	1.5 U	--	1.5 U	--	1.14 J
BARIUM	--	117	--	242	232	--	78.7	--	88.4	--	160	--	42.8	--	48.7
BERYLLIUM	--	0.5 U	--	1.86	1.85	--	0.629 J	--	0.414 J	--	1.51	--	0.426 J	--	0.5 U
CADMIUM	--	0.5 U	--	0.596 J	0.765 J	--	0.348 J	--	0.5 U	--	0.257 J	--	0.5 U	--	0.5 U
CHROMIUM	--	1 U	--	1 U	1 U	--	1 U	--	1 U	--	1 U	--	1 U	--	4.5 K
COBALT	--	2.5 U	--	121	117	15.1	19.7	--	33.6	--	71.8	--	3.85	--	2 J
COPPER	--	2 U	--	1.28 J	1.13 J	--	2 U	--	2 U	--	1.49 J	--	2 U	--	8.61
IRON	--	25700	--	5930	5800	559	1020	--	6050 K	--	821	--	1410	--	66
LEAD	--	0.75 U	--	0.75 U	0.75 U	--	0.75 U	--	0.75 UL	--	0.75 U	--	0.75 U	--	0.75 U
MANGANESE	--	502	--	1090	1060	119	223	--	907	--	499	--	142	--	83.3
MERCURY	--	0.16 UL	--	0.16 UL	0.16 UL	--	0.16 U	--	0.16 U	--	0.16 U	--	0.16 U	--	0.16 U
NICKEL	--	1.5 U	--	45.1	43.3	--	20.6	--	15.6	--	39.5	--	8.32	--	2.03 J
SELENIUM	--	1.25 U	--	1.25 U	1.25 U	--	1.25 U	--	1.25 U	--	1.25 U	--	1.25 U	--	0.855 J
SILVER	--	0.5 U	--	0.5 U	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U
THALLIUM	--	1 U	--	1 U	0.751 J	--	1 U	--	1 U	--	1 U	--	1 U	--	1 U
VANADIUM	--	1.54 J	--	2.89 J	2.82 J	--	2.5 U	--	2.52 J	--	1.35 J	--	2.5 U	--	2.5 U
ZINC	--	1.41 J	--	89.1	86.2	--	34.8	--	22.7	--	59.8	--	12.5	--	11.4

LOCATION	S43MW025		S43MW026			S43MW027	S43MW028	S43MW029	S43MW030		S43PZ001	S43PZ002	S43PZ003	S43PZ004
SAMPLE ID	S43MW02502	S43MW2501	S43MW02602	S43MW2601	S43MW26-	S43MW02701	S43MW02801	S43MW02901	S43MW03001	S43MW03001-D	S43PZ001	S43PZ002	S43PZ003	S43PZ004
SAMPLE DATE	20130508	20120720	20130509	20120718	20130429	20130513	20130513	20130513	20130513	20130513	20130514	20130514	20130514	20130514
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	ORIG	DUP	NORMAL	NORMAL	NORMAL	NORMAL
MATRIX	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW
VOLATILES (UG/L)														
1,1,1-TRICHLOROETHANE	--	0.5 U	--	0.5 U	--	--	--	--	--	--	--	--	--	--
1,1,2,2-TETRACHLOROETHANE	--	0.5 U	--	0.5 U	--	--	--	--	--	--	--	--	--	--
1,1,2-TRICHLOROETHANE	--	0.5 U	--	0.5 U	--	--	--	--	--	--	--	--	--	--
1,1,2-TRICHLOROTRIFLUOROETHANE	--	0.5 U	--	0.5 U	--	--	--	--	--	--	--	--	--	--
1,1-DICHLOROETHANE	1.46	0.76 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	1 U	0.5 U	0.5 U	0.59 J	0.47 J
1,1-DICHLOROETHENE	0.8 J	0.8 J	0.5 U	0.5 U	0.5 U	0.5 U	0.34 J	0.5 U	0.72 J	0.78 J	0.5 U	0.5 U	1.34	0.5 U
1,2,3-TRICHLOROBENZENE	--	0.5 U	--	0.5 U	--	--	--	--	--	--	--	--	--	--
1,2,4-TRICHLOROBENZENE	--	0.5 U	--	0.5 U	--	--	--	--	--	--	--	--	--	--
1,2-DIBROMO-3-CHLOROPROPANE	--	0.5 U	--	0.5 U	--	--	--	--	--	--	--	--	--	--
1,2-DIBROMOETHANE	--	0.5 U	--	0.5 U	--	--	--	--	--	--	--	--	--	--
1,2-DICHLOROBENZENE	--	0.5 U	--	0.5 U	--	--	--	--	--	--	--	--	--	--
1,2-DICHLOROETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-DICHLOROPROPANE	--	0.5 U	--	0.5 U	--	--	--	--	--	--	--	--	--	--
1,3-DICHLOROBENZENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-DICHLOROPROPANE	--	0.5 U	--	0.5 U	--	--	--	--	--	--	--	--	--	--
1,4-DICHLOROBENZENE	--	0.5 U	--	0.5 U	--	--	--	--	--	--	--	--	--	--
1,4-DIOXANE	--	10 UR	--	10 UR	--	--	--	--	--	--	--	--	--	--
2-BUTANONE	--	5 U	--	5 U	--	--	--	--	--	--	--	--	--	--
2-HEXANONE	--	2.5 U	--	2.5 U	--	--	--	--	--	--	--	--	--	--
4-METHYL-2-PENTANONE	--	2.5 U	--	2.5 U	--	--	--	--	--	--	--	--	--	--
ACETONE	--	5 U	--	5 U	--	--	--	--	--	--	--	--	--	--
BENZENE	--	0.5 U	--	0.5 U	--	--	--	--	--	--	--	--	--	--
BROMOCHLOROMETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BROMODICHLOROMETHANE	--	0.5 U	--	0.5 U	--	--	--	--	--	--	--	--	--	--
BROMOFORM	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U
BROMOMETHANE	--	1 U	--	1 U	--	--	--	--	--	--	--	--	--	--
CARBON DISULFIDE	--	0.5 U	--	0.5 U	--	--	--	--	--	--	--	--	--	--
CARBON TETRACHLORIDE	--	0.5 U	--	0.5 U	--	--	--	--	--	--	--	--	--	--
CHLOROBENZENE	--	0.5 U	--	0.5 U	--	--	--	--	--	--	--	--	--	--
CHLORODIBROMOMETHANE	--	0.5 U	--	0.5 U	--	--	--	--	--	--	--	--	--	--
CHLOROETHANE	--	1 U	--	1 U	--	--	--	--	--	--	--	--	--	--
CHLOROFORM	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U
CHLOROMETHANE	--	0.5 U	--	0.5 U	--	--	--	--	--	--	--	--	--	--
CIS-1,2-DICHLOROETHENE	0.95 J	1	0.5 U	0.5 U	0.5 U	0.5 U	1.88	0.5 U	77.3	76.6	0.5 U	2.53	9.9	0.5 U
CIS-1,3-DICHLOROPROPENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CYCLOHEXANE	--	0.5 U	--	0.5 U	--	--	--	--	--	--	--	--	--	--
DICHLORODIFLUOROMETHANE	--	1 U	--	1 U	--	--	--	--	--	--	--	--	--	--
ETHYLBENZENE	--	0.5 U	--	0.5 U	--	--	--	--	--	--	--	--	--	--
ISOPROPYLBENZENE	--	0.5 U	--	0.5 U	--	--	--	--	--	--	--	--	--	--
METHYL ACETATE	--	1 U	--	1 U	--	--	--	--	--	--	--	--	--	--
METHYL CYCLOHEXANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METHYL TERT-BUTYL ETHER	--	0.5 U	--	0.5 U	--	--	--	--	--	--	--	--	--	--
METHYLENE CHLORIDE	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1.64 J	1.8 J	1 U	0.5 J	1 U	1 U
STYRENE	--	0.5 U	--	0.5 U	--	--	--	--	--	--	--	--	--	--
TETRACHLOROETHENE	--	0.5 U	--	0.5 U	--	--	--	--	--	--	--	--	--	--
TOLUENE	--	0.5 U	--	0.5 U	--	--	--	--	--	--	--	--	--	--
TOTAL XYLENES	--	1 U	--	1 U	--	--	--	--	--	--	--	--	--	--
TRANS-1,2-DICHLOROETHENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	7.86	7.8	0.5 U	0.5 U	0.69 J	0.5 U
TRANS-1,3-DICHLOROPROPENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TRICHLOROETHENE	2.15	9.22	1.24	0.51 J	2.02	0.5 U	2.14	0.5 U	102	101	0.5 U	0.5 U	41.8	0.5 U
TRICHLOROFLUOROMETHANE	--	1 U	--	1 U	--	--	--	--	--	--	--	--	--	--
VINYL CHLORIDE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	17.6	17.2	0.5 U	0.91 J	0.81 J	0.5 U
VOLATILE GASES (UG/L)														
ETHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ETHENE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METHANE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
EXPLOSIVES (UG/L)														
1,3,5-TRINITROBENZENE	--	0.178 U	--	0.157 U	--	--	--	--	--	--	--	--	--	--
1,3-DINITROBENZENE	--	0.186 J	--	0.157 U	--	--	--	--	--	--	--	--	--	--
2,4,6-TRINITROTOLUENE	--	0.178 U	--	0.157 U	--	--	--	--	--	--	--	--	--	--
2,4-DINITROTOLUENE	--	0.178 U	--	0.157 U	--	--	--	--	--	--	--	--	--	--
2,6-DINITROTOLUENE	--	0.178 U	--	0.157 U	--	--	--	--	--	--	--	--	--	--
2-AMINO-4,6-DINITROTOLUENE	--	0.178 U	--	0.157 U	--	--	--	--	--	--	--	--	--	--
2-NITROTOLUENE	--	0.353 B	--	0.157 U	--	--	--	--	--	--	--	--	--	--
3-NITROTOLUENE	--	0.301 J	--	0.157 U	--	--	--	--	--	--	--	--	--	--
4-AMINO-2,6-DINITROTOLUENE	--	0.178 U	--	0.157 U	--	--	--	--	--	--	--	--	--	--
4-NITROTOLUENE	--	0.114 J	--	0.157 U	--	--	--	--	--	--	--	--	--	--
HMX	--	0.178 U	--	0.157 U	--	--	--	--	--	--	--	--	--	--
NITROBENZENE	--	0.178 U	--	0.157 U	--	--	--	--	--	--	--	--	--	--
NITROCELLULOSE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NITROGLYCERIN	--	0.295 B	--	0.392 U	--	--	--	--	--	--	--	--	--	--
NITROGUANIDINE	--	10 U	--	10 U	--	--	--	--	--	--	--	--	--	--
RDX	--	0.178 U	--	0.157 U	--	--	--	--	--	--	--	--	--	--
TETRYL	--	0.178 U	--	0.157 U	--	--	--	--	--	--	--	--	--	--
MISCELLANEOUS PARAMETERS (UG/L)														
PERCHLORATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--

LOCATION	S43MW025		S43MW026			S43MW027	S43MW028	S43MW029	S43MW030		S43PZ001	S43PZ002	S43PZ003	S43PZ004
SAMPLE ID	S43MW02502	S43MW2501	S43MW02602	S43MW2601	S43MW26-	S43MW02701	S43MW02801	S43MW02901	S43MW03001	S43MW03001-D	S43PZ001	S43PZ002	S43PZ003	S43PZ004
SAMPLE DATE	20130508	20120720	20130509	20120718	20130429	20130513	20130513	20130513	20130513	20130513	20130514	20130514	20130514	20130514
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	ORIG	DUP	NORMAL	NORMAL	NORMAL	NORMAL
MATRIX	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW
MISCELLANEOUS PARAMETERS (MG/L)														
CHLORIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CYANIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DISSOLVED ORGANIC CARBON	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NITRATE-N	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NITRITE-N	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SULFATE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SULFIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
METALS (UG/L)														
ALUMINUM	--	39.3 J	--	49.1 J	--	--	--	--	--	--	--	--	--	--
ANTIMONY	--	2 U	--	2 U	--	--	--	--	--	--	--	--	--	--
ARSENIC	1.5 U	1.5 U	1.5 U	1.5 U	--	1.5 UL	1.32 J	1.5 UL	1.5 UL	1.5 UL	2.81 L	1.64 J	1.5 UL	1.5 UL
BARIUM	--	92.9	--	45.1	--	--	--	--	--	--	--	--	--	--
BERYLLIUM	--	0.5 U	--	0.42 J	--	--	--	--	--	--	--	--	--	--
CADMIUM	--	0.5 U	--	0.5 U	--	--	--	--	--	--	--	--	--	--
CALCIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHROMIUM	--	1 U	--	1.53 J	--	--	--	--	--	--	--	--	--	--
COBALT	30.4	2.35 J	6.35	4.85	--	25.8	5.7	45.2	2.5 U	2.5 U	7.62	15	2.5 U	9.42
COPPER	--	1.37 J	--	2 U	--	--	--	--	--	--	--	--	--	--
CYANIDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--
IRON	402	1510	15 U	209	--	14000	1200	2140	24400	24700	32100	10700	21400	102
LEAD	--	0.75 UL	--	0.75 U	--	--	--	--	--	--	--	--	--	--
MAGNESIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MANGANESE	494	184	51.6	32.7	--	492	63.6	572	376	375	2060	600	343	135
MERCURY	--	0.16 U	--	0.16 U	--	--	--	--	--	--	--	--	--	--
NICKEL	--	3.09	--	7.88	--	--	--	--	--	--	--	--	--	--
POTASSIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SELENIUM	--	1.25 U	--	1.25 U	--	--	--	--	--	--	--	--	--	--
SILVER	--	0.5 U	--	0.5 U	--	--	--	--	--	--	--	--	--	--
SODIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--
THALLIUM	--	1 U	--	1 U	--	--	--	--	--	--	--	--	--	--
VANADIUM	--	2.5 U	--	2.5 U	--	--	--	--	--	--	--	--	--	--
ZINC	--	4.86 J	--	13.2	--	--	--	--	--	--	--	--	--	--
DISSOLVED METALS (UG/L)														
ALUMINUM	--	41.7 B	--	54.3 B	--	--	--	--	--	--	--	--	--	--
ANTIMONY	--	2 U	--	2 U	--	--	--	--	--	--	--	--	--	--
ARSENIC	--	1.5 U	--	1.5 U	--	--	--	--	--	--	--	1.5 UL	--	--
BARIUM	--	85.7	--	44.5	--	--	--	--	--	--	--	--	--	--
BERYLLIUM	--	0.5 U	--	0.409 J	--	--	--	--	--	--	--	--	--	--
CADMIUM	--	0.5 U	--	0.5 U	--	--	--	--	--	--	--	--	--	--
CHROMIUM	--	1 U	--	1.4 J	--	--	--	--	--	--	--	--	--	--
COBALT	--	2.31 J	--	5.08	--	--	--	--	--	--	--	16.6	--	--
COPPER	--	1.42 J	--	1.17 J	--	--	--	--	--	--	--	--	--	--
IRON	--	1580	--	150	--	--	--	--	--	--	--	6670	--	--
LEAD	--	0.75 U	--	0.75 U	--	--	--	--	--	--	--	--	--	--
MANGANESE	--	179	--	33.4	--	--	--	--	--	--	--	563	--	--
MERCURY	--	0.16 U	--	0.16 U	--	--	--	--	--	--	--	--	--	--
NICKEL	--	2.82	--	7.76	--	--	--	--	--	--	--	--	--	--
SELENIUM	--	1.25 U	--	1.25 U	--	--	--	--	--	--	--	--	--	--
SILVER	--	0.5 U	--	0.5 U	--	--	--	--	--	--	--	--	--	--
THALLIUM	--	1 U	--	1 U	--	--	--	--	--	--	--	--	--	--
VANADIUM	--	2.5 U	--	2.5 U	--	--	--	--	--	--	--	--	--	--
ZINC	--	5.91	--	15.7	--	--	--	--	--	--	--	--	--	--

APPENDIX P
SOIL GAS AND INDOOR AIR ANALYTICAL RESULTS
SITE 43 - TOLUENE DISPOSAL AREA
NAVAL SUPPORT FACILITY INDIAN HEAD
INDIAN HEAD, MARYLAND

LOCATION	S43IND01		S43IND02	S43SG01	S43SG03	S43SG04	S43SG05		S43SG06	S43SG07	S43SG08
SAMPLE ID	S43IND01	S43IND01-D	S43IND02	S43SG0106	S43SG0305	S43SG0406	S43SG05-0708_20130506	S43SG05-0708_20130506-D	S43SG06-0708_20130507	S43SG07-1011_20130506	S43SG08-0708_20130506
SAMPLE DATE	20120420	20120420	20120420	20110611	20110611	20110611	20130506	20130506	20130507	20130506	20130506
SAMPLE CODE	ORIG	DUP	NORMAL	NORMAL	NORMAL	NORMAL	ORIG	DUP	NORMAL	NORMAL	NORMAL
MATRIX	AS	AS	AS	SG	SG	SG	SG	SG	SG	SG	SG
VOLATILE ORGANICS FOR AIR REPORTED IN METERS CUBED (UG/M3)											
1,1,1-TRICHLOROETHANE	0.072 J	0.035 J	0.04 J	45 U	0.24 J	1000 U	0.33 J	0.36	21	18	3.9
1,1,2,2-TETRACHLOROETHANE	--	--	--	56 U	0.088 U	1300 U	--	--	--	--	--
1,1,2-TRICHLOROETHANE	--	--	--	45 U	0.058 U	1000 U	--	--	--	--	--
1,1,2-TRICHLOROTRIFLUOROETHANE	--	--	--	63 U	1.1 U	1400 U	--	--	--	--	--
1,1-DICHLOROETHANE	0.014 U	0.014 U	0.015 U	140	0.069 J	760 U	0.48	0.59	6.7	2.7	0.026 U
1,1-DICHLOROETHENE	0.014 U	0.014 U	0.015 U	33 U	0.19	740 U	1.5	2	9.5	28	0.025 U
1,2,4-TRICHLOROBENZENE	--	--	--	140 U	2.6 U	3100 U	--	--	--	--	--
1,2-DIBROMO-3-CHLOROPROPANE	--	--	--	800 U	14 U	18000 U	--	--	--	--	--
1,2-DIBROMOETHANE	--	--	--	63 U	1.1 U	1400 U	--	--	--	--	--
1,2-DICHLOROBENZENE	--	--	--	50 U	0.88 U	1100 U	--	--	--	--	--
1,2-DICHLOROETHANE	0.098 B	0.08 B	0.088 B	33 U	0.07 J	760 U	0.067 U	0.03 U	0.24 U	0.24 U	0.027 U
1,2-DICHLOROPROPANE	--	--	--	38 U	0.67 U	860 U	--	--	--	--	--
1,4-DICHLOROBENZENE	--	--	--	50 U	0.88 U	1100 U	--	--	--	--	--
1,4-DIOXANE	0.52 U	0.52 U	0.55 U	67 U	0.68 J	1500 U	0.56 U	0.26 U	2.1 U	2.1 U	0.23 U
2-BUTANONE	1 J	0.91 J	1 J	160 J	100	1600 J	26	32	26	38	19
2-HEXANONE	0.59 U	0.59 U	0.62 U	76 U	12	1700 U	9.3	12	8.2 U	12 J	8.3
4-METHYL-2-PENTANONE	0.59 U	0.59 U	0.62 U	76 U	0.6 U	1600 J	14	19	6.5	23	12
ACETONE	6.5 J	5 J	5.7 J	3100	190	690000	72	84	220	240	140
BENZENE	0.45	0.28 J	0.27 J	26 U	1.1	600 U	6.6	7.4	13	11	12
BROMODICHLOROMETHANE	--	--	--	55 U	0.98 U	1200 U	--	--	--	--	--
BROMOFORM	1.5 U	1.5 U	1.6 U	85 U	1.5 U	1900 U	1.6 U	0.73 U	5.9 U	5.9 U	0.66 U
BROMOMETHANE	--	--	--	32 U	0.91 U	730 U	--	--	--	--	--
CARBON DISULFIDE	0.44 U	0.44 U	0.48 U	26 U	2.8 J	580 U	21	27	220	19 J	20
CARBON TETRACHLORIDE	0.9 U	0.9 U	0.96 U	52 U	0.92 U	1200 U	2 U	0.89 U	7.2 U	7.2 U	0.8 U
CHLOROBENZENE	--	--	--	38 U	0.67 U	860 U	--	--	--	--	--
CHLORODIBROMOMETHANE	--	--	--	70 U	1.2 U	1600 U	--	--	--	--	--
CHLOROETHANE	0.38 U	0.38 U	0.4 U	180 J	0.64 J	1100 U	1.4 U	0.65 U	5.3 U	5.3 U	0.59 U
CHLOROFORM	0.7 U	0.7 U	0.75 U	40 U	0.71 U	910 U	0.76 U	0.34 U	19	2.8 U	0.31 U
CHLOROMETHANE	0.91	0.68 J	1.1 J	100 J	2.3	870 U	1.2 J	0.83 J	2.4 U	2.4 U	0.58 J
CIS-1,2-DICHLOROETHENE	0.015 B	0.014 U	0.015 U	140	59	29000	1.6	1.9	6.1	24	0.11 J
CYCLOHEXANE	--	--	--	28 U	0.5 U	640 U	--	--	--	--	--
DICHLORODIFLUOROMETHANE	2.8	2.7 J	2.4 J	41 U	2.7	920 U	1.2 J	0.85 J	3.8 J	2.8 U	2.5
ETHYLBENZENE	0.13 J	0.11 J	0.12 J	36 U	0.53	810 U	15	18	18	29	34
ISOPROPYLBENZENE	--	--	--	40 U	0.72 U	920 U	--	--	--	--	--
M+P-XYLENES	--	--	--	100	1.1	810 U	--	--	--	--	--
METHYL ACETATE	--	--	--	250 U	4.4 U	5700 U	--	--	--	--	--
METHYL TERT-BUTYL ETHER	0.1 U	0.1 U	0.11 U	30 U	0.083 J	670 U	0.056 U	0.07 J	0.21 U	0.86 J	1.1
METHYLENE CHLORIDE	0.5 U	0.5 U	0.53 U	29 U	5	650 U	0.54 U	0.24 U	2 U	2 U	0.22 U
O-XYLENE	--	--	--	36 U	0.68	810 U	--	--	--	--	--
STYRENE	--	--	--	35 U	0.62 U	800 U	--	--	--	--	--
TETRACHLOROETHENE	0.17 J	0.074 J	0.076 J	56 U	0.19 J	1300 U	0.75	0.86	2.1	6.8	6.9
TOLUENE	1.3	0.63 J	0.66 J	790	2	700 U	180 J	81 J	92	110	100
TRANS-1,2-DICHLOROETHENE	0.014 U	0.014 U	0.015 U	33 U	0.44 J	740 U	0.077 J	0.063 J	0.23 U	1.2 J	0.025 U
TRICHLOROETHENE	0.16 J	0.019 U	0.023 B	44 U	0.33	1000 U	58	71	1200	1400	0.51
TRICHLOROFLUOROMETHANE	1.1	1.2 J	1.3 J	46 U	1.6 J	1000 U	0.88 U	0.4 U	3.2 U	3.2 U	1.2
VINYL CHLORIDE	0.0091 U	0.0091 U	0.011 J	30000	100	1100 U	0.25	0.29	0.43	22	0.04 J

APPENDIX P
SEEP AND SURFACE WATER ANALYTICAL RESULTS
SITE 43 - TOLUENE DISPOSAL AREA
NAVAL SUPPORT FACILITY INDIAN HEAD
INDIAN HEAD, MARYLAND

LOCATION	S43CL01	S43OF01	S43SP01		S43SP02		S43SW01		S43SW02	S43SW04
SAMPLE ID	S43CL01_20130510	S43OF01_20130510	S43SP01-01	S43SP0102_20130510	S43SP02-01	S43SP0202_20130510	S43SW01_20130510	S43SW01_20130510-D	S43SW02_20130510	S43SW04_20130510
SAMPLE DATE	20130510	20130510	20120620	20130510	20120621	20130510	20130510	20130510	20130510	20130510
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	ORIG	DUP	NORMAL	NORMAL
MATRIX	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW
METALS (UG/L)										
ARSENIC	1.5 U	0.751 J	--	1.5 U	--	1.5 U	1.5 U	1.5 U	1.21 J	1.5 U
COBALT	2.5 U	6.58	--	7.13	--	25.9	4.16	4.17	6.38	10.7
IRON	2590	1750	--	1290	--	761	1450	1450	3340	1670
MANGANESE	41.2	189	--	134	--	65.7	128	129	192	256
VOLATILES (UG/L)										
1,1,1-TRICHLOROETHANE	--	--	2.36	--	0.5 U	--	--	--	--	--
1,1,2,2-TETRACHLOROETHANE	--	--	1 U	--	0.5 U	--	--	--	--	--
1,1,2-TRICHLOROETHANE	--	--	1 U	--	0.5 U	--	--	--	--	--
1,1,2-TRICHLOROTRIFLUOROETHANE	--	--	1 U	--	0.5 U	--	--	--	--	--
1,1-DICHLOROETHANE	0.5 U	0.5 J	1 U	0.84 J	0.49 J	0.5 U	0.75 J	0.69 J	0.34 J	0.5 U
1,1-DICHLOROETHENE	0.5 U	0.37 J	1 U	1 U	4.43	0.5 U	0.5 U	0.5 U	0.5 U	0.7 J
1,2,3-TRICHLOROBENZENE	--	--	1 UJ	--	0.5 U	--	--	--	--	--
1,2,4-TRICHLOROBENZENE	--	--	1 UJ	--	0.5 U	--	--	--	--	--
1,2-DIBROMO-3-CHLOROPROPANE	--	--	1 U	--	0.5 U	--	--	--	--	--
1,2-DIBROMOETHANE	--	--	1 U	--	0.5 U	--	--	--	--	--
1,2-DICHLOROBENZENE	--	--	1 U	--	0.5 U	--	--	--	--	--
1,2-DICHLOROETHANE	0.5 U	0.5 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-DICHLOROPROPANE	--	--	1 U	--	0.5 U	--	--	--	--	--
1,3-DICHLOROPROPANE	--	--	1 U	--	0.5 U	--	--	--	--	--
1,4-DICHLOROBENZENE	--	--	1 U	--	0.5 U	--	--	--	--	--
1,4-DIOXANE	--	--	20 UR	--	10 UR	--	--	--	--	--
2-BUTANONE	--	--	10 U	--	5 U	--	--	--	--	--
2-HEXANONE	--	--	5 U	--	2.5 U	--	--	--	--	--
4-METHYL-2-PENTANONE	--	--	5 U	--	2.5 U	--	--	--	--	--
ACETONE	--	--	10 U	--	25.8 B	--	--	--	--	--
BENZENE	--	--	1 U	--	0.5 U	--	--	--	--	--
BROMODICHLOROMETHANE	--	--	1 U	--	0.5 U	--	--	--	--	--
BROMOFORM	0.5 U	0.5 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
BROMOMETHANE	--	--	2 U	--	1 U	--	--	--	--	--
CARBON DISULFIDE	--	--	1 U	--	0.5 U	--	--	--	--	--
CARBON TETRACHLORIDE	--	--	1 U	--	0.5 U	--	--	--	--	--
CHLOROBENZENE	--	--	1 U	--	0.5 U	--	--	--	--	--
CHLORODIBROMOMETHANE	--	--	1 U	--	0.5 U	--	--	--	--	--
CHLOROETHANE	--	--	2 U	--	1 U	--	--	--	--	--
CHLOROFORM	0.5 U	0.5 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CHLOROMETHANE	--	--	1 U	--	0.5 U	--	--	--	--	--
CIS-1,2-DICHLOROETHENE	0.5 U	1.79	3.62	2.08	195	0.44 J	1.37	1.31	1.78	48.2
CYCLOHEXANE	--	--	1 U	--	0.5 U	--	--	--	--	--
DICHLORODIFLUOROMETHANE	--	--	2 U	--	1 U	--	--	--	--	--
ETHYLBENZENE	--	--	1 U	--	0.5 U	--	--	--	--	--
ISOPROPYLBENZENE	--	--	1 U	--	0.5 U	--	--	--	--	--
METHYL ACETATE	--	--	2 U	--	1 U	--	--	--	--	--
METHYL TERT-BUTYL ETHER	--	--	1 U	--	0.5 U	--	--	--	--	--
METHYLENE CHLORIDE	1 U	1 U	2 U	1 J	0.65 J	1 U	1 U	1 U	1 U	1 U
STYRENE	--	--	1 U	--	0.5 U	--	--	--	--	--
TETRACHLOROETHENE	--	--	0.24 J	--	0.5 U	--	--	--	--	--
TOLUENE	--	--	1 U	--	0.5 U	--	--	--	--	--
TOTAL XYLENES	--	--	2 U	--	1 U	--	--	--	--	--
TRANS-1,2-DICHLOROETHENE	0.5 U	0.5 U	1 U	1 U	1.09	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
TRICHLOROETHENE	0.5 U	4.98	354	156	28.7	1.86	27.2	26.6	10.2	30.5
TRICHLOROFLUOROMETHANE	--	--	2 U	--	1 U	--	--	--	--	--
VINYL CHLORIDE	0.5 U	0.5 U	1 U	1 U	1.16	0.5 U	0.5 U	0.5 U	0.5 U	1.26

APPENDIX P
SEDIMENT ANALYTICAL RESULTS
SITE 43 - TOLUENE DISPOSAL AREA
NAVAL SUPPORT FACILITY INDIAN HEAD
INDIAN HEAD, MARYLAND

LOCATION	**S43SD01**		**S43SD02**	**S43SD04**
SAMPLE ID	**S43SD01_20130510**	**S43SD01_20130510-D**	**S43SD02_20130510**	**S43SD04_20130510**
SAMPLE DATE	**20130510**	**20130510**	**20130510**	**20130510**
SAMPLE CODE	**ORIG**	**DUP**	**NORMAL**	**NORMAL**
MATRIX	**SD**	**SD**	**SD**	**SD**
METALS (MG/KG)				
ARSENIC	2.55	1.63	2	2.07 L
COBALT	10.3	6.85	16.5	13
IRON	6920	4630	4850	17100
MANGANESE	64.5 J	32.7 J	83 J	129 J
VOLATILES (UG/KG)				
1,1-DICHLOROETHANE	3.03 UJ	3.14 UJ	3.61 UJ	3.34 UJ
1,1-DICHLOROETHENE	3.03 UJ	3.14 UJ	3.61 UJ	3.34 UJ
1,2-DICHLOROETHANE	3.03 UJ	3.14 UJ	3.61 UJ	3.34 UJ
BROMOFORM	3.03 UJ	3.14 UJ	3.61 UJ	3.34 UJ
CHLOROFORM	3.03 UJ	3.14 UJ	3.61 UJ	3.34 UJ
CIS-1,2-DICHLOROETHENE	4.97 J	5.86 J	4.55 J	3.18 J
METHYLENE CHLORIDE	142 J	222 J	103 J	113 J
TRANS-1,2-DICHLOROETHENE	3.03 UJ	3.14 UJ	3.61 UJ	3.34 UJ
TRICHLOROETHENE	22.1 J	22.3 J	8.9 J	2.9 J
VINYL CHLORIDE	3.03 UJ	3.14 UJ	3.61 UJ	3.34 UJ

APPENDIX P
2011 GROUNDWATER GRAB ANALYTICAL RESULTS
SITE 43 - TOLUENE DISPOSAL AREA
NAVAL SUPPORT FACILITY INDIAN HEAD
INDIAN HEAD, MARYLAND

LOCATION	S43TW006	S43TW007		S43TW008	S43TW009	S43TW011	S43TW012
SAMPLE ID	S43TW006-2832	S43TW007-2327	S43TW007-2327-D	S43TW008-2832	S43TW009-2125	S43TW011-3034	S43TW012-2630
SAMPLE DATE	20110611	20110603	20110603	20110605	20110603	20110610	20110611
SAMPLE CODE	NORMAL	ORIG	DUP	NORMAL	NORMAL	NORMAL	NORMAL
MATRIX	GW	GW	GW	GW	GW	GW	GW
TOTAL METALS (UG/L)							
ALUMINUM	21900	23700	24300	21500	13900	27100	20500
ANTIMONY	2.5 U	10 U	10 U	10 U	10 U	5 U	5 U
ARSENIC	12.9	11.7 J	11.8 J	28.8	13.8 L	43.5	39.2
BARIUM	234	295	301	316	208	267	243
BERYLLIUM	2.38	2.53 J	2.54 J	4.11 J	1.99 J	1.98 J	1.76 J
CADMIUM	1.25 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
CHROMIUM	141	53.2	53.6	75.7	78.5	126	239
COBALT	29.5	28.3	29.6	132	11.4 J	32.3	29.6
COPPER	99.2	93.5	98.2	91.8	87	93.7	163
IRON	52800 K	58200	58300	58500	61300	58200 K	68500 K
LEAD	42.6	48.1	48.7	41.9	43.4	38.7	32
MANGANESE	811	610	618	678	485	418	507
MERCURY	0.125 J	0.261	0.25	0.36	0.0857 J	0.236	0.206
NICKEL	34	23.1	23.8	112	15 L	64.9	85.6
SELENIUM	2.5 U	6.25 UL	6.25 UL	6.25 UL	6.25 UL	6.49	2.92
SILVER	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	5 U	5 U
THALLIUM	2 UL	5 U	5 U	5 U	5 U	4 UL	4 UL
VANADIUM	101	80.2	82.2	104	64.8	91	78.6
ZINC	66	99.3	104	312	42	103	129
DISSOLVED METALS (UG/L)							
ALUMINUM	3150	11400 J	2740 J	2150	42.2 J	373	1340
ANTIMONY	2.5 U	4 U	4 U	10 U	4 U	2.5 U	2.5 U
ARSENIC	2.97	7.17 K	2.86 J	5.84 J	7.59 L	3.74	4.53
BARIUM	93.4	173 J	106 J	93.7	108 J	92.2	90.9
BERYLLIUM	0.386 J	1.11 J	1 U	2.5 U	1 U	1.25 U	1.25 U
CADMIUM	1.25 U	1 U	1 U	2.5 U	1 U	1.25 U	1.25 U
CHROMIUM	16.3	23.8 J	5.59 J	9.44 J	2 UJ	1.83 J	15.3
COBALT	14.2	14.7 J	7.12 J	17.8	2.5 J	3.12 U	2.2 J
COPPER	11.9	38.9 J	9.23 J	9.53 J	4 UJ	2.5 U	9.95
IRON	28300 K	48200	39900	32500	47200	23700 K	24200 K
LEAD	5.6	18.7 J	4.78 J	3.72 J	1.5 UJ	0.75 UL	1.12 L
MANGANESE	566	550	472	491	475	270	274
MERCURY	0.2 U	0.0825 J	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
NICKEL	8.43	12.7 J	5.2 J	17.9	8.06 J	4.4	10.2
SELENIUM	2.5 U	2.5 U	2.5 U	6.25 UL	2.5 UL	2.5 U	2.5 U
SILVER	2.5 U	1 U	1 U	2.5 U	1 U	2.5 U	2.5 U
THALLIUM	2 UL	2 U	2 U	5 U	2 U	2 UL	2 UL
VANADIUM	14.9	38 J	9.44 J	11.9 J	5 UJ	1.54 J	5.39
ZINC	10.9	42.5 J	12.2 J	33.1	17.4 J	2.72 J	11.4
EXPLOSIVES (UG/L)							
1,3,5-TRINITROBENZENE	0.157 UJ	0.157 U	0.15 U	0.154 U	0.157 U	0.478 UJ	0.248 UJ
1,3-DINITROBENZENE	0.157 UJ	0.157 U	0.15 U	0.154 U	0.157 U	0.421 J	0.248 UJ
2,4,6-TRINITROTOLUENE	0.157 UJ	0.157 U	0.15 U	0.154 U	0.157 U	0.478 UJ	0.248 UJ
2,4-DINITROTOLUENE	0.157 UJ	0.157 U	0.15 U	0.154 U	0.157 U	0.478 UJ	0.248 UJ
2,6-DINITROTOLUENE	0.157 UJ	0.157 U	0.15 U	0.154 U	0.157 U	0.478 UJ	0.248 UJ
2-AMINO-4,6-DINITROTOLUENE	0.157 UJ	0.157 U	0.15 U	0.154 U	0.157 U	0.478 UJ	0.248 UJ
2-NITROTOLUENE	0.157 UJ	0.157 U	0.15 U	0.154 U	0.11 J	0.478 UJ	0.248 UJ
3-NITROTOLUENE	0.157 UJ	0.898 J	0.708 J	0.156 J	0.157 U	0.478 UJ	0.811 J
4-AMINO-2,6-DINITROTOLUENE	0.157 UJ	0.176 J	0.177 J	0.154 U	0.0873 J	0.478 UJ	0.248 UJ
4-NITROTOLUENE	0.157 UJ	0.157 U	0.401 J	0.146 J	0.157 U	0.478 UJ	0.248 UJ
HMX	0.157 UJ	0.157 U	0.15 U	0.154 U	0.157 U	1.33 J	0.248 UJ
NITROBENZENE	0.157 UJ	0.157 U	0.15 U	0.154 U	0.157 U	0.478 UJ	0.248 UJ
NITROGLYCERIN	0.392 UJ	0.392 U	0.374 U	0.385 U	0.392 U	0.639 J	0.341 J
NITROGUANIDINE	10 UJ	5 U	5 U	5 UJ	10 U	5 U	5 U
RDX	0.37 J	0.628 J	0.616 J	0.49 J	0.763	0.478 UJ	0.248 UJ
TETRYL	0.157 UJ	0.157 U	0.15 U	0.154 U	0.157 U	0.478 UJ	0.248 UJ
MISCELLANEOUS PARAMETERS (UG/L)							
PERCHLORATE	0.2 U	0.2 U	0.2 U	0.2 UJ	0.2 U	0.2 U	0.2 U
MISCELLANEOUS PARAMETERS (MG/L)							
ALKALINITY	--	27.4	41	--	41.8	--	--
CHLORIDE	--	41.7	41	--	54	--	--
CYANIDE	0.02 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.02 U
NITRATE-N	--	0.043 J	0.1 U	--	0.1 U	--	--
NITRITE-N	--	0.1 U	0.1 U	--	0.1 U	--	--
SULFATE	--	11.8	11.2	--	0.926 J	--	--
SULFIDE	--	1.82 U	1.85 U	--	2 U	--	--
TOTAL ORGANIC CARBON	--	1.86 J	4.33 J	--	3.86 J	--	--

APPENDIX P
2011 GROUNDWATER GRAB ANALYTICAL RESULTS
SITE 43 - TOLUENE DISPOSAL AREA
NAVAL SUPPORT FACILITY INDIAN HEAD
INDIAN HEAD, MARYLAND

LOCATION	S43TW006	S43TW007		S43TW008	S43TW009	S43TW011	S43TW012
SAMPLE ID	S43TW006-2832	S43TW007-2327	S43TW007-2327-D	S43TW008-2832	S43TW009-2125	S43TW011-3034	S43TW012-2630
SAMPLE DATE	20110611	20110603	20110603	20110605	20110603	20110610	20110611
SAMPLE CODE	NORMAL	ORIG	DUP	NORMAL	NORMAL	NORMAL	NORMAL
MATRIX	GW	GW	GW	GW	GW	GW	GW
VOLATILE GASES (UG/L)							
ETHANE	--	10.3 J	11.5 J	--	2 UJ	--	--
ETHENE	--	8.89	10.3	--	2 U	--	--
METHANE	--	196 J	235 J	--	46.4 J	--	--
VOLATILES (UG/L)							
1,1,1-TRICHLOROETHANE	0.5 U	5 U	5 U	0.5 U	2.5 U	0.5 U	0.5 U
1,1,2,2-TETRACHLOROETHANE	0.5 U	5 U	5 U	0.5 U	2.5 U	0.5 U	0.5 U
1,1,2-TRICHLOROETHANE	0.5 U	5 U	5 U	0.5 U	2.5 U	0.5 U	0.5 U
1,1,2-TRICHLOROTRIFLUOROETHANE	0.5 U	10 U	10 U	0.5 U	5 U	0.5 U	0.5 U
1,1-DICHLOROETHANE	0.5 U	5 U	5 U	0.5 U	2.5 U	0.5 U	0.5 U
1,1-DICHLOROETHENE	0.5 U	4.5 J	4.75 J	0.364 J	2.5 U	0.5 U	0.5 U
1,2,3-TRICHLOROBENZENE	0.5 U	5 U	5 U	0.5 U	2.5 U	0.5 U	0.5 U
1,2,4-TRICHLOROBENZENE	0.5 U	5 U	5 U	0.5 U	2.5 U	0.5 U	0.5 U
1,2-DIBROMO-3-CHLOROPROPANE	0.5 U	10 U	10 U	0.5 U	5 U	0.5 U	0.5 U
1,2-DIBROMOETHANE	0.5 U	5 U	5 U	0.5 U	2.5 U	0.5 U	0.5 U
1,2-DICHLOROBENZENE	0.5 U	5 U	5 U	0.5 U	2.5 U	0.5 U	0.5 U
1,2-DICHLOROETHANE	0.5 U	5 U	5 U	0.5 U	2.5 U	0.5 U	0.5 U
1,2-DICHLOROPROPANE	0.5 U	5 U	5 U	0.5 U	2.5 U	0.5 U	0.5 U
1,3-DICHLOROPROPANE	0.5 U	5 U	5 U	0.5 U	2.5 U	0.5 U	0.5 U
1,4-DICHLOROBENZENE	0.5 U	5 U	5 U	0.5 U	2.5 U	0.5 U	0.5 U
1,4-DIOXANE	10 UR	100 UR	100 UR	10 UR	10 UR	10 UR	10 UR
2-BUTANONE	5 U	50 U	50 U	5 U	25 U	5 U	5 U
2-HEXANONE	2.5 U	25 U	25 U	2.5 U	12.5 U	2.5 U	2.5 U
4-METHYL-2-PENTANONE	2.5 U	25 U	25 U	2.5 U	12.5 U	2.5 U	2.5 U
ACETONE	5 U	50 U	50 U	10.6 J	55.6 J	5 U	5 U
BENZENE	0.5 U	5 U	5 U	0.5 U	2.5 U	0.5 U	0.5 U
BROMODICHLOROMETHANE	0.5 U	5 U	5 U	0.5 U	2.5 U	0.5 U	0.5 U
BROMOFORM	0.5 U	5 U	5 U	0.5 U	2.5 U	0.5 U	0.5 U
BROMOMETHANE	1 U	10 U	10 U	1 U	5 U	1 U	1 U
CARBON DISULFIDE	0.5 U	5 U	5 U	0.5 U	2.5 U	0.5 U	0.5 U
CARBON TETRACHLORIDE	0.5 U	5 U	5 U	0.5 U	2.5 U	0.5 U	0.5 U
CHLOROBENZENE	0.5 U	5 U	5 U	0.5 U	2.5 U	0.5 U	0.5 U
CHLORODIBROMOMETHANE	0.5 U	5 U	5 U	0.5 U	2.5 U	0.5 U	0.5 U
CHLOROETHANE	1 U	10 U	10 U	1 U	5 U	1 U	1 U
CHLOROFORM	0.5 U	5 U	5 U	0.5 U	2.5 U	0.5 U	0.5 U
CHLOROMETHANE	0.5 U	5 U	5 U	0.5 U	2.5 U	0.5 U	0.5 U
CIS-1,2-DICHLOROETHENE	4.49	56.5	61.3	21.8	2.61 J	0.5 U	0.5 U
CYCLOHEXANE	0.5 U	5 U	5 U	0.5 U	2.5 U	0.5 U	0.5 U
DICHLORODIFLUOROMETHANE	1 U	10 U	10 U	1 U	5 U	1 U	1 U
ETHYLBENZENE	0.5 U	5 U	5 U	0.5 U	2.5 U	0.5 U	0.5 U
ISOPROPYLBENZENE	0.5 U	5 U	5 U	0.5 U	2.5 U	0.5 U	0.5 U
METHYL ACETATE	1 U	10 U	10 U	1 U	5 U	1 U	1 U
METHYL TERT-BUTYL ETHER	0.5 U	5 U	5 U	0.5 U	2.5 U	0.5 U	0.5 U
METHYLENE CHLORIDE	1 U	7.7 J	9.74 J	0.748 J	4.84 J	1 U	1 U
STYRENE	0.5 U	5 U	5 U	0.5 U	2.5 U	0.5 U	0.5 U
TETRACHLOROETHENE	0.5 U	5 U	5 U	0.5 U	2.5 U	0.5 U	0.5 U
TOLUENE	0.5 U	5 U	5 U	0.5 U	2.5 U	0.5 U	0.5 U
TOTAL XYLENES	1 U	15 U	15 U	1 U	7.5 U	1 U	1 U
TRANS-1,2-DICHLOROETHENE	0.5 U	5 U	5 U	0.5 U	2.5 U	0.5 U	0.5 U
TRICHLOROETHENE	53.9	923	1010	41.9	563	1.68	0.5 U
TRICHLOROFLUOROMETHANE	1 U	10 U	10 U	1 U	5 U	1 U	1 U
VINYL CHLORIDE	0.724 J	26.2	25.8	16.2	2.5 U	0.5 U	0.5 U

REDOX TECH, LLC

"Providing Innovative In Situ Soil and Groundwater Treatment"

TOTAL OXIDANT DEMAND (TOD) SAMPLE ANALYSES

Company: **TetraTech**
Project No: **112G007-11**

Samples received: June 14, 2011
Samples prepared: June 14, 2011
Samples titrated: June 20, 2011
Oxidant: Potassium Permanganate
Oxidant Dose: 1g/kg, 5g/kg, 10g/kg, 20g/kg

Sample ID	Oxidant demand (g/kg)
S43SB011 (Outside 1)	**0.3**
S45SB022 (Inside 1)	**7.7**
S45SB019 (Inside 2)	**4.4**

All samples were prepared with 100 g saturated soil and 120 mL distilled water.
TOD is reported in grams of oxidant per kilogram of saturated soil. TOD testing for permanganate completed per Haselow *et al., 2003.* Estimating the Total Oxidant Demand for In Situ Chemical Oxidation Design, Remediation, Autumn, 2003.

All samples had a very strong odor when received. The contaminant of concern is TCE. Samples were prepared on June 14, 2011, and dosed with 1 grams, 5grams, 10grams, and 20g of potassium permanganate per kilogram of soil. On June 16, 2010, the purple color of potassium permanganate had disappeared in sample S43SB022 (Inside 1) and S43SB019 (Inside 2) dosed with 5 grams of potassium permanganate per kilogram of soil. 10 grams potassium permanganate per kilogram soil was added to both samples to increase the treatment dose to 15 grams potassium permanganate per kilogram of soil. After treatment samples did not have any odor.

Magaly A. Ramirez

200 QUADE DRIVE, CARY NC 27560 TEL (919) 678-0140 FAX (919) 678-0150
WWW.REDOX-TECH.COM E-MAIL: RAMIREZ@REDOX-TECH.COM

GeoTesting EXPRESS

Client:	Tetra Tech NUS, Inc.
Project Name:	Indian Head
Project Location:	---
GTX #:	10905
Test Date:	06/22/11
Tested By:	jef
Checked By:	jdt

Density (Unit Weight) of Soil by ASTM D 7263

Boring ID	Sample ID	Depth, ft	Visual Description	Bulk Density, lb/ft^3	Moisture Content, %	Dry Density, lb/ft^3
SB-08	S435SB008-0608	6-8	Moist, yellowish brown silty sand	112	17.1	95.2

Notes: Density determined on disturbed samples by hand compacting into a container of known volume, measuring mass of soil and calculating.
Moisture content determined by ASTM D 2216 at 110° C

GeoTesting EXPRESS

Client:	Tetra Tech NUS, Inc.		
Project:	Indian Head		
Location:		Project No:	GTX-10905
Boring ID: SB-08	Sample Type: jar	Tested By:	ema
Sample ID:S435 SB008- 0608	Test Date: 06/24/11	Checked By:	jdt
Depth : 6-8 ft	Test Id: 210060		
Test Comment: ---			
Sample Description: Moist, yellowish brown silty sand			
Sample Comment: ---			

Specific Gravity of Soils by ASTM D 854 with Porosity Calculation-06

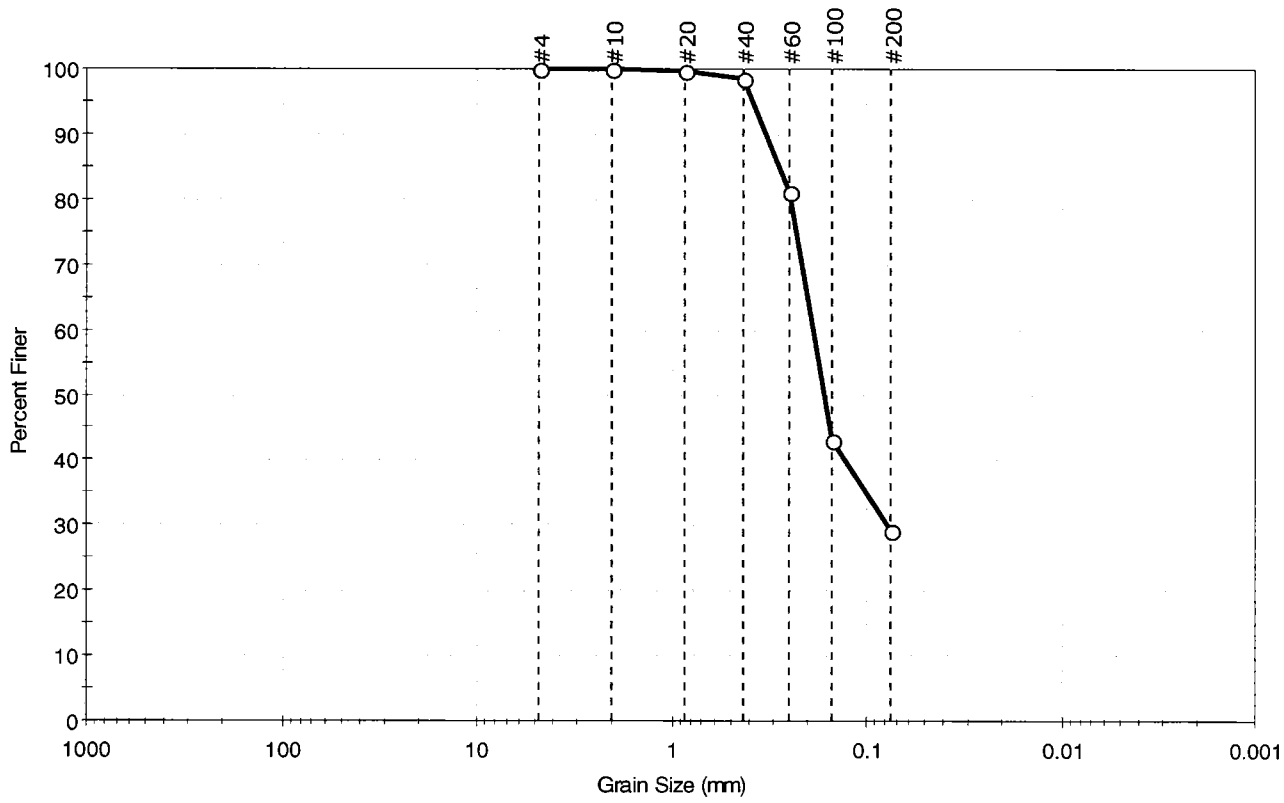
Boring ID	Sample ID	Depth	Visual Description	Dry Density, pcf	Porosity	Specific Gravity	Moisture Content, %
SB-08	S435 SB008-0608	6-8 ft	Moist, yellowish brown silty sand	95	0.43	2.66	17

Notes: Specific Gravity performed by using method A (oven dried specimens) of ASTM D 854
Moisture Content determined by ASTM D 2216.

GeoTesting EXPRESS

Client:	Tetra Tech NUS, Inc.		
Project:	Indian Head		
Location:		Project No:	GTX-10905
Boring ID: SB-08	Sample Type: jar	Tested By:	jbr
Sample ID:S435SB008-0608	Test Date: 06/22/11	Checked By:	jdt
Depth : 6-8 ft	Test Id: 210056		
Test Comment: ---			
Sample Description:	Moist, yellowish brown silty sand		
Sample Comment: ---			

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	70.8	29.2

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	99		
#60	0.25	81		
#100	0.15	43		
#200	0.075	29		

Coefficients

D_{85} = 0.2807 mm D_{30} = 0.0780 mm
D_{60} = 0.1880 mm D_{15} = N/A
D_{50} = 0.1644 mm D_{10} = N/A
C_u = N/A C_c = N/A

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample/Test Description

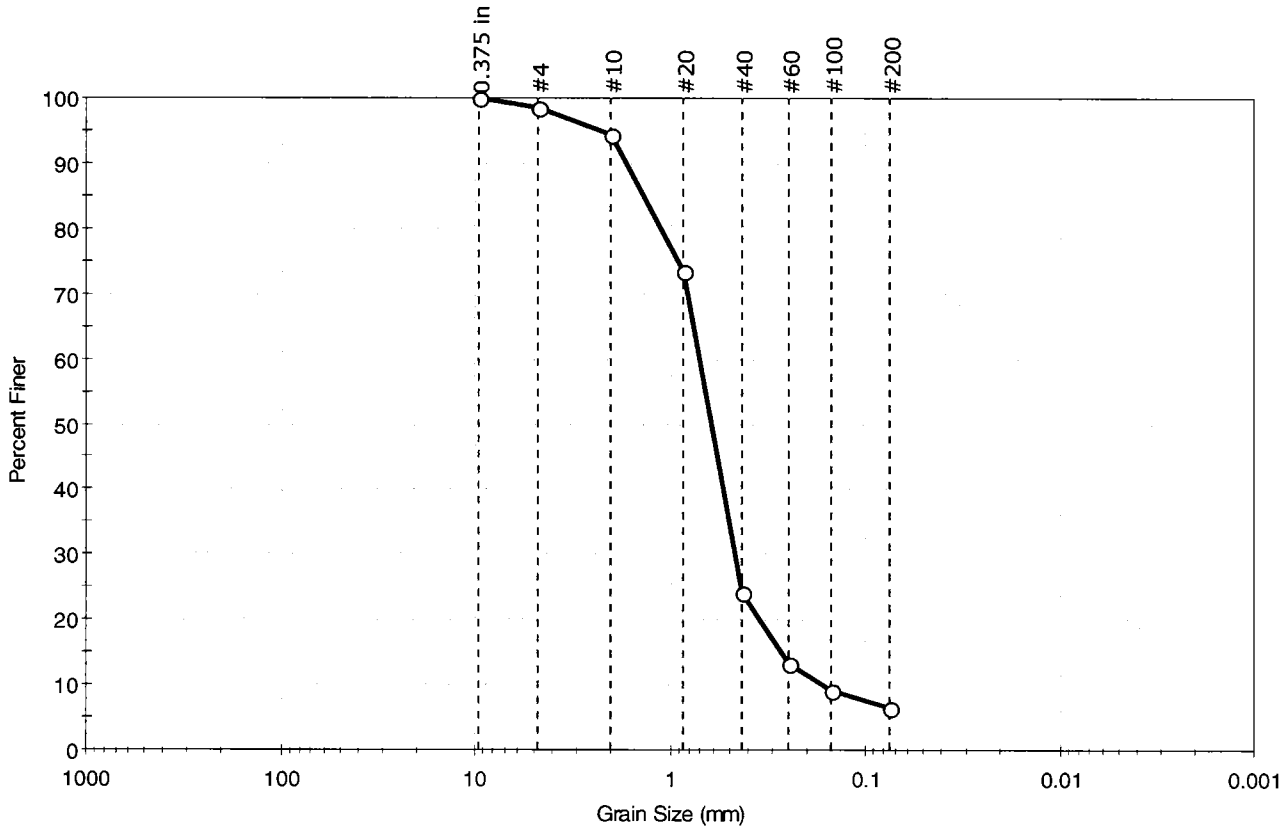
Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

GeoTesting EXPRESS

Client:	Tetra Tech NUS, Inc.		
Project:	Indian Head		
Location:		Project No:	GTX-10905
Boring ID: SB-17	Sample Type: jar	Tested By:	jbr
Sample ID:S435SB017-1517	Test Date: 06/23/11	Checked By:	jdt
Depth : 15-17 ft	Test Id: 210057		
Test Comment: ---			
Sample Description:	Moist, yellowish brown sand with silt		
Sample Comment:	---		

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	1.5	92.0	6.5

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	98		
#10	2.00	94		
#20	0.85	73		
#40	0.42	24		
#60	0.25	13		
#100	0.15	9		
#200	0.075	7		

Coefficients

D_{85} = 1.3610 mm D_{30} = 0.4609 mm

D_{60} = 0.7034 mm D_{15} = 0.2712 mm

D_{50} = 0.6109 mm D_{10} = 0.1647 mm

C_u = 4.271 C_c = 1.834

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-b (0))

Sample/Test Description

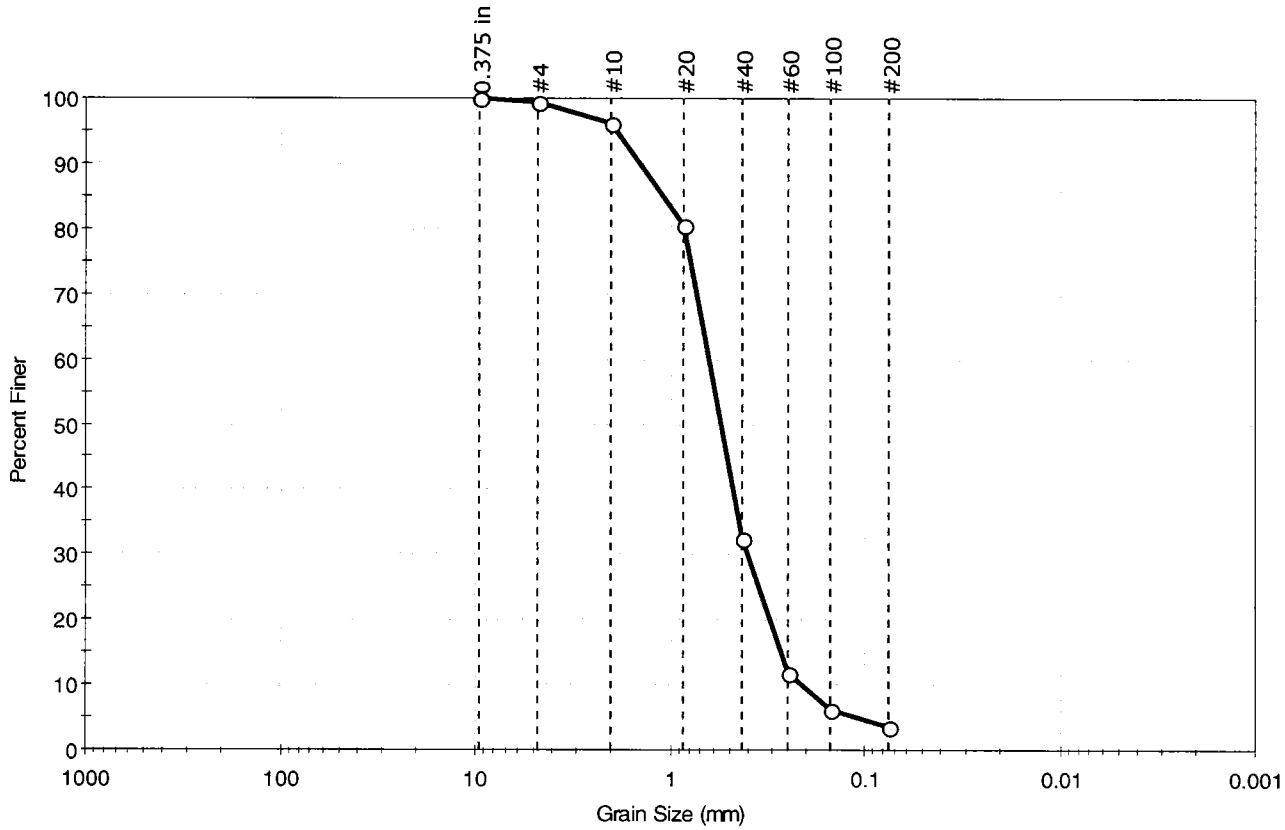
Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

GeoTesting EXPRESS

Client:	Tetra Tech NUS, Inc.		
Project:	Indian Head		
Location:		Project No:	GTX-10905
Boring ID: SB-18	Sample Type: jar	Tested By:	jbr
Sample ID:S435SB018-3234	Test Date: 06/23/11	Checked By:	jdt
Depth : 32-34 ft	Test Id: 210058		
Test Comment: ---			
Sample Description: Moist, light gray sand			
Sample Comment: ---			

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.6	95.9	3.5

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	99		
#10	2.00	96		
#20	0.85	81		
#40	0.42	33		
#60	0.25	12		
#100	0.15	6		
#200	0.075	4		

Coefficients

D_{85} =1.0806 mm D_{30} =0.3982 mm

D_{60} =0.6312 mm D_{15} =0.2709 mm

D_{50} =0.5466 mm D_{10} =0.2113 mm

C_u =2.987 C_c =1.189

Classification

ASTM Poorly graded sand (SP)

AASHTO Stone Fragments, Gravel and Sand (A-1-b (0))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

GeoTesting EXPRESS

Client:	Tetra Tech NUS, Inc.		
Project Name:	Indian Head		
Project Location:	---		
GTX #:	10905		
Start Date:	6/22/2011	Tested By:	ema
End Date:	6/24/2011	Checked By:	jdt
Boring #:	---		
Sample #:	S435SB011-3335		
Depth:	33-35 ft.		
Visual Description:	Moist, olive brown clay		

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter by ASTM D 5084

Constant Volume

Sample Type:	tube	Permeant Fluid:	de-aired tap water
Orientation:	Vertical	Cell #:	16/5/12

Sample Preparation: Extruded from tube, cut, trimmed and placed into permeameter at as-received density and moisture content. Trimmings moisture content = 60.5%.

Parameter	Initial	Final
Height, in	2.80	2.78
Diameter, in	1.66	1.64
Area, in^2	2.16	2.11
Volume, in^3	6.06	5.87
Mass, g	158	158
Bulk Density, pcf	98.9	102
Moisture Content, %	61.7	62.1
Dry Density, pcf	61.2	63.1
Degree of Saturation, %	---	99

B COEFFICIENT DETERMINATION

Cell Pressure, psi:	94.9	Pressure Increment, psi:	4.98
Sample Pressure, psi:	90.0	B Coefficient:	0.96

FLOW DATA

Date	Trial #	Pressure, psi Cell	Pressure, psi Sample	Manometer Readings Z_1	Manometer Readings Z_2	Manometer Readings Z_1-Z_2	Elapsed Time, sec	Gradient	Permeability K, cm/sec	Temp, °C	R_t	Permeability K @ 20 °C, cm/sec
6/23	1	90	85	10.0	9.9	0.1	142	17.8	9.1E-08	20	1.000	9.1E-08
6/23	2	90	85	10.0	9.9	0.1	159	17.8	8.2E-08	20	1.000	8.2E-08
6/23	3	90	85	10.0	9.9	0.1	165	17.8	7.9E-08	20	1.000	7.9E-08
6/23	4	90	85	10.0	9.9	0.1	170	17.8	7.6E-08	20	1.000	7.6E-08

PERMEABILITY AT 20° C: 8.2 x 10^{-8} cm/sec (@ 5 psi effective stress)

APPENDIX Q

SUPPORTING INFORMATION FOR HUMAN HEALTH RISK ASSESSMENT

Q.1 RAGS Part D Table 2s
Q.2 RAGS Part D Table 3s
Q.3 RAGS Part D Table 4s
Q.4 RAGS Part D Table 5s
Q.5 RAGS Part D Table 6s
Q.6 RAGS Part D Table 7s
Q.7 RAGS Part D Table 9s
Q.8 Sample Calculations
Q.9 ProUCL Outputs

Q.1 RAGS PART D TABLE 2s

Occurrence, Distribution, and Selection Of Chemicals of Potential Concern

LIST OF TABLES

RAGS PART D TABLE 2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Table No.

2.1 Surface Soil - Direct Contact

2.2 Surface Soil - Migration from Surface Soil to Groundwater

2.3 Subsurface Soil - Direct Contact

2.4 Subsurface Soil - Migration from Surface Soil to Groundwater

2.5 Groundwater - Direct Contact

2.6 Sediment - Direct Contact

2.7 Surface Water - Direct Contact

TABLE 2.1
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - DIRECT CONTACT WITH SURFACE SOIL
SITE 43 - TOLUENE DISPOSAL AREA
NSF-IH, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects[1]	Concentration Used for Screening[2]	NSF-IH Background Value[3]	Adjusted USEPA RSL Residential Soil[4]	COPC Flag	Rationale for Contaminant Deletion or Selection[5]
Site 43		**Explosives**											
	99-35-4	1,3,5-Trinitrobenzene	0.032 J	0.032 J	mg/kg	S43SB028-0001	1/8	0.0385 - 0.25	0.032	NA	220 N	No	BSL
	9004-70-0	Nitrocellulose	8 J	9 J	mg/kg	S43SS0020001	2/2	--	9	NA	18000000 N	No	BSL
	556-88-7	Nitroguanidine	0.429 J	0.429 J	mg/kg	S43SB028-0001	1/8	0.182 - 0.25	0.429	NA	610 N	No	BSL
		Metals											
	7429-90-5	**Aluminum**	4410 J	20200	mg/kg	S43SB023-0001	8/8	--	20200	**19700**	**7700 N**	**Yes**	ASL
	7440-38-2	Arsenic	1.6 L	12.3	mg/kg	S43SB028-0001	8/8	--	12.3	14.9	**0.61 C**	No	BKG
	7440-39-3	Barium	25.9 J	233 L	mg/kg	S43SB027-0001	8/8	--	233	**80.4**	1500 N	No	BSL
	7440-41-7	Beryllium	0.27	0.883	mg/kg	S43SB028-0001	8/8	--	0.883	1.1	16 N	No	BSL, BKG
	7440-43-9	**Cadmium**	0.072 J	12.2	mg/kg	S43SB028-0001	8/8	--	12.2	**2.5**	**7 N**	**Yes**	ASL
	7440-70-2	Calcium	1170	1610	mg/kg	S43SS0010001	2/2	--	1610	2060	NA	No	NUT, BKG
	7440-47-3	**Chromium**	17.1 K	37.5 J	mg/kg	S43SS0020001	8/8	--	37.5	**33.4**	**0.29 C [6]**	**Yes**	ASL
	7440-48-4	Cobalt	2.94	19.3	mg/kg	S43SS0020001	8/8	--	19.3	22.3	**2.3 N**	No	BKG
	7440-50-8	Copper	10.6	57.4	mg/kg	S43SB028-0001	8/8	--	57.4	**20.3**	310 N	No	BSL
	7439-89-6	Iron	12500 J	32100 J	mg/kg	S43SB023-0001-D	8/8	--	32100	38500	**5500 N**	No	BKG
	7439-92-1	Lead	9.69	91	mg/kg	S43SS0010001	8/8	--	91	**62.5**	400	No	BSL
	7439-95-4	Magnesium	765	3860	mg/kg	S43SS0010001	2/2	--	3860	**1620**	NA	No	NUT
	7439-96-5	Manganese	14.7 K	813 J	mg/kg	S43SS0020001	8/8	--	813	1390	**180 N**	No	BKG
	7439-97-6	Mercury	0.0207 J	0.12	mg/kg	S43SB028-0001	2/8	0.033 - 0.05	0.12	NA	2.3 N[7]	No	BSL
	7440-02-0	Nickel	7.1	38.8	mg/kg	S43SS0010001	8/8	--	38.8	**15.4**	150 N	No	BSL
	7440-09-7	Potassium	299	441	mg/kg	S43SS0020001	2/2	--	441	1470	NA	No	NUT, BKG
	7782-49-2	Selenium	0.256 J	0.801 J	mg/kg	S43SB028-0001	6/8	--	0.801	1.2	39 N	No	BSL, BKG
	7440-22-4	Silver	0.0673 J	0.262 J	mg/kg	S43SB028-0001	4/8	0.121 - 0.55	0.262	0.84	39 N	No	BSL, BKG
	7440-23-5	Sodium	281	465	mg/kg	S43SS0020001	2/2	--	465	**120**	NA	No	NUT
	7440-28-0	Thallium	0.664 J	0.664 J	mg/kg	S43SB028-0001	1/8	0.242 - 0.38	0.664	2.3	**0.078 N**	No	BKG
	7440-62-2	Vanadium	29.5	44.6	mg/kg	S43SB028-0001	8/8	--	44.6	53.3	**39 N**	No	BKG
	7440-66-6	Zinc	19.4 J	402 J	mg/kg	S43SB028-0001	8/8	--	402	**37.5**	2300 N	No	BSL
		Volatiles											
	156-59-2	cis-1,2-Dichloroethene	14.4	175 J	µg/kg	S43SB027-0001	3/8	2.17 - 243	175	NA	16000 N	No	BSL
	75-09-2	Methylene Chloride	210 J	210 J	µg/kg	S43SS0020001	1/8	4.34 - 486	210	NA	36000 N [8]	No	BSL
	79-01-6	**Trichloroethene**	1.91 J	2720	µg/kg	S43SB027-0001	3/8	2.3 - 243	2720	NA	**440 N [8]**	**Yes**	ASL
	75-01-4	Vinyl Chloride	2.18 J	2.18 J	µg/kg	S43SB026-0001	1/8	2.17 - 243	2.18	NA	60 C	No	BSL

Footnotes:
1 - Values presented are sample-specific quantitation limits.
2 - The maximum detected concentration is used for screening purposes.
3 - NSF Indian Head surface soil background values.
4 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2013. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag).
5 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is greater than site background.
6 - Value is for hexavalent chromium.
7- Value is for mercuric chloride (and other mercury salts).
8- 1/10 the non-carcinogenic value is less than the carcinogenic value. Screening level is the non-carcinogenic value.

Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Definitions:
C = Carcinogen
CAS = Chemical Abstracts Services
COPC = Chemical Of Potential Concern
J = Estimated value
K = Biased High
L = Biased Low
N = Noncarcinogen
NA = Not Applicable/Not Available

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level and site background.

For elimination as a COPC:
BKG = Less than Background Concentration
BSL = Below COPC Screening Level
NUT = Essential Nutrient

Associated Samples
S43SB023-0001
S43SB023-0001-D
S43SB024-0001
S43SB025-0001
S43SB026-0001
S43SB027-0001
S43SB028-0001
S43SS0010001
S43SS0020001

TABLE 2.2
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - MIGRATION FROM SURFACE SOIL TO GROUNDWATER
SITE 43 - TOLUENE DISPOSAL AREA
NSF-IH, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects(1)	Concentration Used for Screening(2)	NSF-IH Background Value(3)	USEPA RSL Protection of Groundwater(4)	COPC Flag	Rationale for Contaminant Deletion or Selection(5)
Site 43		**Explosives**											
	99-35-4	1,3,5-Trinitrobenzene	0.032 J	0.032 J	mg/kg	S43SB028-0001	1/8	0.0385 - 0.25	0.032	NA	34	No	BSL
	9004-70-0	Nitrocellulose	8 J	9 J	mg/kg	S43SS0020001	2/2	--	9	NA	200000	No	BSL
	556-88-7	Nitroguanidine	0.429 J	0.429 J	mg/kg	S43SB028-0001	1/8	0.182 - 0.25	0.429	NA	7.6	No	BSL
		Metals											
	7429-90-5	Aluminum	4410 J	20200	mg/kg	S43SB023-0001	8/8	--	20200	**19700**	460000	No	BSL
	7440-38-2	Arsenic	1.6 L	12.3	mg/kg	S43SB028-0001	8/8	--	12.3	14.9	**0.026**	No	BKG
	7440-39-3	Barium	25.9 J	233 L	mg/kg	S43SB027-0001	8/8	--	233	**80.4**	2400	No	BSL
	7440-41-7	Beryllium	0.27	0.883	mg/kg	S43SB028-0001	8/8	--	0.883	1.1	260	No	BSL, BKG
	7440-43-9	**Cadmium**	0.072 J	12.2	mg/kg	S43SB028-0001	8/8	--	12.2	**2.5**	**10.4**	**Yes**	ASL
	7440-70-2	Calcium	1170	1610	mg/kg	S43SS0010001	2/2	--	1610	2060	NA	No	BKG, NUT
	7440-47-3	**Chromium**	17.1 K	37.5 J	mg/kg	S43SS0020001	8/8	--	37.5	**33.4**	**0.0118** (6)	**Yes**	ASL
	7440-48-4	Cobalt	2.94	19.3	mg/kg	S43SS0020001	8/8	--	19.3	22.3	**4.2**	No	BKG
	7440-50-8	Copper	10.6	57.4	mg/kg	S43SB028-0001	8/8	--	57.4	**20.3**	440	No	BSL
	7439-89-6	Iron	12500 J	32100 J	mg/kg	S43SB023-0001-D	8/8	--	32100	38500	**5400**	No	BKG
	7439-92-1	Lead	9.69	91	mg/kg	S43SS0010001	8/8	--	91	**62.5**	280 (7)	No	BSL
	7439-95-4	Magnesium	765	3860	mg/kg	S43SS0010001	2/2	--	3860	**1620**	NA	No	NUT
	7439-96-5	Manganese	14.7 K	813 J	mg/kg	S43SS0020001	8/8	--	813	1390	**420**	No	BKG
	7439-97-6	Mercury	0.0207 J	0.12	mg/kg	S43SB028-0001	2/8	0.033 0.05	0.12	NA	NA (8)	No	NSL
	7440-02-0	Nickel	7.1	38.8	mg/kg	S43SS0010001	8/8	--	38.8	**15.4**	400	No	BSL
	7440-09-7	Potassium	299	441	mg/kg	S43SS0020001	2/2	--	441	1470	NA	No	NUT, BKG
	7782-49-2	Selenium	0.256 J	0.801 J	mg/kg	S43SB028-0001	6/8	--	0.801	1.2	8	No	BSL, BKG
	7440-22-4	Silver	0.0673 J	0.262 J	mg/kg	S43SB028-0001	4/8	0.121 0.55	0.262	0.84	12	No	BSL, BKG
	7440-23-5	Sodium	281	465	mg/kg	S43SS0020001	2/2	--	465	**120**	NA	No	NUT
	7440-28-0	Thallium	0.664 J	0.664 J	mg/kg	S43SB028-0001	1/8	0.242 0.38	0.664	2.3	**0.22**	No	BKG
	7440-62-2	Vanadium	29.5	44.6	mg/kg	S43SB028-0001	8/8	--	44.6	53.3	1560	No	BSL, BKG
	7440-66-6	Zinc	19.4 J	402 J	mg/kg	S43SB028-0001	8/8	--	402	**37.5**	5800	No	BSL
		Volatiles											
	156-59-2	**cis-1,2-Dichloroethene**	14.4	175 J	µg/kg	S43SB027-0001	3/8	2.17 243	175	NA	**164**	Yes	ASL
	75-09-2	Methylene Chloride	210 J	210 J	µg/kg	S43SS0020001	1/8	4.34 486	210	NA	**50**	**Yes**	ASL
	79-01-6	**Trichloroethene**	1.91 J	2720	µg/kg	S43SB027-0001	3/8	2.3 243	2720	NA	**3.2**	**Yes**	ASL
	75-01-4	**Vinyl Chloride**	2.18 J	2.18 J	µg/kg	S43SB026-0001	1/8	2.17 243	2.18	NA	**0.106**	Yes	ASL

Footnotes:
1 - Values presented are sample-specific quantitation limits.
2 - The maximum detected concentration is used for screening purposes.
3 - NSF Indian Head surface soil background values.
4 - USEPA protection of groundwater SSL with DAF of 20, May 2013.
5 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is greater than site background.
6 - Value is for hexavalent chromium.
7- Value is MCL based SSL.
8 - Value is for mercuric chloride (and other mercury salts).

Definitions:
C = Carcinogen
CAS = Chemical Abstracts Services
COPC = Chemical Of Potential Concern
J = Estimated value
K = Biased High
L = Biased Low
NA = Not Applicable/Not Available

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level and site background.

For elimination as a COPC:
BKG = Less than Background Concentration
BSL = Below COPC Screening Level
NSL = No Screening Level
NUT = Essential Nutrient

Associated Samples
S43SB026-0001
S43SB027-0001
S43SB028-0001
S43SS0010001
S43SS0020001
S43SB023-0001
S43SB023-0001-D
S43SB024-0001
S43SB025-0001

Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

TABLE 2.3
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - DIRECT CONTACT WITH SUBSURFACE SOIL
SITE 43 - TOLUENE DISPOSAL AREA
NSF-IH, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil

Exposure Point	CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects[1]	Concentration Used for Screening[2]	NSF-IH Background Value[3]	Adjusted USEPA RSL Residential Soil[4]	COPC Flag	Rationale for Contaminant Deletion or Selection[5]
Site 43		**Explosives**											
	99-65-0	1,3-Dinitrobenzene	0.028 J	0.0375 J	mg/kg	S43SB009-0608	3/19	0.0367 - 0.25	0.0375	NA	0.61 N	No	BSL
	99-99-0	4-Nitrotoluene	0.023 J	0.064 J	mg/kg	S43SB011-0709	3/19	0.0367 - 0.25	0.064	NA	24 N[6]	No	BSL
		Metals											
	7429-90-5	Aluminum	2180	12300	mg/kg	S43SB014-0709	19/19	--	12300	21400	**7700 N**	No	BKG
	7440-38-2	Arsenic	0.834 J	5.24 J	mg/kg	S43SB011-0709-D	19/19	--	5.24	28.7	**0.61 C**	No	BKG
	7440-39-3	Barium	14.9 L	408 K	mg/kg	S43SB023-0607	19/19	--	408	**66.5**	1500 N	No	BSL
	7440-41-7	Beryllium	0.26	1.6	mg/kg	S43SB0020101	19/19	--	1.6	**1.5**	16 N	No	BSL
	7440-43-9	Cadmium	0.077 J	0.4	mg/kg	S43SB0020101	3/19	0.112 - 0.298	0.4	0.61	7 N	No	BSL, BKG
	7440-70-2	Calcium	176	1280	mg/kg	S43SB0020101	2/2	--	1280	**1270**	NA	No	NUT
	7440-47-3	Chromium	8.03 K	18.5 K	mg/kg	S43SB013-0608, S43SB028-0405	19/19	--	18.5	59.1	**0.29 C** [7]	No	BKG
	7440-48-4	Cobalt	1.47	6.28	mg/kg	S43SB023-0607	19/19	--	6.28	14.7	**2.3 N**	No	BKG
	7440-50-8	Copper	4.8	21.9	mg/kg	S43SB0020101	19/19	--	21.9	47.6	310 N	No	BSL, BKG
	7439-89-6	Iron	4010	18700	mg/kg	S43SB0020101	19/19	--	18700	35200	**5500 N**	No	BKG
	7439-92-1	Lead	5.02	13.3	mg/kg	S43SB014-0709	19/19	--	13.3	38.6	400	No	BSL, BKG
	7439-95-4	Magnesium	196	777	mg/kg	S43SB0020101	2/2	--	777	2940	NA	No	NUT, BKG
	7439-96-5	**Manganese**	9.75 K	227 J	mg/kg	S43SB0020101	19/19	--	227	**155**	**180 N**	Yes	ASL
	7439-97-6	Mercury	0.013 J	0.0221 J	mg/kg	S43SB028-0405	3/19	0.029 - 0.048	0.0221	NA	2.3 N[8]	No	BSL
	7440-02-0	Nickel	5.26	14.5	mg/kg	S43SB023-0607	19/19	--	14.5	15.9	150 N	No	BSL, BKG
	7440-09-7	Potassium	311	380	mg/kg	S43SB0020101	2/2	--	380	3440	NA	No	NUT, BKG
	7782-49-2	Selenium	0.223 J	0.358 J	mg/kg	S43SB026-0506	7/19	0.28 - 0.597	0.358	3.8	39 N	No	BSL, BKG
	7440-23-5	Sodium	265	288	mg/kg	S43SB0010101	2/2	--	288	461	NA	No	NUT, BKG
	7440-62-2	Vanadium	7.53	34	mg/kg	S43SB028-0405	19/19	--	34	102	39 N	No	BSL, BKG
	7440-66-6	Zinc	9.98	46.6 K	mg/kg	S43SB014-0709	19/19	--	46.6	49.7	2300 N	No	BSL, BKG
		Miscellaneous Parameters											
	57-12-5	Cyanide	1.4	1.4	mg/kg	S43SB0010101	1/13	0.097 - 0.884	1.4	NA	2.2 N	No	BSL
	14797-73-0	Perchlorate	1.08 J	4.84 J	µg/kg	S43SB011-0709-D	3/11	2.33 - 2.45	4.84	NA	5500 N	No	BSL
		Volatiles											
	78-93-3	2-Butanone	564 J	837	µg/kg	S43SB022-0708	2/20	4.52 - 5020	837	NA	2800000 N	No	BSL
	591-78-6	2-Hexanone	16	16	µg/kg	S43SB015-0810	1/20	2.26 - 2510	16	NA	21000 N	No	BSL
	108-10-1	4-Methyl-2-Pentanone	5190 J	19100 J	µg/kg	S43SB022-0708	2/20	2.26 - 2510	19100	NA	530000 N	No	BSL
	67-64-1	Acetone	12 J	4660000	µg/kg	S43SB022-0708	8/20	10 - 556	4660000	NA	6100000 N	No	BSL
	156-59-2	cis-1,2-Dichloroethene	100 J	585	µg/kg	S43SB022-0708	5/20	2.26 - 2510	585	NA	16000 N	No	BSL
	75-09-2	Methylene Chloride	6.81 J	3590 J	µg/kg	S43SB023-0607	3/20	4.52 - 278	3590	NA	36000 N[6]	No	BSL
	127-18-4	Tetrachloroethene	1.65 J	1.65 J	µg/kg	S43SB010-0709	1/20	2.26 - 2510	1.65	NA	8600 N[6]	No	BSL
	108-88-3	Toluene	1.29 J	1.29 J	µg/kg	S43SB013-0608	1/20	2.26 - 2510	1.29	NA	500000 N	No	BSL
	79-01-6		8 J	4790	µg/kg	S43SB027-0708	8/20	2.26 - 2510	4790	NA	**440 N**[6]	Yes	ASL
	75-01-4	Vinyl Chloride	14.3	14.3	µg/kg	S43SB019-0607	1/20	2.3 - 2510	14.3	NA	60 C	No	BSL

Footnotes:
1 - Values presented are sample-specific quantitation limits.
2 - The maximum detected concentration is used for screening purposes.
3 - NSF Indian Head subsurface soil background values.
4 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2013. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag).
5 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is greater than site background.
6 - 1/10 the non-carcinogenic value is less than the carcinogenic value. Screening level is the non-carcinogenic value.
7 - Value is for hexavalent chromium.
8- Value is for mercuric chloride (and other mercury salts).

Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Definitions:
C = Carcinogen
CAS = Chemical Abstracts Services
COPC = Chemical Of Potential Concern
J = Estimated value
K = Biased High
L = Baised Low
N = Noncarcinogen
NA = Not Applicable/Not Available

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level and site background.
For elimination as a COPC:
BKG = Less than Background Concentration
BSL = Below COPC Screening Level
NUT = Essential Nutrient

Associated Samples

S43SB0010101	S43SB015-0810
S43SB0020101	S43SB016-0607
S43SB008-0607	S43SB016-0608
S43SB008-0608	S43SB017-0608
S43SB009-0608	S43SB018-0507
S43SB009-0708	S43SB019-0607
S43SB009-0708-D	S43SB022-0708
S43SB010-0709	S43SB023-0607
S43SB011-0507	S43SB024-0607
S43SB011-0709	S43SB024-0607-D
S43SB011-0709-D	S43SB025-0607
S43SB012-0507	S43SB026-0506
S43SB012-0507-D	S43SB027-0708
S43SB013-0608	S43SB028-0405
S43SB014-0709	

TABLE 2.4
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN -MIGRATION FROM SUBSURFACE SOIL TO GROUNDWATER
SITE 43 - TOLUENE DISPOSAL AREA
NSF-IH, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil

Exposure Point	CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects(1)	Concentration Used for Screening(2)	NSF-IH Background Value(3)	USEPA RSL Protection of Groundwater(4)	COPC Flag	Rationale for Contaminant Deletion or Selection(5)
Site 43		**Explosives**											
	99-65-0	1,3-Dinitrobenzene	0.0277 J	0.0375 J	mg/kg	S43SB009-0608	3/19	0.0367 - 0.25	0.0375	NA	**0.028**	Yes	ASL
	99-99-0	4-Nitrotoluene	0.0234 J	0.064 J	mg/kg	S43SB011-0709	3/19	0.0367 - 0.25	0.064	NA	0.068	No	BSL
		Metals											
	7429-90-5	Aluminum	2180	12300	mg/kg	S43SB014-0709	19/19	--	12300	21400	460000	No	BSL, BKG
	7440-38-2	Arsenic	0.834 J	5.24 J	mg/kg	S43SB011-0709-D	19/19	--	5.24	28.7	**0.026**	No	BKG
	7440-39-3	Barium	14.9 L	408 K	mg/kg	S43SB023-0607	19/19	--	408	**66.5**	2400	No	BSL
	7440-41-7	Beryllium	0.26	1.6	mg/kg	S43SB0020101	19/19	--	1.6	**1.5**	260	No	BSL
	7440-43-9	Cadmium	0.0771 J	0.4	mg/kg	S43SB0020101	3/19	0.112 - 0.298	0.4	0.61	10.4	No	BSL, BKG
	7440-70-2	Calcium	176	1280	mg/kg	S43SB0020101	2/2	--	1280	**1270**	NA	No	NUT
	7440-47-3	Chromium	8.03 K	18.5 K	mg/kg	S43SB013-0608, S43SB028-0405	19/19	--	18.5	59.1	**0.0118** (6)	No	BKG
	7440-48-4	Cobalt	1.47	6.28	mg/kg	S43SB023-0607	19/19	--	6.28	14.7	**4.2**	No	BKG
	7440-50-8	Copper	4.8	21.9	mg/kg	S43SB0020101	19/19	--	21.9	47.6	440	No	BSL, BKG
	7439-89-6	Iron	4010	18700	mg/kg	S43SB0020101	19/19	--	18700	35200	**5400**	No	BKG
	7439-92-1	Lead	5.02	13.3	mg/kg	S43SB014-0709	19/19	--	13.3	38.6	280 (7)	No	BSL, BKG
	7439-95-4	Magnesium	196	777	mg/kg	S43SB0020101	2/2	--	777	2940	NA	No	NUT, BKG
	7439-96-5	Manganese	9.75 K	227 J	mg/kg	S43SB0020101	19/19	--	227	**155**	420	No	BSL, BKG
	7439-97-6	Mercury	0.0128 J	0.0221 J	mg/kg	S43SB028-0405	3/19	0.029 - 0.048	0.0221	NA	NA (8)	No	NSL
	7440-02-0	Nickel	5.26	14.5	mg/kg	S43SB023-0607	19/19	--	14.5	15.9	400	No	BSL, BKG
	7440-09-7	Potassium	311	380	mg/kg	S43SB0020101	2/2	--	380	3440	NA	No	NUT, BKG
	7782-49-2	Selenium	0.223 J	0.358 J	mg/kg	S43SB026-0506	7/19	0.28 - 0.597	0.358	3.8	8	No	BSL, BKG
	7440-23-5	Sodium	265	288	mg/kg	S43SB0010101	2/2	--	288	461	NA	No	NUT, BKG
	7440-62-2	Vanadium	7.53	34	mg/kg	S43SB028-0405	19/19	--	34	102	1260	No	BSL, BKG
	7440-66-6	Zinc	9.98	46.6 K	mg/kg	S43SB014-0709	19/19	--	46.6	49.7	5800	No	BSL, BKG
		Miscellaneous Parameters											
	57-12-5	**Cyanide**	1.4	1.4	mg/kg	S43SB0010101	1/13	0.097 - 0.884	1.4	NA	**0.28**	**Yes**	ASL
	14797-73-0	Perchlorate	1.08 J	4.84 J	µg/kg	S43SB011-0709-D	3/11	2.33 - 2.45	4.84	NA	NA	No	NSL
		Volatiles											
	78-93-3	2-Butanone	564 J	837	µg/kg	S43SB022-0708	2/20	4.52 - 5020	837	NA	20000	No	BSL
	591-78-6	**2-Hexanone**	16	16	µg/kg	S43SB015-0810	1/20	2.26 - 2510	16	NA	158	No	BSL
	108-10-1	**4-Methyl-2-Pentanone**	5190 J	19100 J	µg/kg	S43SB022-0708	2/20	2.26 - 2510	19100	NA	**4600**	**Yes**	ASL
	67-64-1	**Acetone**	12 J	4660000	µg/kg	S43SB022-0708	8/20	10 - 556	4660000	NA	**48000**	**Yes**	ASL
	156-59-2	**cis-1,2-Dichloroethene**	100 J	585	µg/kg	S43SB022-0708	5/20	2.26 - 2510	585	NA	**164**	**Yes**	ASL
	75-09-2	Methylene Chloride	6.81 J	3590 J	µg/kg	S43SB023-0607	3/20	4.52 - 278	3590	NA	**50**	**Yes**	ASL
	127-18-4	Tetrachloroethene	1.65 J	1.65 J	µg/kg	S43SB010-0709	1/20	2.26 - 2510	1.65	NA	88	No	BSL
	108-88-3	**Toluene**	1.29 J	1.29 J	µg/kg	S43SB013-0608	1/20	2.26 - 2510	1.29	NA	11800	No	BSL
	79-01-6	**Trichloroethene**	8 J	4790	µg/kg	S43SB027-0708	8/20	2.26 - 2510	4790	NA	**3.2**	**Yes**	ASL
	75-01-4	Vinyl Chloride	14.3	14.3	µg/kg	S43SB019-0607	1/20	2.3 - 2510	14.3	NA	**0.106**	**Yes**	ASL

Footnotes:
1 - Values presented are sample-specific quantitation limits.
2 - The maximum detected concentration is used for screening purposes.
3 - NSF Indian Head subsurface soil background values.
4 - USEPA protection of Groundwater SSLs May 2013 with a DAF of 20.
5 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is greater than site background.
6 - Value is for hexavalent chromium.
7 - Value is for MCL based SSL.
8 - Value is for mercuric chloride (and other mercury salts).

Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Definitions:
C = Carcinogen
CAS = Chemical Abstracts Services
COPC = Chemical Of Potential Concern
J = Estimated value
K = Biased high
L = Biased low
NA = Not Applicable/Not Available

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level

For elimination as a COPC:
BKG = Less than Background Concentration
BSL = Below COPC Screening Level
NSL = No Screening Level
NUT = Essential Nutrient

Associated Samples:
S43SB0010101
S43SB0020101
S43SB008-0607
S43SB008-0608
S43SB009-0608
S43SB009-0708
S43SB009-0708-D
S43SB010-0709
S43SB011-0507
S43SB011-0709
S43SB011-0709-D
S43SB012-0507
S43SB012-0507-D
S43SB013-0608
S43SB014-0709
S43SB015-0810
S43SB016-0607
S43SB016-0608
S43SB017-0608
S43SB018-0507
S43SB019-0607
S43SB022-0708
S43SB023-0607
S43SB024-0607
S43SB024-0607-D
S43SB025-0607
S43SB026-0506
S43SB027-0708
S43SB028-0405

TABLE 2.5
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - GROUNDWATER
SITE 43 - TOLUENE DISPOSAL AREA
NSF-IH, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects[1]	Concentration Used for Screening[2]	NSF-IH Background Value[3]	Adjusted USEPA Tapwater RSL[4]	COPC Flag	Rationale for Contaminant Deletion or Selection[5]
Site 43		**Explosives**											
	99-65-0	**1,3-Dinitrobenzene**	0.186 J	0.212 J	ug/L	S43MW2401	2/24	0.151 - 0.168	0.212	NA	**0.15 N**	Yes	ASL
	606-20-2	**2,6-Dinitrotoluene**	0.185 J	0.504 J	ug/L	S43MW1001	2/24	0.151 - 0.178	0.504	NA	**0.042 C**	Yes	ASL
	99-08-1	**3-Nitrotoluene**	0.107 J	0.871	ug/L	S43MW0602	14/24	0.151 - 0.168	0.871	NA	**0.13 N**	Yes	ASL
	19406-51-0	4-Amino-2,6-Dinitrotoluene	0.473	0.473	ug/L	S43MW2401	1/24	0.151 - 0.178	0.473	NA	3 N	No	BSL
	99-99-0	4-Nitrotoluene	0.0861 J	2.13 J	ug/L	S43MW17D01	16/24	0.155 - 0.168	2.13	NA	3.7 C	No	BSL
	2691-41-0	HMX	0.123 J	0.965	ug/L	S43MW2201	5/24	0.151 - 0.178	0.965	NA	78 N	No	BSL
	479-45-8	Tetryl	0.198 J	0.198 J	ug/L	S43MW2401	1/24	0.151 - 0.178	0.198	NA	6.1 N	No	BSL
		Metals											
	7429-90-5	Aluminum	14.8 J	1190	ug/L	S43MW0602	21/24	25 - 28	1190	9620	1600 N	No	BSL, BKG
	7440-38-2	**Arsenic**	1.02 J	12.2	ug/L	S43MW0302	25/61	1.5 - 1.5	12.2	NA	**0.045 C**	Yes	ASL
	7440-39-3	**Barium**	27	352	ug/L	S43MW09S01	24/24	--	352	**139**	**290 N**	Yes	ASL
	7440-41-7	**Beryllium**	0.306 J	1.95	ug/L	S43MW19S01	14/24	0.5 - 0.5	1.95	NA	**1.6 N**	Yes	ASL
	7440-43-9	Cadmium	0.29 J	0.909 J	ug/L	S43MW1801	5/24	0.5 - 0.5	0.909	2.8	**0.69 N**	No	BKG
	7440-47-3	Chromium	0.841 J	4.45	ug/L	S43MW2401	7/24	1 - 1	4.45	16.4	**0.031 C[6]**	No	BKG
	7440-48-4	**Cobalt**	1.95 J	147	ug/L	S43MW019S02_20130508	58/66	2.5 - 2.5	147	**15.6**	**0.47 N**	Yes	ASL
	7440-50-8	Copper	1.01 J	8.18	ug/L	S43MW2401	12/24	2 - 2	8.18	22.4	62 N	No	BSL, BKG
	7439-89-6	**Iron**	12.4 J	54900 K	ug/L	S43MW0602	60/61	15 - 15	54900	**19900**	**1100 N**	Yes	ASL
	7439-92-1	Lead	0.69 J	1.08	ug/L	S43MW0104-D	2/24	0.75 - 0.75	1.08	NA	15 [7]	No	BSL
	7439-96-5	**Manganese**	32.7	2060	ug/L	S43PZ001_20130514	61/61	--	2060	**824**	**32 N**	Yes	ASL
	7440-02-0	**Nickel**	0.761 J	52.9	ug/L	S43MW1801	21/24	1.5 - 1.5	52.9	**16.6**	**30 N**	Yes	ASL
	7440-28-0	**Thallium**	0.799 J	0.803 J	ug/L	S43MW19S01-D	1/24	1 - 1	0.803	NA	**0.016 N**	Yes	ASL
	7440-62-2	Vanadium	1.27 J	6.68	ug/L	S43MW0602	17/24	2.5 - 2.5	6.68	20.9	**6.3 N**	No	BKG
	7440-66-6	Zinc	1.32 J	92.4	ug/L	S43MW19S01	24/24	--	92.4	**45.2**	470 N	No	BSL
		Volatiles											
	71-55-6	1,1,1-Trichloroethane	0.37 J	11.1	ug/L	S43MW2001	3/24	0.5 - 50	11.1	NA	750 N	No	BSL
	75-34-3	**1,1-Dichloroethane**	0.34 J	41.9	ug/L	S43MW02402_20130508	16/61	0.5 - 50	41.9	NA	**2.4 C**	Yes	ASL
	75-35-4	**1,1-Dichloroethene**	0.34 J	70	ug/L	S43MW19S01-D	23/61	0.5 - 50	70	NA	**26 N**	Yes	ASL
	107-06-2	**1,2-Dichloroethane**	0.36 J	0.36 J	ug/L	S43MW01302_20130519	1/61	0.5 - 50	0.36	NA	**0.15 C**	Yes	ASL
	78-93-3	2-Butanone	4.04 J	4.04 J	ug/L	S43MW2401	1/24	5 - 500	4.04	NA	490 N	No	BSL
	67-64-1	Acetone	7.56 J	7.56 J	ug/L	S43MW2401	1/24	5 - 500	7.56	NA	1200 N	No	BSL
	75-15-0	Carbon Disulfide	0.55 J	2.65	ug/L	S43MW1001	4/24	0.5 - 50	2.65	NA	72 N	No	BSL
	67-66-3	Chloroform	0.14 J	0.14 J	ug/L	S43MW01602_20130519	1/61	0.5 - 50	0.14	NA	0.19 C	No	BSL
	156-59-2	**cis-1,2-Dichloroethene**	0.77 J	400	ug/L	S43MW0104	28/61	0.5 - 0.5	400	NA	**2.8 N**	Yes	ASL
	75-09-2	Methylene Chloride	0.5 J	5.3 J	ug/L	S43MW00403_20130513	8/61	1 - 100	5.3	NA	8.4 N[8]	No	BSL
	156-60-5	trans-1,2-Dichloroethene	0.34 J	7.86	ug/L	S43MW03001_20130513	6/61	0.5 - 50	7.86	NA	8.6 N	No	BSL
	79-01-6	**Trichloroethene**	0.26 J	17500	ug/L	S43MW0104	43/66	0.5 - 0.5	17500	NA	**0.26 N[8]**	Yes	ASL
	75-01-4	**Vinyl Chloride**	0.81 J	65.6	ug/L	S43MW17D01	16/61	0.5 - 50	65.6	NA	**0.015 C**	Yes	ASL

TABLE 2.5
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - GROUNDWATER
SITE 43 - TOLUENE DISPOSAL AREA
NSF-IH, INDIAN HEAD, MARYLAND

Footnotes:

1 - Values presented are sample-specific quantitation limits.
2 - The maximum detected concentration is used for screening purposes.
3 - NSF Indian Head groundwater background values.
4 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2013. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag).
5 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is greater than site background.
6 - Value is for hexavalent chromium.
7 - Value is the MCL.
8 - 1/10 the non-carcinogenic value is less than the carcinogenic value. Screening level is the non-carcinogenic value.

Definitions:

C = Carcinogen
CAS = Chemical Abstracts Services
COPC = Chemical Of Potential Concern
J = Estimated value
K = Biased high
N = Noncarcinogen
NA = Not Applicable/Not Available

Rationale Codes:

For selection as a COPC:
ASL = Above Screening Level and site background.

For elimination as a COPC:
BKG = Less than Background Concentration
BSL = Below COPC Screening Level
NSL = No Screening Level
NUT = Essential Nutrient

Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Associated Samples

S43MW0104-AVG	S43MW1301	S43MW2401
S43MW00105_20130508-AVG	S43MW01302_20130519	S43MW02402_20130508
S43MW0204-AVG	S43MW1401	S43MW2501
S43MW00205_20130519	S43MW01402_20130519	S43MW02502_20130508
S43MW0302	S43MW1501	S43MW2601
S43MW00303_20130509	S43MW01502_20130519	S43MW02602_20130509
S43MW0402	S43MW1601	S43MW02701_20130513
S43MW00403_20130513	S43MW01602_20130519	S43MW02801_20130513
S43MW0502	S43MW17D01	S43MW02901_20130513
S43MW00503_20130509	S43MW017D02_20130509-AVG	S43MW03001_20130513-AVG
S43MW0602	S43MW17S01	S43PZ001_20130514
S43MW00603_20130509	S43MW017S02_20130509	S43PZ002_20130514
S43MW0701	S43MW1801	S43PZ003_20130514
S43MW00702_20130513	S43MW01802_20130508	S43PZ004_20130514
S43MW0801	S43MW19D01	
S43MW00802_20130509	S43MW019D02_20130508	
S43MW09D01	S43MW19S01-AVG	
S43MW009D02_20130513	S43MW019S02_20130508	
S43MW09S01	S43MW2001	
S43MW009S02_20130513-AVG	S43MW02002_20130509	
S43MW1001	S43MW2101	
S43MW01002_20130509	S43MW02102_20130508	
S43MW1101	S43MW2201	
S43MW01102_20130509	S43MW02202_20130509	
S43MW1201	S43MW2301	
S43MW01202_20130514	S43MW02302_20130509	

TABLE 2.6
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - SEDIMENT
SITE 43 - TOLUENE DISPOSAL AREA
NSF-IH, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Point	CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects(1)	Concentration Used for Screening(2)	Adjusted USEPA RSL Residential Soil(3)	COPC Flag	Rationale for Contaminant Deletion or Selection(4)
Site 43		**Metals**										
	7440-38-2	Arsenic	1.63	2.55	mg/kg	S43SD01_20130510	3/3	--	2.55	6.1 C	No	BSL
	7440-48-4	Cobalt	6.85	16.5	mg/kg	S43SD02_20130510	3/3	--	16.5	23 N	No	BSL
	7439-89-6	Iron	4630	17100	mg/kg	S43SD04_20130510	3/3	--	17100	55000 N	No	BSL
	7439-96-5	Manganese	32.7 J	129 J	mg/kg	S43SD04_20130510	3/3	--	129	1800 N	No	BSL
		Volatiles										
	156-59-2	cis-1,2-Dichloroethene	3.18 J	5.86 J	ug/kg	S43SD01_20130510-D	3/3	--	5.86	160000 N	No	BSL
	75-09-2	Methylene Chloride	103 J	222 J	ug/kg	S43SD01_20130510-D	3/3	--	222	360000 N(5)	No	BSL
	79-01-6	Trichloroethene	2.9 J	22.3 J	ug/kg	S43SD01_20130510-D	3/3	--	22.3	4400 N(5)	No	BSL

Footnotes:
1 - Values presented are sample-specific quantitation limits.
2 - The maximum detected concentration is used for screening purposes.
3 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2013. The RSLs are multiplied by 10 to account for reduced exposure to sediment.
The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10. Carcinogenic values (denoted with a "C" flag) represent an incremental cancer risk of 1.0E-06
4 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level
5 - One tenth the non-carcinogenic value is less than the carciongenic value so the non-carcinogenic value is used.

Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria.
Shaded chemical name indicates that the chemical was retained as a COPC.

Definitions:
C = Carcinogen
CAS = Chemical Abstracts Services
COPC = Chemical Of Potential Concern
J = Estimated value
N = Noncarcinogen

Associated Samples
S43SD01_20130510
S43SD01_20130510-D
S43SD01_20130510-AVG
S43SD02_20130510
S43SD04_20130510

Rationale Codes:
For elimination as a COPC:
BSL = Below COPC Screening Level

TABLE 2.7
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - SURFACE WATER
SITE 43 - TOLUENE DISPOSAL AREA
NSF-IH, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Point	CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects(1)	Concentration Used for Screening(2)	USEPA Tapwater RSL(3)	COPC Flag(4)	Rationale for Contaminant Deletion or Selection
Site 43		**Metals**										
	7440-38-2	**Arsenic**	0.751 J	1.21 J	µg/L	S43SW02_20130510	2/7	1.5 - 1.5	1.21	**0.45 C**	Yes	ASL
	7440-48-4	**Cobalt**	4.16	25.9	µg/L	S43SP0202_20130510	6/7	2.5 - 2.5	25.9	**4.7 N**	Yes	ASL
	7439-89-6	Iron	761	3340	µg/L	S43SW02_20130510	7/7	-	3340	11000 N	No	BSL
	7439-96-5	Manganese	41.2	256	µg/L	S43SW04_20130510	7/7	-	256	320 N	No	BSL
		Volatiles										
	71-55-6	1,1,1-Trichloroethane	2.36	2.36	µg/L	S43SP01-01	1/2	0.5 - 0.5	2.36	7500 N	No	BSL
	75-34-3	1,1-Dichloroethane	0.34 J	0.84 J	µg/L	S43SP0102_20130510	5/9	0.5 - 1	0.84	24 C	No	BSL
	75-35-4	1,1-Dichloroethene	0.37 J	4.43	µg/L	S43SP02-01	3/9	0.5 - 1	4.43	260 N	No	BSL
	156-59-2	**cis-1,2-Dichloroethene**	0.44 J	195	µg/L	S43SP02-01	8/9	0.5 - 0.5	195	**28 N**	Yes	ASL
	75-09-2	Methylene Chloride	0.65 J	1 J	µg/L	S43SP0102_20130510	2/9	1 - 2	1	84 N(5)	No	BSL
	127-18-4	Tetrachloroethene	0.24 J	0.24 J	µg/L	S43SP01-01	1/2	0.5 - 0.5	0.24	35 N(5)	No	BSL
	156-60-5	trans-1,2-Dichloroethene	1.09	1.09	µg/L	S43SP02-01	1/9	0.5 - 1	1.09	86 N	No	BSL
	79-01-6	**Trichloroethene**	1.86	354	µg/L	S43SP01-01	8/9	0.5 - 0.5	354	**2.6 N(5)**	Yes	ASL
	75-01-4	**Vinyl Chloride**	1.16	1.26	µg/L	S43SW04_20130510	2/9	0.5 - 1	1.26	**0.15 C**	Yes	ASL

Footnotes:
1 - Values presented are sample-specific quantitation limits.
2 - The maximum detected concentration is used for screening purposes.
3 - USEPA tapwater RSL May 2013 multipled by 10 to account for reduced exposure to surface water.
The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10.
Carcinogenic values (denoted with a "C" flag).
4 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level.
5 - One tenth the non-carcinogenic value is less than the carcinogenic value so the non-carcinogenic value is used.

Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria.
Shaded chemical name indicates that the chemical was retained as a COPC.

Definitions:
C = Carcinogen
CAS = Chemical Abstracts Services
COPC = Chemical Of Potential Concern
J = Estimated value
N = Noncarcinogen

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level
For elimination as a COPC:
BSL = Below COPC Screening Level

Associated Samples
S43CL01_20130510
S43OF01_20130510
S43SP01-01
S43SP0102_20130510
S43SP02-01
S43SP0202_20130510
S43SW01_20130510
S43SW01_20130510-D
S43SW01_20130510-avg
S43SW02_20130510
S43SW04_20130510

Q.2 RAGS PART D TABLE 3s

Medium-Specific Exposure Point Concentration Summary

LIST OF TABLES

RAGS PART D TABLE 3

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Table No.

3.1.RME	Surface Soil
3.2.RME	Subsurface Soil
3.3.RME	Groundwater
3.4.RME	Surface Water
3.5.RME	Surface Soil Including Background Chemicals
3.6.RME	Subsurface Soil Including Background Chemicals
3.7.RME	Groundwater Including Background Chemicals

TABLE 3.1.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
Site 43	Aluminum	mg/kg	13,900	17,600 (N)	20,200	17,600	mg/kg	95% Student's T UCL	ProUCL 4.1.01
	Cadmium	mg/kg	2	10.8 (G)	12.2	10.8	mg/kg	95% Adjusted Gamma UCL	ProUCL 4.1.01
	Chromium VI	mg/kg	23.1	28.1 (L)	37.5 J	28.1	mg/kg	95% Modified-T UCL	ProUCL 4.1.01
	Trichloroethene	mg/kg	0.37	NA(1)	2.72	2.72	mg/kg	Maximum Detected Concentration	(1)

G = Gamma
L = Lognormal
N = Normal
NA = Not applicable

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.
(1) ProUCL recommends there be at least 8 to 10 samples with at least 4 detections before a reliable UCL is calculated.

TABLE 3.2.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
Site 43	Manganese	mg/kg	38.3	92.3 (NP)	227 J	92.3	mg/kg	95% Chebyshev (Mean, Sd) UCL	ProUCL 4.1.01
	Trichloroethene	mg/kg	0.837	1.37 (N)	4.79	1.37	mg/kg	95% KM (t) UCL	ProUCL 4.1.01

J = Estimated Value
NP = Non-parametric
N = Normal

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.

TABLE 3.3.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
Site 43	1,3-Dinitrobenzene	ug/L	0.0904	NA(1)	0.212 J	0.212	ug/L	Maximum Detected Concentration	(1)
	2,6-Dinitrotoluene	ug/L	0.106	NA(1)	0.504 J	0.504	ug/L	Maximum Detected Concentration	(1)
	3-Nitrotoluene	ug/L	0.27	0.38 (N)	0.871	0.378	ug/L	95% KM (Percentile Bootstrap) UCL	ProUCL 4.1.01
	Arsenic	ug/L	2.048	2.8 (L)	12.2	2.8	ug/L	95% KM (t) UCL	ProUCL 4.1.01
	Barium	ug/L	111.5	138 (G)	352	138	ug/L	95% Approximate Gamma UCL	(1)
	Beryllium	ug/L	0.584	0.82 (G)	1.95	0.82	ug/L	95% KM (t) UCL	ProUCL 4.1.01
	Cobalt	ug/L	29.6	48.9 (G)	147	48.9	ug/L	95% KM (Chebyshev) UCL	ProUCL 4.1.01
	Iron	ug/L	13127	24800 (NP)	54900	24800	ug/L	97.5% KM (Chebyshev) UCL	ProUCL 4.1.01
	Manganese	ug/L	405	481	2060	481	ug/L	95% Approximate Gamma UCL	ProUCL 4.1.01
	Nickel	ug/L	16.66	32.8 (G)	52.9	32.8	ug/L	95% KM (Chebyshev) UCL	ProUCL 4.1.01
	Thallium	ug/L	NA(1)	NA(1)	0.803 J	0.803	ug/L	Maximum Detected Concentration	(1)
	1,1-Dichloroethane	ug/L	4.341	4.7 (G)	41.9	4.7	ug/L	95% KM (t) UCL	ProUCL 4.1.01
	1,1-Dichloroethene	ug/L	3.767	4.4 (G)	70	4.4	ug/L	95% KM (t) UCL	ProUCL 4.1.01
	1,2-Dichloroethane	ug/L	NA(1)	NA(1)	0.36 J	0.36	ug/L	Maximum Detected Concentration	(1)
	Cis-1,2-Dichloroethene	ug/L	40.21	58 (G)	400	58	ug/L	95% KM (t) UCL	ProUCL 4.1.01
	Trichloroethene	ug/L	785.9	2680 (NP)	17500	2680	ug/L	97.5% KM (Chebyshev) UCL	ProUCL 4.1.01
	Vinyl Chloride	ug/L	5.953	8 (G)	65.6	8	ug/L	95% KM (t) UCL	ProUCL 4.1.01

G = Gamma
J = Estimated Value
L = Lognormal
N = Normal
NA = Not applicable
NP = Nonparametric

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.
(1) ProUCL recommends there be at least 8 to 10 samples with at least 4 detections before a reliable UCL is calculated.

TABLE 3.4.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
Site 43	Arsenic	ug/L	0.8	NA(1)	1.21 J	1.21	ug/L	Maximum Detected Concentration	(1)
	Cobalt	ug/L	7.8	12.0 (G)	25.9	25.9	ug/L	Maximum Detected Concentration	(1)
	Cis-1,2-Dichloroethene	ug/L	28.3	244 (L)	195	195	ug/L	Maximum Detected Concentration	(2)
	Trichloroethene	ug/L	68.2	240 (G)	354	240	ug/L	95% KM (Chebyshev) UCL	ProUCL 4.1.01
	Vinyl Chloride	ug/L	0.52	NA(1)	1.26	1.26	ug/L	Maximum Detected Concentration	(1)

G = Gamma
J = Estimated Value
L = Lognormal
NP = Nonparametric
NA = Not applicable

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.
(1) ProUCL recommends there be at least 8 to 10 samples with at least 4 detections before a reliable UCL is calculated.
(2) The recommended UCL exceeded the maximum concentration. The maximum concentration was used as the EPC.

TABLE 3.5.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
Site 43 including Background Chemicals	Aluminum	mg/kg	13900	17600 (N)	20200	17600	mg/kg	95% Student's-t UCL	ProUCL 4.1.01
	Arsenic	mg/kg	4.2	7.2 (G)	12.3	7.2	mg/kg	95% Approximate Gamma UCL	ProUCL 4.1.01
	Cadmium	mg/kg	2	10.8 (G)	12.2	10.8	mg/kg	95% Adjusted Gamma UCL	ProUCL 4.1.01
	Chromium VI	mg/kg	23.1	28.1 (L)	37.5 J	28.1	mg/kg	95% Modified-t UCL	ProUCL 4.1.01
	Cobalt	mg/kg	7.1	12.1 (G)	19.3	12.1	mg/kg	95% Approximate Gamma UCL	ProUCL 4.1.01
	Iron	mg/kg	18600	22800 (N)	32100 J	22800	mg/kg	95% Student's T UCL	ProUCL 4.1.01
	Manganese	mg/kg	193	1200 (L)	813 J	1200	mg/kg	99% Chebyshev (Mean, Sd) UCL	ProUCL 4.1.01
	Thallium	mg/kg	NA(1)	NA(1)	0.664 J	0.664	mg/kg	Maximum Detected Concentration	ProUCL 4.1.01
	Vanadium	mg/kg	33.8	38.5 (N)	44.6	38.5	mg/kg	95% Student's T UCL	ProUCL 4.1.01
	Trichloroethene	mg/kg	0.37	NA(1)	2.72	2.72	mg/kg	Maximum Detected Concentration	(1)

G = Gamma
L = Lognormal
N = Normal
NA = Not applicable

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.
(1) ProUCL recommends there be at least 8 to 10 samples with at least 4 detections before a reliable UCL is calculated.

TABLE 3.6.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
Site 43 including Background Chemicals	Aluminum	mg/kg	7854	8950 (N)	12300	8950	mg/kg	95% Student's T UCL	ProUCL 4.1.01
	Arsenic	mg/kg	2.01	2.38 (N)	5.24 J	2.38	mg/kg	95% Student's T UCL	ProUCL 4.1.01
	Chromium VI	mg/kg	14.3	15.4 (N)	18.5 K	15.4	mg/kg	95% Student's T UCL	ProUCL 4.1.01
	Cobalt	mg/kg	4.4	4.9 (N)	6.28	4.9	mg/kg	95% Student's T UCL	ProUCL 4.1.01
	Iron	mg/kg	11607	13000 (N)	18700	13000	mg/kg	95% Student's T UCL	ProUCL 4.1.01
	Manganese	mg/kg	38.3	92.3 (NP)	227 J	92.3	mg/kg	95% Chebyshev (Mean, Sd) UCL	ProUCL 4.1.01
	Trichloroethene	mg/kg	0.837	1.37 (N)	4.79	1.37	mg/kg	95% KM (t) UCL	ProUCL 4.1.01

J = Estimate Value
K = Value Biased High
NP = Non-parametric
N = Normal

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.

TABLE 3.7.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
Site 43 including Background Chemicals	1,3-Dinitrobenzene	ug/L	0.0904	NA(1)	0.212 J	0.212	ug/L	Maximum Detected Concentration	(1)
	2,6-Dinitrotoluene	ug/L	0.106	NA(1)	0.504 J	0.504	ug/L	Maximum Detected Concentration	(1)
	3-Nitrotoluene	ug/L	0.27	0.38 (N)	0.871	0.378	ug/L	95% KM (Percentile Bootstrap) UCL	ProUCL 4.1.01
	Arsenic	ug/L	2.048	2.8 (L)	12.2	2.8	ug/L	95% KM (t) UCL	ProUCL 4.1.01
	Barium	ug/L	111.5	138 (G)	352	138	ug/L	95% Approximate Gamma UCL	(1)
	Beryllium	ug/L	0.584	0.82 (G)	1.95	0.82	ug/L	95% KM (t) UCL	ProUCL 4.1.01
	Cadmium	ug/L	0.303	0.422 (N)	0.909 J	0.422	ug/L	95% KM (t) UCL	ProUCL 4.1.01
	Chromium VI	ug/L	0.903	1.5 (G)	4.45	1.5	ug/L	95% KM (t) UCL	ProUCL 4.1.01
	Cobalt	ug/L	29.6	48.9 (G)	147	48.9	ug/L	95% KM (Chebyshev) UCL	ProUCL 4.1.01
	Iron	ug/L	13127	24800 (NP)	54900 K	24800	ug/L	97.5% KM (Chebyshev) UCL	ProUCL 4.1.01
	Manganese	ug/L	405	481 (G)	2060	481	ug/L	95% Approximate Gamma UCL	ProUCL 4.1.01
	Nickel	ug/L	16.66	32.8 (G)	52.9	32.8	ug/L	95% KM (Chebyshev) UCL	ProUCL 4.1.01
	Thallium	ug/L	NA(1)	NA(1)	0.803 J	0.803	ug/L	Maximum Detected Concentration	(1)
	Vanadium	ug/L	1.9	2.5 (NP)	6.68	2.5	ug/L	95% KM (BCA) UCL	ProUCL 4.1.01
	1,1-Dichloroethane	ug/L	4.341	4.7 (G)	41.9	4.7	ug/L	95% KM (t) UCL	ProUCL 4.1.01
	1,1-Dichloroethene	ug/L	3.767	4.4 (G)	70	4.4	ug/L	95% KM (t) UCL	ProUCL 4.1.01
	1,2-Dichloroethane	ug/L	NA(1)	NA(1)	0.36 J	0.36	ug/L	Maximum Detected Concentration	(1)
	Cis-1,2-Dichloroethene	ug/L	40.21	58 (G)	400	58	ug/L	95% KM (t) UCL	ProUCL 4.1.01
	Trichloroethene	ug/L	785.9	2680 (NP)	17500	2680	ug/L	97.5% KM (Chebyshev) UCL	ProUCL 4.1.01
	Vinyl Chloride	ug/L	5.953	8 (G)	65.6	8	ug/L	95% KM (t) UCL	ProUCL 4.1.01

G = Gamma
J = Estimate Value
K = Value Biased High
L = Lognormal
N = Normal
NP = Nonparametric

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.
(1) ProUCL recommends there be at least 8 to 10 samples with at least 4 detections before a reliable UCL is calculated .

Q.3 RAGS PART D TABLE 4s

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TABLE 4.1.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - CONSTRUCTION WORKERS- SOILS

NAVAL SUPPORT FACILITY, INDIAN HEAD, INDIAN HEAD MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Construction Workers	Adult	Site 43	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002a	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	330	mg/day	USEPA, 2002b	
				RBA	Relative Bioavailability	Chemical Specific	unitless	USEPA, 1989	Cs x RBA x IRS x CF3 x FI x EF x ED
				CF3	Conversion Factor 3	0.000001	kg/mg	--	BW x AT
				FI	Fraction Ingested	1	unitless	USEPA, 2002b	
				EF	Exposure Frequency	150	days/year	(1)	
				ED	Exposure Duration	1	years	(1)	
				BW	Body Weight	70	kg	USEPA, 2002b	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	
Dermal	Construction Workers	Adult	Site 43	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002a	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	0.000001	kg/mg	--	
				SA	Skin Surface Available for Contact	3300	cm2	USEPA, 2002b	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.3	mg/cm2/event	USEPA, 2002b	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2002b	
				EV	Events Frequency	1	events/day	USEPA, 2002b	
				EF	Exposure Frequency	150	days/year	(1)	
				ED	Exposure Duration	1	years	(1)	
				BW	Body Weight	70	kg	USEPA, 2002b	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	

Notes:

1 - Professional judgment.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A.

USEPA, 2002a:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2002b: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Cancer Ingestion Intake = 2.77E-08 Cancer Dermal Intake = 8.30E-08

Noncancer Ingestion Intake = 1.94E-06 Noncancer Dermal Intake = 5.81E-06

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.2.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - CONSTRUCTION WORKERS - SOILS TO AIR

NAVAL SUPPORT FACILITY, INDIAN HEAD, INDIAN HEAD MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Construction Workers	Adult	Site 43	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	8	hours/day	(1)	CA x ET x EF x ED
				EF	Exposure Frequency	150	days/year	(1)	AT x 24 hours/day
				ED	Exposure Duration	1	years	(1)	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	CA = (1/PEF + 1/VF) x Cs
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	
				PEF	Particulate Emission Factor	1.62E+06	m3/kg	USEPA, 2002a	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	14.31	g/m2-s per kg/m3	USEPA, 2002a	

Notes:

1 - Professional judgment.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Cancer Inhalation Intake = 1.96E-03 Noncancer Inhalation Intake = 1.37E-01

Cancer risk from inhalation = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from inhalation = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.3.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - CONSTRUCTION WORKERS - GROUNDWATER

NAVAL SUPPORT FACILITY, INDIAN HEAD, INDIAN HEAD MARYLAND

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Construction Workers	Adult	Site 43	CGW	Chemical Concentration in Groundwater	Max or 95% UCL	ug/L	USEPA, 2002	Chronic Daily Intake (CDI) (mg/kg/day) =
				CF	Conversion Factor	0.001	mg/ug	- -	
				IR-GW	Ingestion Rate of Groundwater	0.01	L/day	(1)	CGW x CF x IR-GW x EF x ED
				EF	Exposure Frequency	90	days/year	(1)	BW x AT
				ED	Exposure Duration	1	years	(1)	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	
Dermal	Construction Workers	Adult	Site 43	Daevent	Dermally Absorbed Dose per Event	Calculated	mg/cm2-event	USEPA, 2004	Dermally Absorbed Dose (mg/kg/day) =
				Cw	Chemical Concentration in Groundwater	Max or 95% UCL	mg/kg	USEPA, 2002	
				FA	Fraction Absorbed	Chemical Specific	unitless	USEPA, 2004	DAevent x EV x EF x ED x SA
				CF	Conversion factor	0.001	L/cm^3	- -	BW x AT
				Kp	Permeability coefficient	Chemical Specific	cm/hr	USEPA, 2004	
				τ	Lag time	Chemical Specific	hr/event	USEPA, 2004	For inorganics
				t*	Time it takes to reach steady state	Chemical Specific	hr/event	USEPA, 2004	DAevent = Kp x CW x CF x tevent
				tevent	Duration of event	4	hr/event	(1)	
				B	Bunge model constant	Chemical Specific	unitless	USEPA, 2004	For organics if tevent <= t*
				SA	Skin Surface Available for Contact	3300	cm2	USEPA, 2004	DAevent= 2 x FA x Kp x Cw x CF x sqrt[(6 x τ x tevent)/pi]
				EV	Event Frequency	1	events/day	(1)	
				EF	Exposure Frequency	90	days/year	(1)	For organics if tevent > t*
				ED	Exposure Duration	1	years	(1)	DAevent =FA x Kp x Cw x CF x [tevent/(1+B) +
				BW	Body Weight	70	kg	USEPA, 1989	2 x τ +(1 + 3B + $3B^2$)/(1+B^2)
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	

Notes

1 - Professional judgment.

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 2002:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Dermal Intake = (SA x EV x EF x ED)/(BW x AT)

Cancer Dermal Intake = 1.66E-01 Noncancer Dermal Intake = 1.16E+01

Cancer risk from dermal contact = Groundwater concentration x Cancer Dermal Intake x DAevent x Dermal Cancer Slope Factor

Hazard Index from dermal contact = Groundwater concentration x Noncancer Dermal Intake x DAevent / Dermal Reference Dose

TABLE 4.4.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - CONSTRUCTION WORKERS - GROUNDWATER TO AIR

NAVAL SUPPORT FACILITY, INDIAN HEAD, INDIAN HEAD MARYLAND

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Construction Workers	Adult	Site 43	CA	Chemical concentration in air	Calculated	mg/m3	VDEQ, 2013	Exposure Concentration (mg/m^3) =
				CW	Chemical concentration in water.	Average	ug/L	--	
				CF	Conversion Factor	0.001	mg/ug	--	CA x ET x EF x ED
				ET	Exposure Time	4	hours/day	(1)	AT x 24 hours/day
				EF	Exposure Frequency	90	days/year	(1)	
				ED	Exposure Duration	1	years	(1)	CA = CW x CF x VF
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	
				VF	Volatilization Factor	Calculated	(mg/m3)/(mg/L)	VDEQ, 2013	

Notes:

1 - Professional judgment.

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

VDEQ, 2013: Virginia Department of Environmental Quality (VDEQ, online- http://www.deq.state.va.us/Programs/LandProtectionRevitalization/RemediationProgram/VoluntaryRemediationProgram/VRPRiskAssessmentGuidance.aspx).

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Cancer Inhalation Intake = 5.87E-07 Noncancer Inhalation Intake = 4.11E-05

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.5.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - CONSTRUCTION WORKERS - SURFACE WATER

NAVAL SUPPORT FACILITY, INDIAN HEAD, INDIAN HEAD MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Construction Workers	Adult	Site 43	CW	Chemical Concentration in Water	Max or 95% UCL	ug/L	USEPA, 2002	Chronic Daily Intake (CDI) (mg/kg/day) =
				CR	Contact Rate	0.01	L/hour	USEPA 4, 2000	
				CF	Conversion factor	0.001	mg/ug	- -	
				ET	Exposure Time	4	hours/event	(1)	CW x CF x CR x ET x EF x ED
				EF	Exposure Frequency	52	events/year	(1)	BW x AT
				ED	Exposure Duration	1	years	(1)	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	
Dermal	Construction Workers	Adult	Site 43	DAevent	Absorbed dose per event	Calculated	mg/cm2-event	USEPA, 2004	Dermally Absorbed Dose (mg/kg/day) =
				Cw	Chemical Concentration in Water	Max or 95% UCL	mg/kg	USEPA, 2002	
				FA	Fraction Absorbed	Chemical Specific	unitless	USEPA, 2004	DAevent x EV x EF x ED x SA
				CF	Conversion factor	0.001	L/cm^3	- -	BW x AT
				Kp	Permeability coefficient	Chemical Specific	cm/hr	USEPA, 2004	
				τ	Lag time	Chemical Specific	hr/event	USEPA, 2004	For inorganics
				t*	Time it takes to reach steady state	Chemical Specific	hr/event	USEPA, 2004	DAevent = Kp x CW x CF x tevent
				tevent	Duration of event	4	hr/event	(1)	
				B	Bunge model constant	Chemical Specific	unitless	USEPA, 2004	For organics if tevent <= t*
				SA	Skin Surface Available for Contact	3,300	cm2	USEPA, 2004	DAevent= 2 x FA x Kp x Cw x CF x sqrt[(6 x τ x tevent)/pi]
				EV	Event Frequency	1	events/day	(1)	
				EF	Exposure Frequency	52	days/year	(1)	For organics if tevent > t*
				ED	Exposure Duration	1	years	(1)	DAevent =FA x Kp x Cw x CF x [tevent/(1+B) +
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	

Notes:

1 - Professional judgment. Assume two days a week in warm weather months for RME and one day a week for CTE.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA Region 4, 2000: Supplement Guidance to RAGS: Region 4 Bulletins.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Ingestion Intake = (CR x CF x ET x EF x ED)/(BW x AT)

Dermal Intake = (SA x EV x EF x ED)/(BW x AT)

Cancer Ingestion Intake = 1.16E-09 Cancer Dermal Intake = 9.59E-02

Noncancer Ingestion Intake = 8.14E-08 Noncancer Dermal Intake = 6.72E+00

Cancer risk from ingestion = Surface Water concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Surface Water concentration x Cancer Dermal Intake x DAevent x Dermal Cancer Slope Factor

Hazard Index from ingestion = Surface Water concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Surface Water concentration x Noncancer Dermal Intake x DAevent / Dermal Reference Dose

TABLE 4.6.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - MAINTENANCE WORKERS - SOIL

NAVAL SUPPORT FACILITY, INDIAN HEAD, INDIAN HEAD MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Maintenance Workers	Adult	Site 43	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002a	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	100	mg/day	USEPA, 2002b	
				RBA	Relative Bioavailability	Chemical Specific	unitless	USEPA, 1989	Cs x RBA x IRS x CF3 x FI x EF x ED
				CF3	Conversion Factor 3	0.000001	kg/mg	--	BW x AT
				FI	Fraction Ingested	1	unitless	USEPA, 2002b	
				EF	Exposure Frequency	24	days/year	(1)	
				ED	Exposure Duration	25	years	USEPA, 2002b	
				BW	Body Weight	70	kg	USEPA, 2002b	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	9125	days	USEPA, 1989	
Dermal	Maintenance Workers	Adult	Site 43	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	0.000001	kg/mg	--	
				SA	Skin Surface Available for Contact	3300	cm2	USEPA, 2002b	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.2	mg/cm2/event	USEPA, 2002b	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	24	days/year	(1)	
				ED	Exposure Duration	25	years	USEPA, 2002b	
				BW	Body Weight	70	kg	USEPA, 2002b	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	9125	days	USEPA, 1989	

Notes:

1 - Professional judgment.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A.

USEPA, 2002a:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2002b: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Cancer Ingestion Intake = 3.35E-08 Cancer Dermal Intake = 2.21E-07

Noncancer Ingestion Intake = 9.39E-08 Noncancer Dermal Intake = 6.20E-07

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

TABLE 4.7.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - MAINTENANCE WORKERS - SOIL TO AIR

NAVAL SUPPORT FACILITY, INDIAN HEAD, INDIAN HEAD MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Maintenance Workers	Adult	Site 43	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	8	hours/day	(1)	CA x ET x EF x ED
				EF	Exposure Frequency	24	days/year	(1)	AT x 24 hours/day
				ED	Exposure Duration	25	years	USEPA, 2002a	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	CA = (1/PEF + 1/VF) x Cs
				AT-N	Averaging Time (Non-Cancer)	9125	days	USEPA, 1989	
				PEF	Particulate Emission Factor	3.23E+09	m3/kg	USEPA 2013	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	87.36898	g/m2-s per kg/m3	USEPA 2013	

Notes:

1 - Professional judgment.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2013: Soil Screening Guidance calculation Internet site at http://rais.ornl.gov/epa/ssl1.shtml. Site-specific values for Philadelphia, PA.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Cancer Inhalation Intake = 7.83E-03 Noncancer Inhalation Intake = 2.19E-02

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.8.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - MAINTENANCE WORKERS - SURFACE WATER

NAVAL SUPPORT FACILITY, INDIAN HEAD, INDIAN HEAD MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Maintenance Workers	Adult	Site 43	CW	Chemical Concentration in Water	Max or 95% UCL	ug/L	USEPA, 2002a	Chronic Daily Intake (CDI) (mg/kg/day) =
				CR	Contact Rate	0.01	L/hour	USEPA 4, 2000	
				CF	Conversion factor	0.001	mg/ug	- -	
				ET	Exposure Time	4	hours/event	(1)	CW x CF x CR x ET x EF x ED
				EF	Exposure Frequency	24	events/year	(1)	BW x AT
				ED	Exposure Duration	25	years	USEPA, 2002b	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	9,125	days	USEPA, 1989	
Dermal	Maintenance Workers	Adult	Site 43	DAevent	Absorbed dose per event	Calculated	mg/cm2-event	USEPA, 2004	Dermally Absorbed Dose (mg/kg/day) =
				Cw	Chemical Concentration in Water	Max or 95% UCL	mg/kg	USEPA, 2002a	
				FA	Fraction Absorbed	Chemical Specific	unitless	USEPA, 2004	DAevent x EV x EF x ED x SA
				CF	Conversion factor	0.001	L/cm^3	- -	BW x AT
				Kp	Permeability coefficient	Chemical Specific	cm/hr	USEPA, 2004	
				τ	Lag time	Chemical Specific	hr/event	USEPA, 2004	For inorganics
				t*	Time it takes to reach steady state	Chemical Specific	hr/event	USEPA, 2004	DAevent = Kp x CW x CF x tevent
				tevent	Duration of event	4	hr/event	(1)	
				B	Bunge model constant	Chemical Specific	unitless	USEPA, 2004	For organics if tevent <= t*
				SA	Skin Surface Available for Contact	3,300	cm2	USEPA, 2004	DAevent= 2 x FA x Kp x Cw x CF x sqrt[(6 x τ x tevent)/pi]
				EV	Event Frequency	1	events/day	(1)	
				EF	Exposure Frequency	24	days/year	(1)	For organics if tevent > t*
				ED	Exposure Duration	25	years	USEPA, 2002b	DAevent =FA x Kp x Cw x CF x [tevent/(1+B) +
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	9,125	days	USEPA, 1989	

Notes:

1 - Professional judgment. Assume two days a week in warm weather months for RME and one day a week for CTE.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA Region 4, 2000: Supplement Guidance to RAGS: Region 4 Bulletins.

USEPA, 2002a:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2002b: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Ingestion Intake = (CR x CF x ET x EF x ED)/(BW x AT)

Dermal Intake = (SA x EV x EF x ED)/(BW x AT)

Cancer Ingestion Intake = 1.34E-08 Cancer Dermal Intake = 1.11E+00

Noncancer Ingestion Intake = 3.76E-08 Noncancer Dermal Intake = 3.10E+00

Cancer risk from ingestion = Surface Water concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Surface Water concentration x Cancer Dermal Intake x DAevent x Dermal Cancer Slope Factor

Hazard Index from ingestion = Surface Water concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Surface Water concentration x Noncancer Dermal Intake x DAevent / Dermal Reference Dose

TABLE 4.9.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - INDUSTRIAL WORKERS - SOIL

NAVAL SUPPORT FACILITY, INDIAN HEAD, INDIAN HEAD MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Industrial Workers	Adult	Site 43	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002a	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	100	mg/day	USEPA, 2002b	
				RBA	Relative Bioavailability	Chemical Specific	unitless	USEPA, 1989	Cs x RBA x IRS x CF3 x FI x EF x ED
				CF3	Conversion Factor 3	0.000001	kg/mg	--	BW x AT
				FI	Fraction Ingested	1	unitless	USEPA, 2002b	
				EF	Exposure Frequency	250	days/year	USEPA, 2002b	
				ED	Exposure Duration	25	years	USEPA, 2002b	
				BW	Body Weight	70	kg	USEPA, 2002b	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	9125	days	USEPA, 1989	
Dermal	Industrial Workers	Adult	Site 43	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	0.000001	kg/mg	--	
				SA	Skin Surface Available for Contact	3300	cm2	USEPA, 2002b	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.2	mg/cm2/event	USEPA, 2002b	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	250	days/year	USEPA, 2002b	
				ED	Exposure Duration	25	years	USEPA, 1989	
				BW	Body Weight	70	kg	USEPA, 2002b	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	9125	days	USEPA, 1989	

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A.

USEPA, 2002a:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2002b: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Cancer Ingestion Intake = 3.49E-07 Cancer Dermal Intake = 2.31E-06

Noncancer Ingestion Intake = 9.78E-07 Noncancer Dermal Intake = 6.46E-06

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.10.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - INDUSTRIAL WORKERS - SOIL TO AIR

NAVAL SUPPORT FACILITY, INDIAN HEAD, INDIAN HEAD MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Industrial Workers	Adult	Site 43	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	8	hours/day	USEPA, 2002a	CA x ET x EF x ED
				EF	Exposure Frequency	250	days/year	USEPA, 2002a	AT x 24 hours/day
				ED	Exposure Duration	25	years	USEPA, 2002a	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	CA = (1/PEF + 1/VF) x Cs
				AT-N	Averaging Time (Non-Cancer)	9125	days	USEPA, 1989	
				PEF	Particulate Emission Factor	3.23E+09	m3/kg	USEPA 2013	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	87.36898	g/m2-s per kg/m3	USEPA 2013	

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2013: Soil Screening Guidance calculation Internet site at http://rais.ornl.gov/epa/ssl1.shtml. Site-specific values for Philadelphia, PA.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Cancer Inhalation Intake = 8.15E-02 Noncancer Inhalation Intake = 2.28E-01

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.11.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE - CHILD RESIDENTS - SOILS
NAVAL SUPPORT FACILITY, INDIAN HEAD, INDIAN HEAD MARYLAND

Scenario Timeframe: Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Child	Site 43	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	200	mg/day	USEPA, 1991	
				RBA	Relative Bioavailability	Chemical Specific	unitless	USEPA, 1989	Cs x RBA x IRS x CF3 x FI x EF x ED
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	BW x AT
				FI	Fraction Ingested	1	unitless	USEPA, 1991	
				EF	Exposure Frequency	350	days/year	USEPA, 1991	
				ED1	Exposure Duration (Age 0 - 2)	2	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	
Dermal	Resident	Child	Site 43	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	1E-06	kg/mg	--	
				SA	Skin Surface Available for Contact	2,800	cm2	USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.2	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	350	days/year	USEPA, 1991	
				ED1	Exposure Duration (Age 0 - 2)	2	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	

Notes:

1 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential children will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.

USEPA, 2002:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 6) = 1.10E-06 Cancer Dermal Intake (Age 0 - 6) = 3.07E-06

Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 2) = 3.65E-07 Cancer Dermal Intake (Age 0 - 2) = 1.02E-06

Cancer Ingestion Intake (Age 2 - 6) = 7.31E-07 Cancer Dermal Intake (Age 2 - 6) = 2.05E-06

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 1.28E-05 Noncancer Dermal Intake = 3.58E-05

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.12.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - CHILD RESIDENTS SOILS TO AIR

NAVAL SUPPORT FACILITY, INDIAN HEAD, INDIAN HEAD MARYLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Resident	Child	Site 43	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	24	hours/day	USEPA, 2002a	CA x ET x EF x ED
				EF	Exposure Frequency	350	days/year	USEPA, 1991	AT x 24 hours/day
				ED1	Exposure Duration (Age 0 - 2)	2	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(1), USEPA, 1989, 2005	CA = (1/PEF + 1/VF) x Cs
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2190	days	USEPA, 1989	
				PEF	Particulate Emission Factor	3.23E+09	m3/kg	USEPA, 2013	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	87.36898	g/m2-s per kg/m3	USEPA, 2013	

Notes:

1 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential children will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2013: Soil Screening Guidance calculation Internet site at http://rais.ornl.gov/epa/ssl1.shtml. Site-specific values for Philadelphia, PA.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Non-Mutagenic Chemicals

Cancer Inhalation Intake (Age 0 - 6) = 8.22E-02

Noncarcinogenic Chemicals

Noncancer Inhalation Intake = 9.59E-01

Mutagenic Chemicals

Cancer Inhalation Intake (Age 0 - 2) = 2.74E-02

Cancer Inhalation Intake (Age 2 - 6) = 5.48E-02

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.13.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE - CHILD RESIDENTS - GROUNDWATER
NAVAL SUPPORT FACILITY, INDIAN HEAD, INDIAN HEAD MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Residents	Child	Site 43	CGW	Chemical Concentration in Groundwater	Max or 95% UCL	mg/kg	USEPA, 2002a	Chronic Daily Intake (CDI) (mg/kg/day) =
				CF	Conversion Factor	0.001	mg/ug	--	
				IR-GW	Ingestion Rate of Groundwater	1	L/day	USEPA, 1991	CGW x CF x IR-GW x EF x ED
				EF	Exposure Frequency	350	days/year	USEPA, 1991	BW x AT
				ED1	Exposure Duration (Age 0 - 2)	2	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	
Dermal	Residents	Child	Site 43	Daevent	Dermally Absorbed Dose per Event	Calculated	mg/cm2-event	USEPA, 2004	Dermally Absorbed Dose (mg/kg/day) =
				Cw	Chemical Concentration in Groundwater	Max or 95% UCL	mg/kg	USEPA, 2002a	
				FA	Fraction Absorbed	Chemical Specific	unitless	USEPA, 2004	DAevent x EV x EF x ED x SA
				CF	Conversion factor	0.001	L/cm^3	- -	BW x AT
				Kp	Permeability coefficient	Chemical Specific	cm/hr	USEPA, 2004	
				τ	Lag time	Chemical Specific	hr/event	USEPA, 2004	For inorganics
				t*	Time it takes to reach steady state	Chemical Specific	hr/event	USEPA, 2004	DAevent = Kp x CW x CF x tevent
				tevent	Duration of event	0.1	hr/event	USEPA, 2004	
				B	Bunge model constant	Chemical Specific	unitless	USEPA, 2004	For organics if tevent <= t*
				SA	Skin Surface Available for Contact	6,600	cm2	USEPA, 2004	DAevent= 2 x FA x Kp x Cw x CF x sqrt[(6 x τ x tevent)/pi]
				EV	Event Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	350	days/year	USEPA, 1991	
				ED1	Exposure Duration (Age 0 - 2)	2	years	(1), USEPA, 1989, 2005	DAevent =FA x Kp x Cw x CF x [tevent/(1+B) +
				ED2	Exposure Duration (Age 2 - 6)	4	years	(1), USEPA, 1989, 2005	2 x τ +(1 + 3B + $3B^2$)/(1+B^2)
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	

Notes:

1 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential children will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.

USEPA, 2002:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Ingestion Intake = (IR-GW x EF x ED)/(BW x AT)

Dermal Intake = (SA x EV x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 6) = 5.48E-06 Cancer Dermal Intake Time (Age 0 - 6) = 3.62E+01

Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 2) = 1.83E-06 Cancer Dermal Intake (Age 0 - 2) = 1.21E+01

Cancer Ingestion Intake (Age 2 - 6) = 3.65E-06 Cancer Dermal Intake (Age 2 - 6) = 2.41E+01

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 6.39E-05 Noncancer Dermal Intake = 4.22E+02

Cancer risk from ingestion = Groundwater concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Groundwater concentration x Cancer Dermal Intake x DAevent x Dermal Cancer Slope Factor

Hazard Index from ingestion = Groundwater concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Groundwater concentration x Noncancer Dermal Intake x DAevent / Dermal Reference Dose

TABLE 4.14.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - CHILD RESIDENTS - SURFACE WATER

NAVAL SUPPORT FACILITY, INDIAN HEAD, INDIAN HEAD MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Child	Site 43	CW	Chemical Concentration in Water	Max or 95% UCL	ug/L	USEPA, 2002	Chronic Daily Intake (CDI) (mg/kg/day) =
				CR	Contact Rate	0.01	L/hr	USEPA 4, 2000	
				CF	Conversion factor	0.001	mg/ug	- -	
				ET	Exposure Time	4	hours/event	(1)	CW x CF x CR x ET x EF x ED
				EF	Exposure Frequency	52	events/year	(1)	BW x AT
				ED1	Exposure Duration (Age 0 - 2)	2	years	(2), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(2), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	
Dermal	Resident	Child	Site 43	DAevent	Absorbed dose per event	Calculated	mg/cm2-event	USEPA, 2004	Dermally Absorbed Dose (mg/kg/day) =
				Cw	Chemical Concentration in Water	Max or 95% UCL	mg/kg	USEPA, 2002a	
				FA	Fraction Absorbed	Chemical Specific	unitless	USEPA, 2004	DAevent x EV x EF x ED x SA
				CF	Conversion factor	0.001	L/cm^3	- -	BW x AT
				Kp	Permeability coefficient	Chemical Specific	cm/hr	USEPA, 2004	
				τ	Lag time	Chemical Specific	hr/event	USEPA, 2004	For inorganics
				t*	Time it takes to reach steady state	Chemical Specific	hr/event	USEPA, 2004	DAevent = Kp x CW x CF x tevent
				tevent	Duration of event	4	hr/event	(1)	
				B	Bunge model constant	Chemical Specific	unitless	USEPA, 2004	For organics if tevent <= t*
				SA	Skin Surface Available for Contact	2,800	cm2	USEPA, 2004	DAevent= 2 x FA x Kp x Cw x CF x sqrt[(6 x τ x tevent)/pi]
				EV	Event Frequency	1	events/day	(1)	
				EF	Exposure Frequency	52	days/year	(1)	For organics if tevent > t*
				ED1	Exposure Duration (Age 0 - 2)	2	years	(2), USEPA, 1989, 2005	DAevent =FA x Kp x Cw x CF x [tevent/(1+B) +
				ED2	Exposure Duration (Age 2 - 6)	4	years	(2), USEPA, 1989, 2005	2 x τ +(1 + 3B + $3B^2$)/(1+B^2)
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	

Notes:

1 - Professional judgment.

2 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, children residents will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA Region 4, 2000: Supplement Guidance to RAGS: Region 4 Bulletins.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Ingestion Intake = (CR x CF x ET x EF x ED)/(BW x AT)

Dermal Intake = (SA x EV x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 6) = 3.26E-08 Cancer Dermal Intake (Age 0 - 6) = 2.28E+00

Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 2) = 1.09E-08 Cancer Dermal Intake (Age 0 - 2) = 7.60E-01

Cancer Ingestion Intake (Age 2 - 6) = 2.17E-08 Cancer Dermal Intake (Age 2 - 6) = 1.52E+00

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 3.80E-07 Noncancer Dermal Intake = 2.66E+01

Cancer risk from ingestion = Surface Water concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Surface Water concentration x Cancer Dermal Intake x DAevent x Dermal Cancer Slope Factor

Hazard Index from ingestion = Surface Water concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Surface Water concentration x Noncancer Dermal Intake x DAevent / Dermal Reference Dose

TABLE 4.15.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE - ADULT RESIDENTS - SOILS
NAVAL SUPPORT FACILITY, INDIAN HEAD, INDIAN HEAD MARYLAND

Scenario Timeframe: Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Adult	Site 43	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	100	mg/day	USEPA, 1991	
				RBA	Relative Bioavailability	Chemical Specific	unitless	USEPA, 1989	Cs x RBA x IRS x CF3 x FI x EF x ED
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	BW x AT
				FI	Fraction Ingested	1	unitless	USEPA, 1991	
				EF	Exposure Frequency	350	days/year	USEPA, 1991	
				ED1	Exposure Duration (Age 6 - 16)	10	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1989	
Dermal	Resident	Adult	Site 43	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	
				SA	Skin Surface Available for Contact	5,700	cm2	USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.07	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	350	days/year	USEPA, 1991	
				ED1	Exposure Duration (Age 6 - 16)	10	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1989	

Notes:

1 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential adults will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A.

USEPA, 2002:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2002b: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 30) = 4.70E-07 Cancer Dermal Intake (Age 6 - 30) = 1.87E-06

Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 16) = 1.96E-07 Cancer Dermal Intake (Age 6 - 16) = 7.81E-07

Cancer Ingestion Intake (Age 16 - 30) = 2.74E-07 Cancer Dermal Intake (Age 16 - 30) = 1.09E-06

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 1.37E-06 Noncancer Dermal Intake = 5.47E-06

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.16.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - ADULT RESIDENTS - SOILS TO AIR

NAVAL SUPPORT FACILITY, INDIAN HEAD, INDIAN HEAD MARYLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Resident	Adult	Site 43	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	24	hours/day	USEPA, 2002a	CA x ET x EF x ED
				EF	Exposure Frequency	350	days/year	USEPA, 1991	AT x 24 hours/day
				ED1	Exposure Duration (Age 6 - 16)	10	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(1), USEPA, 1989, 2005	CA = (1/PEF + 1/VF) x Cs
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1989	
				PEF	Particulate Emission Factor	3.23E+09	m3/kg	USEPA, 2013	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	87.36898	g/m2-s per kg/m3	USEPA, 2013	

Notes:

1 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential adults will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10.

USEPA, 2013: Soil Screening Guidance calculation Internet site at http://rais.ornl.gov/epa/ssl1.shtml. Site-specific values for Philadelphia, PA.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Non-Mutagenic Chemicals

Cancer Inhalation Intake (Age 6 - 30) = 3.29E-01

Noncarcinogenic Chemicals

Noncancer Inhalation Intake = 9.59E-01

Mutagenic Chemicals

Cancer Inhalation Intake (Age 6 - 16) = 1.37E-01

Cancer Inhalation Intake (Age 16 - 30) = 1.92E-01

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.17.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE - ADULT RESIDENTS - GROUNDWATER
NAVAL SUPPORT FACILITY, INDIAN HEAD, INDIAN HEAD MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Residents	Adult	Site 43	CGW	Chemical Concentration in Groundwater	95% UCL or Max	ug/L	USEPA, 2002	Chronic Daily Intake (CDI) (mg/kg/day) =
				CF	Conversion Factor	0.001	mg/ug	--	
				IR-GW	Ingestion Rate of Groundwater	2	L/day	USEPA, 1991	CGW x CF x IR-GW x EF x ED
				EF	Exposure Frequency	350	days/year	USEPA, 1991	BW x AT
				ED1	Exposure Duration (Age 6 - 16)	10	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1989	
Dermal	Residents	Adult	Site 43	Daevent	Dermally Absorbed Dose per Event	Calculated	mg/cm2-event	USEPA, 2004	Dermally Absorbed Dose (mg/kg/day) =
				Cw	Chemical Concentration in Groundwater	Max or 95% UCL	mg/kg	USEPA, 2002	DAevent x EV x EF x ED x SA
				FA	Fraction Absorbed	Chemical Specific	unitless	USEPA, 2004	BW x AT
				CF	Conversion factor	0.001	L/cm^3	- -	
				Kp	Permeability coefficient	Chemical Specific	cm/hr	USEPA, 2004	For inorganics
				τ	Lag time	Chemical Specific	hr/event	USEPA, 2004	DAevent = Kp x CW x CF x tevent
				t*	Time it takes to reach steady state	Chemical Specific	hr/event	USEPA, 2004	
				tevent	Duration of event	0.58	hr/event	USEPA, 2004	For organics if tevent <= t*
				B	Bunge model constant	Chemical Specific	unitless	USEPA, 2004	DAevent= 2 x FA x Kp x Cw x CF x sqrt[(6 x τ x tevent)/pi]
				SA	Skin Surface Available for Contact	18,000	cm2	USEPA, 2004	
				EV	Event Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	350	days/year	USEPA, 1991	For organics if tevent > t*
				ED1	Exposure Duration (Age 6 - 16)	10	years	(1), USEPA, 1989, 2005	DAevent =FA x Kp x Cw x CF x [tevent/(1+B) +
				ED2	Exposure Duration (Age 16 - 30)	14	years	(1), USEPA, 1989, 2005	2 x τ +(1 + 3B + $3B^2$)/(1+B^2)
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1989	

Notes:

1 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential adults will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Ingestion Intake = (IR-GW x EF x ED)/(BW x AT)

Dermal Intake = (SA x EV x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 30) = 9.39E-06 Cancer Dermal Intake (Age 6 - 30) = 8.45E+01

Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 16) = 3.91E-06 Cancer Dermal Intake (Age 6 - 16) = 3.52E+01

Cancer Ingestion Intake (Age 16 - 30) = 5.48E-06 Cancer Dermal Intake (Age 16 - 30) = 4.93E+01

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 2.74E-05 Noncancer Dermal Intake = 2.47E+02

Cancer risk from ingestion = Groundwater concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Groundwater concentration x Cancer Dermal Intake x DAevent x Dermal Cancer Slope Factor

Hazard Index from ingestion = Groundwater concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Groundwater concentration x Noncancer Dermal Intake x DAevent / Dermal Reference Dose

TABLE 4.18.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - ADULT RESIDENTS - INHALATION OF VOLATILES FROM GROUNDWATER

NAVAL SUPPORT FACILITY, INDIAN HEAD, INDIAN HEAD MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Residents	Adult	Site 43	S	Volatile Chemical Generation Rate	Derived	mg/m3-min-shower	Foster&Chrostowski 1987	Exposure Concentration (mg/m^3)=
				K	Masss Transfer Coefficient	Derived	min	Foster&Chrostowski 1987	
				EF	Exposure Frequency	350	showers/year	U.S. EPA, 1991	$\frac{S \times K \times EF \times ED}{AT \times Ra \times CF}$
				ED1	Exposure Duration (Age 6 - 16)	10	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(1), USEPA, 1989, 2005	
				Ra	Air Exchange Rate	0.017	min^{-1}	Foster&Chrostowski 1987	
				CF	Conversion Factor	1440	min/day	--	
				Ds	Shower Duration	30	min	U.S. EPA, 2004	
				Dt	Total Time in Bathroom	60	min	Professional judgement	
				Fr	Shower Water Flow Rate	10	L/min	Foster&Chrostowski 1987	
				Sv	Shower Room Air Volume	12	m^3	Foster&Chrostowski 1987	
				ts	Shower Dropler Drop Time	0.5	sec	Foster&Chrostowski 1987	
				d	Shower Droplet Diameter	1	mm	Foster&Chrostowski 1987	
				T1	Calibration Water Temperature	293	K	Foster&Chrostowski 1987	
				Ts	Shower Water Temperature	318	K	Foster&Chrostowski 1987	
				m1	Water Viscosity at T1	1.002	cp	Foster&Chrostowski 1987	
				ms	Water Viscosity at Ts	0.596	cp	Foster&Chrostowski 1987	
				AT-C	Averaging Time (Cancer)	25550	days	U.S. EPA, 1989	
				AT-N	Averaging Time (Noncancer)	8760	days	U.S. EPA ,1989	

Notes:

1 - Adults were evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential adults were evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources

U.S. EPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

U.S. EPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.

U.S. EPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Foster, S.A. and P.C. Chrostowski, 1987. Inhalation Exposure to Volatile Organic Contaminants in the Shower.

Unit Intake Calculations

Inhalation Intake = (EF x ED)/(AT x Ra x CF)

Non-Mutagenic Chemicals		Noncarcinogenic Chemicals	
Cancer Inhalation Intake (Age 6 - 30) =	1.37E-02	Noncancer Inhalation Intake =	4.00E-02

Mutagenic Chemicals

Cancer Inhalation Intake (Age 6 - 16) = 5.71E-03

Cancer Inhalation Intake (Age 16 - 30) = 7.99E-03

TABLE 4.19.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - ADULT RESIDENTS - SURFACE WATER

NAVAL SUPPORT FACILITY, INDIAN HEAD, INDIAN HEAD MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Residents	Adult	Site 43	CW	Chemical Concentration in Water	Max or 95% UCL	ug/L	USEPA, 2002	Chronic Daily Intake (CDI) (mg/kg/day) =
				CR	Contact Rate	0.01	L/hour	USEPA 4, 2000	
				CF	Conversion factor	0.001	mg/ug	- -	
				ET	Exposure Time	4	hours/event	(1)	CW x CF x CR x ET x EF x ED
				EF	Exposure Frequency	52	events/year	(1)	BW x AT
				ED1	Exposure Duration (Age 6 - 16)	10	years	(2), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(2), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1989	
Dermal	Residents	Adult	Site 43	DAevent	Absorbed dose per event	Calculated	mg/cm2-event	USEPA, 2004	Dermally Absorbed Dose (mg/kg/day) =
				Cw	Chemical Concentration in Water	Max or 95% UCL	mg/kg	USEPA, 2002a	
				FA	Fraction Absorbed	Chemical Specific	unitless	USEPA, 2004	DAevent x EV x EF x ED x SA
				CF	Conversion factor	0.001	L/cm^3	- -	BW x AT
				Kp	Permeability coefficient	Chemical Specific	cm/hr	USEPA, 2004	
				τ	Lag time	Chemical Specific	hr/event	USEPA, 2004	For inorganics
				t*	Time it takes to reach steady state	Chemical Specific	hr/event	USEPA, 2004	DAevent = Kp x CW x CF x tevent
				tevent	Duration of event	4	hr/event	(1)	
				B	Bunge model constant	Chemical Specific	unitless	USEPA, 2004	For organics if tevent <= t*
				SA	Skin Surface Available for Contact	5,700	cm2	USEPA, 2004	DAevent= 2 x FA x Kp x Cw x CF x sqrt[(6 x τ x tevent)/pi]
				EV	Event Frequency	1	events/day	(1)	
				EF	Exposure Frequency	52	days/year	(1)	For organics if tevent > t*
				ED1	Exposure Duration (Age 6 - 16)	10	years	(2), USEPA, 1989, 2005	DAevent =FA x Kp x Cw x CF x [tevent/(1+B) +
				ED2	Exposure Duration (Age 16 - 30)	14	years	(2), USEPA, 1989, 2005	2 x τ +(1 + 3B + $3B^2$)/(1+B^2)
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1989	

Notes:

1 - Professional judgment. Assume two days a week in warm weather months for RME and one day a week for CTE.

2 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, adult residents will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA Region 4, 2000: Supplement Guidance to RAGS: Region 4 Bulletins.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Ingestion Intake = (CR x CF x ET x EF x ED)/(BW x AT)

Dermal Intake = (SA x EV x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 30) = 2.79E-08 Cancer Dermal Intake (Age 6 - 30) = 3.98E+00

Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 16) = 1.16E-08 Cancer Dermal Intake (Age 6 - 16) = 1.66E+00

Cancer Ingestion Intake (Age 16 - 30) = 1.63E-08 Cancer Dermal Intake (Age 16 - 30) = 2.32E+00

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 8.14E-08 Noncancer Dermal Intake = 1.16E+01

Cancer risk from ingestion = Surface Water concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Surface Water concentration x Cancer Dermal Intake x DAevent x Dermal Cancer Slope Factor

Hazard Index from ingestion = Surface Water concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Surface Water concentration x Noncancer Dermal Intake x DAevent / Dermal Reference Dose

TABLE 4.1.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - CONSTRUCTION WORKERS - SOILS

NAVAL SUPPORT FACILITY, INDIAN HEAD, INDIAN HEAD MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Construction Workers	Adult	Site 43	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002a	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	165	mg/day	(1)	
				RBA	Relative Bioavailability	Chemical Specific	unitless	USEPA, 1989	Cs x RBA x IRS x CF3 x FI x EF x ED
				CF3	Conversion Factor 3	0.000001	kg/mg	--	BW x AT
				FI	Fraction Ingested	1	unitless	USEPA, 2002b	
				EF	Exposure Frequency	150	days/year	(1)	
				ED	Exposure Duration	1	years	(1)	
				BW	Body Weight	70	kg	USEPA, 2002b	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	
Dermal	Construction Workers	Adult	Site 43	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002a	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	0.000001	kg/mg	--	
				SA	Skin Surface Available for Contact	3300	cm2	USEPA, 2002b	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.1	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	150	days/year	(1)	
				ED	Exposure Duration	1	years	(1)	
				BW	Body Weight	70	kg	USEPA, 2002b	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	

Notes:

1 - Professional judgment. For some factors, CTE is assumed to be 50 percent of RME.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A.

USEPA, 2002a:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2002b: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Cancer Ingestion Intake = 1.38E-08 Cancer Dermal Intake = 2.77E-08

Noncancer Ingestion Intake = 9.69E-07 Noncancer Dermal Intake = 1.94E-06

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.2.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - CONSTRUCTION WORKERS - SOILS TO AIR

NAVAL SUPPORT FACILITY, INDIAN HEAD, INDIAN HEAD MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Construction Workers	Adult	Site 43	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	8	hours/day	(1)	CA x ET x EF x ED
				EF	Exposure Frequency	150	days/year	(1)	AT x 24 hours/day
				ED	Exposure Duration	1	years	(1)	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	CA = (1/PEF + 1/VF) x Cs
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	
				PEF	Particulate Emission Factor	1.62E+06	m3/kg	USEPA, 2002a	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	14.31	g/m2-s per kg/m3	USEPA, 2002a	

Notes:

1 - Professional judgment. For some factors, CTE is assumed to be 50 percent of RME.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Cancer Inhalation Intake = 1.96E-03 Noncancer Inhalation Intake = 1.37E-01

Cancer risk from inhalation = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from inhalation = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.3.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - CONSTRUCTION WORKERS - GROUNDWATER

NAVAL SUPPORT FACILITY, INDIAN HEAD, INDIAN HEAD MARYLAND

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Construction Workers	Adult	Site 43	CGW	Chemical Concentration in Groundwater	Max or 95% UCL	ug/L	USEPA, 2002	Chronic Daily Intake (CDI) (mg/kg/day) =
				CF	Conversion Factor	0.001	mg/ug	- -	
				IR-GW	Ingestion Rate of Groundwater	0.01	L/day	(1)	CGW x CF x IR-GW x EF x ED
				EF	Exposure Frequency	30	days/year	(1)	BW x AT
				ED	Exposure Duration	1	years	(1)	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	
Dermal	Construction Workers	Adult	Site 43	Daevent	Dermally Absorbed Dose per Event	Calculated	mg/cm2-event	USEPA, 2004	Dermally Absorbed Dose (mg/kg/day) =
				Cw	Chemical Concentration in Groundwater	Max or 95% UCL	mg/kg	USEPA, 2002	
				FA	Fraction Absorbed	Chemical Specific	unitless	USEPA, 2004	DAevent x EV x EF x ED x SA
				CF	Conversion factor	0.001	L/cm^3	- -	BW x AT
				Kp	Permeability coefficient	Chemical Specific	cm/hr	USEPA, 2004	
				τ	Lag time	Chemical Specific	hr/event	USEPA, 2004	For inorganics
				t*	Time it takes to reach steady state	Chemical Specific	hr/event	USEPA, 2004	DAevent = Kp x CW x CF x tevent
				tevent	Duration of event	2	hr/event	(1)	
				B	Bunge model constant	Chemical Specific	unitless	USEPA, 2004	For organics if tevent <= t*
				SA	Skin Surface Available for Contact	3300	cm2	USEPA, 2004	DAevent= 2 x FA x Kp x Cw x CF x sqrt[(6 x τ x tevent)/pi]
				EV	Event Frequency	1	events/day	(1)	
				EF	Exposure Frequency	30	days/year	(1)	For organics if tevent > t*
				ED	Exposure Duration	1	years	(1)	DAevent =FA x Kp x Cw x CF x [tevent/(1+B) +
				BW	Body Weight	70	kg	USEPA, 1989	2 x τ +(1 + 3B + $3B^2$)/(1+B^2)
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	

Notes

1 - Professional judgment. For some factors, CTE is assumed to be 50 percent of RME.

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 2002:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Dermal Intake = (SA x EV x EF x ED)/(BW x AT)

Cancer Dermal Intake = 5.54E-02 Noncancer Dermal Intake = 3.87E+00

Cancer risk from dermal contact = Groundwater concentration x Cancer Dermal Intake x DAevent x Dermal Cancer Slope Factor

Hazard Index from dermal contact = Groundwater concentration x Noncancer Dermal Intake x DAevent / Dermal Reference Dose

TABLE 4.4.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - CONSTRUCTION WORKERS - GROUNDWATER TO AIR

NAVAL SUPPORT FACILITY, INDIAN HEAD, INDIAN HEAD MARYLAND

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Construction Workers	Adult	Site 43	CA	Chemical concentration in air	Calculated	mg/m3	VDEQ, 2013	Exposure Concentration (mg/m^3) =
				CW	Chemical concentration in water.	Average	ug/L	--	
				CF	Conversion Factor	0.001	mg/ug	--	CA x ET x EF x ED
				ET	Exposure Time	2	hours/day	(1)	AT x 24 hours/day
				EF	Exposure Frequency	30	days/year	(1)	
				ED	Exposure Duration	1	years	(1)	CA = CW x CF x VF
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	
				VF	Volatilization Factor	Calculated	(mg/m3)/(mg/L)	VDEQ, 2013	

Notes:

1 - Professional judgment. For some factors, CTE is assumed to be 50 percent of RME.

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

VDEQ, 2013: Virginia Department of Environmental Quality (VDEQ, online- http://www.deq.state.va.us/Programs/LandProtectionRevitalization/RemediationProgram/VoluntaryRemediationProgram/VRPRiskAssessmentGuidance.aspx).

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Cancer Inhalation Intake = 9.78E-08 Noncancer Inhalation Intake = 6.85E-06

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.5.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - CONSTRUCTION WORKERS - SURFACE WATER

NAVAL SUPPORT FACILITY, INDIAN HEAD, INDIAN HEAD MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Construction Workers	Adult	Site 43	CW	Chemical Concentration in Water	Max or 95% UCL	ug/L	USEPA, 2002	Chronic Daily Intake (CDI) (mg/kg/day) =
				CR	Contact Rate	0.01	L/hour	USEPA 4, 2000	
				CF	Conversion factor	0.001	mg/ug	- -	
				ET	Exposure Time	2	hours/event	(1)	CW x CF x CR x ET x EF x ED
				EF	Exposure Frequency	26	events/year	(1)	BW x AT
				ED	Exposure Duration	1	years	(1)	
				BW	Body Weight	70	kg	USEPA, 1993	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	
Dermal	Construction Workers	Adult	Site 43	DAevent	Absorbed dose per event	Calculated	mg/cm2-event	USEPA, 2004	Dermally Absorbed Dose (mg/kg/day) =
				Cw	Chemical Concentration in Water	Max or 95% UCL	mg/kg	USEPA, 2002a	
				FA	Fraction Absorbed	Chemical Specific	unitless	USEPA, 2004	DAevent x EV x EF x ED x SA
				CF	Conversion factor	0.001	L/cm^3	- -	BW x AT
				Kp	Permeability coefficient	Chemical Specific	cm/hr	USEPA, 2004	
				τ	Lag time	Chemical Specific	hr/event	USEPA, 2004	For inorganics
				t*	Time it takes to reach steady state	Chemical Specific	hr/event	USEPA, 2004	DAevent = Kp x CW x CF x tevent
				tevent	Duration of event	2	hr/event	(1)	
				B	Bunge model constant	Chemical Specific	unitless	USEPA, 2004	For organics if tevent <= t*
				SA	Skin Surface Available for Contact	3,300	cm2	USEPA, 2004	DAevent= 2 x FA x Kp x Cw x CF x sqrt[(6 x τ x tevent)/pi]
				EV	Event Frequency	1	events/day	(1)	
				EF	Exposure Frequency	26	days/year	(1)	For organics if tevent > t*
				ED	Exposure Duration	1	years	(1)	DAevent =FA x Kp x Cw x CF x [tevent/(1+B) +
				BW	Body Weight	70	kg	USEPA, 1993	2 x τ +(1 + 3B + $3B^2$)/(1+B^2)
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	

Notes:

1 - Professional judgment. For some factors, CTE is assumed to be 50 percent of RME.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

USEPA Region 4, 2000: Supplement Guidance to RAGS: Region 4 Bulletins.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Ingestion Intake = (CR x CF x ET x EF x ED)/(BW x AT)

Dermal Intake = (SA x EV x EF x ED)/(BW x AT)

Cancer Ingestion Intake = 2.91E-10 Cancer Dermal Intake = 4.80E-02

Noncancer Ingestion Intake = 2.04E-08 Noncancer Dermal Intake = 3.36E+00

Cancer risk from ingestion = Surface Water concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Surface Water concentration x Cancer Dermal Intake x DAevent x Dermal Cancer Slope Factor

Hazard Index from ingestion = Surface Water concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Surface Water concentration x Noncancer Dermal Intake x DAevent / Dermal Reference Dose

TABLE 4.6.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - MAINTENANCE WORKERS - SOIL

NAVAL SUPPORT FACILITY, INDIAN HEAD, INDIAN HEAD MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Maintenance Workers	Adult	Site 43	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	50	mg/day	USEPA, 1993	
				RBA	Relative Bioavailability	Chemical Specific	unitless	USEPA, 1989	Cs x RBA x IRS x CF3 x FI x EF x ED
				CF3	Conversion Factor 3	0.000001	kg/mg	--	BW x AT
				FI	Fraction Ingested	1	unitless	USEPA, 1993	
				EF	Exposure Frequency	12	days/year	(1)	
				ED	Exposure Duration	9	years	USEPA, 1993	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3285	days	USEPA, 1989	
Dermal	Maintenance Workers	Adult	Site 43	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	0.000001	kg/mg	--	
				SA	Skin Surface Available for Contact	3300	cm2	USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.02	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	12	days/year	(1)	
				ED	Exposure Duration	9	years	USEPA, 1993	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3285	days	USEPA, 1989	

Notes:

1 - Professional judgment. For some factors, CTE is assumed to be 50 percent of RME.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A.

USEPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Cancer Ingestion Intake = 3.02E-09 Cancer Dermal Intake = 3.99E-09

Noncancer Ingestion Intake = 2.35E-08 Noncancer Dermal Intake = 3.10E-08

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.7.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - MAINTENANCE WORKERS - SOIL TO AIR

NAVAL SUPPORT FACILITY, INDIAN HEAD, INDIAN HEAD MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Maintenance Workers	Adult	Site 43	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	8	hours/day	(1)	CA x ET x EF x ED
				EF	Exposure Frequency	12	days/year	(1)	AT x 24 hours/day
				ED	Exposure Duration	9	years	USEPA, 1993	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	CA = (1/PEF + 1/VF) x Cs
				AT-N	Averaging Time (Non-Cancer)	3285	days	USEPA, 1989	
				PEF	Particulate Emission Factor	3.23E+09	m3/kg	USEPA 2013	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	87.36898	g/m2-s per kg/m3	USEPA 2013	

Notes:

1 - Professional judgment. For some factors, CTE is assumed to be 50 percent of RME.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2013: Soil Screening Guidance calculation Internet site at http://rais.ornl.gov/epa/ssl1.shtml. Site-specific values for Philadelphia, PA.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Cancer Inhalation Intake = 1.41E-03 Noncancer Inhalation Intake = 1.10E-02

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.8.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - MAINTENANCE WORKERS - SURFACE WATER

NAVAL SUPPORT FACILITY, INDIAN HEAD, INDIAN HEAD MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Maintenance Workers	Adult	Site 43	CW	Chemical Concentration in Water	Max or 95% UCL	ug/L	USEPA, 2002	Chronic Daily Intake (CDI) (mg/kg/day) =
				CR	Contact Rate	0.01	L/hour	USEPA 4, 2000	
				CF	Conversion factor	0.001	mg/ug	- -	
				ET	Exposure Time	2	hours/event	(1)	CW x CF x CR x ET x EF x ED
				EF	Exposure Frequency	12	events/year	(1)	BW x AT
				ED	Exposure Duration	9	years	USEPA, 1993	
				BW	Body Weight	70	kg	USEPA, 1993	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	USEPA, 1989	
Dermal	Maintenance Workers	Adult	Site 43	DAevent	Absorbed dose per event	Calculated	mg/cm2-event	USEPA, 2004	Dermally Absorbed Dose (mg/kg/day) =
				Cw	Chemical Concentration in Water	Max or 95% UCL	mg/kg	USEPA, 2002a	
				FA	Fraction Absorbed	Chemical Specific	unitless	USEPA, 2004	DAevent x EV x EF x ED x SA
				CF	Conversion factor	0.001	L/cm^3	- -	BW x AT
				Kp	Permeability coefficient	Chemical Specific	cm/hr	USEPA, 2004	
				τ	Lag time	Chemical Specific	hr/event	USEPA, 2004	For inorganics
				t*	Time it takes to reach steady state	Chemical Specific	hr/event	USEPA, 2004	DAevent = Kp x CW x CF x tevent
				tevent	Duration of event	2	hr/event	(1)	
				B	Bunge model constant	Chemical Specific	unitless	USEPA, 2004	For organics if tevent <= t*
				SA	Skin Surface Available for Contact	3,300	cm2	USEPA, 2004	DAevent= 2 x FA x Kp x Cw x CF x sqrt[(6 x τ x tevent)/pi]
				EV	Event Frequency	1	events/day	(1)	
				EF	Exposure Frequency	12	days/year	(1)	For organics if tevent > t*
				ED	Exposure Duration	9	years	USEPA, 1993	DAevent =FA x Kp x Cw x CF x [tevent/(1+B) +
				BW	Body Weight	70	kg	USEPA, 1993	2 x τ +(1 + 3B + $3B^2$)/(1+B^2)
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	USEPA, 1989	

Notes:

1 - Professional judgment. For some factors, CTE is assumed to be 50 percent of RME.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

USEPA Region 4, 2000: Supplement Guidance to RAGS: Region 4 Bulletins.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Ingestion Intake = (CR x CF x ET x EF x ED)/(BW x AT)

Dermal Intake = (SA x EV x EF x ED)/(BW x AT)

Cancer Ingestion Intake = 1.21E-09 Cancer Dermal Intake = 1.99E-01

Noncancer Ingestion Intake = 9.39E-09 Noncancer Dermal Intake = 1.55E+00

Cancer risk from ingestion = Surface Water concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Surface Water concentration x Cancer Dermal Intake x DAevent x Dermal Cancer Slope Factor

Hazard Index from ingestion = Surface Water concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Surface Water concentration x Noncancer Dermal Intake x DAevent / Dermal Reference Dose

TABLE 4.9.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - INDUSTRIAL WORKERS - SOIL

NAVAL SUPPORT FACILITY, INDIAN HEAD, INDIAN HEAD MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Industrial Workers	Adult	Site 43	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	50	mg/day	USEPA, 1993	
				RBA	Relative Bioavailability	Chemical Specific	unitless	USEPA, 1989	Cs x RBA x IRS x CF3 x FI x EF x ED
				CF3	Conversion Factor 3	0.000001	kg/mg	--	BW x AT
				FI	Fraction Ingested	1	unitless	USEPA, 1993	
				EF	Exposure Frequency	219	days/year	USEPA, 1993	
				ED	Exposure Duration	9	years	USEPA, 1993	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3285	days	USEPA, 1989	
Dermal	Industrial Workers	Adult	Site 43	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	0.000001	kg/mg	--	
				SA	Skin Surface Available for Contact	3300	cm2	USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.02	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	219	days/year	USEPA, 1993	
				ED	Exposure Duration	9	years	USEPA, 1993	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3285	days	USEPA, 1989	

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A.

USEPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Cancer Ingestion Intake = 5.51E-08 Cancer Dermal Intake = 7.27E-08

Noncancer Ingestion Intake = 4.29E-07 Noncancer Dermal Intake = 5.66E-07

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.10.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - INDUSTRIAL WORKERS - SOIL TO AIR

NAVAL SUPPORT FACILITY, INDIAN HEAD, INDIAN HEAD MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Industrial Workers	Adult	Site 43	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	8	hours/day	USEPA, 2002b	CA x ET x EF x ED
				EF	Exposure Frequency	219	days/year	USEPA, 1993	AT x 24 hours/day
				ED	Exposure Duration	9	years	USEPA, 1993	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	CA = (1/PEF + 1/VF) x Cs
				AT-N	Averaging Time (Non-Cancer)	3285	days	USEPA, 1989	
				PEF	Particulate Emission Factor	3.23E+09	m3/kg	USEPA 2013	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	87.36898	g/m2-s per kg/m3	USEPA 2013	

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2013: Soil Screening Guidance calculation Internet site at http://rais.ornl.gov/epa/ssl1.shtml. Site-specific values for Philadelphia, PA.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Cancer Inhalation Intake = 2.57E-02 Noncancer Inhalation Intake = 2.00E-01

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.11.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY EXPOSURES - CHILD RESIDENTS - SOILS
NAVAL SUPPORT FACILITY, INDIAN HEAD, INDIAN HEAD MARYLAND

Scenario Timeframe: Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Child	Site 43	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	100	mg/day	USEPA, 1993	
				RBA	Relative Bioavailability	Chemical Specific	unitless	USEPA, 1989	Cs x RBA x IRS x CF3 x FI x EF x ED
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	BW x AT
				FI	Fraction Ingested	1	unitless	USEPA, 1993	
				EF	Exposure Frequency	234	days/year	USEPA, 1993	
				ED1	Exposure Duration (Age 0 - 2)	1	years	(1), USEPA, 1993, 2005	
				ED2	Exposure Duration (Age 2 - 6)	1	years	(1), USEPA, 1993, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	730	days	USEPA, 1989	
Dermal	Resident	Child	Site 43	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	1E-06	kg/mg	--	
				SA	Skin Surface Available for Contact	2,800	cm2	USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.04	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	234	days/year	USEPA, 1993	
				ED1	Exposure Duration (Age 0 - 2)	1	years	(1), USEPA, 1993, 2005	
				ED2	Exposure Duration (Age 2 - 6)	1	years	(1), USEPA, 1993, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	730	days	USEPA, 1989	

Notes:

1 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential children will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake = 1.22E-07 Cancer Dermal Intake = 1.37E-07

Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 2) = 6.11E-08 Cancer Dermal Intake (Age 0 - 2) = 6.84E-08

Cancer Ingestion Intake (Age 2 - 6) = 6.11E-08 Cancer Dermal Intake (Age 2 - 6) = 6.84E-08

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 4.27E-06 Noncancer Dermal Intake = 4.79E-06

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.12.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - CHILD RESIDENTS - SOILS TO AIR

NAVAL SUPPORT FACILITY, INDIAN HEAD, INDIAN HEAD MARYLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Resident	Child	Site 43	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	24	hours/day	USEPA, 1993	CA x ET x EF x ED
				EF	Exposure Frequency	234	days/year	USEPA, 1993	AT x 24 hours/day
				ED1	Exposure Duration (Age 0 - 2)	1	years	(1), USEPA, 1993, 2005	
				ED2	Exposure Duration (Age 2 - 6)	1	years	(1), USEPA, 1993, 2005	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	CA = (1/PEF + 1/VF) x Cs
				AT-N	Averaging Time (Non-Cancer)	730	days	USEPA, 1989	
				PEF	Particulate Emission Factor	3.23E+09	m3/kg	USEPA, 2013	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	87.36898	g/m2-s per kg/m3	USEPA, 2013	

Notes:

1 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential children will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2013: Soil Screening Guidance calculation Internet site at http://rais.ornl.gov/epa/ssl1.shtml. Site-specific values for Philadelphia, PA.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Non-Mutagenic Chemicals

Cancer Inhalation Intake = 1.83E-02

Noncarcinogenic Chemicals

Noncancer Inhalation Intake = 6.41E-01

Mutagenic Chemicals

Cancer Inhalation Intake (Age 0 - 2) = 9.16E-03

Cancer Inhalation Intake (Age 2 - 6) = 9.16E-03

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.13.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY EXPOSURES - CHILD RESIDENTS - GROUNDWATER
NAVAL SUPPORT FACILITY, INDIAN HEAD, INDIAN HEAD MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Residents	Child	Site 43	CGW	Chemical Concentration in Groundwater	Max or 95% UCL	mg/kg	USEPA, 2002	Chronic Daily Intake (CDI) (mg/kg/day) =
				CF	Conversion Factor	0.001	mg/ug	--	
				IR-GW	Ingestion Rate of Groundwater	0.66	L/day	USEPA, 1997	CGW x CF x IR-GW x EF x ED
				EF	Exposure Frequency	350	days/year	USEPA, 1993	BW x AT
				ED1	Exposure Duration (Age 0 - 2)	1	years	(1), USEPA, 1993, 2005	
				ED2	Exposure Duration (Age 2 - 6)	1	years	(1), USEPA, 1993, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	730	days	USEPA, 1989	
Dermal	Residents	Child	Site 43	Daevent	Dermally Absorbed Dose per Event	Calculated	mg/cm2-event	USEPA, 2004	Dermally Absorbed Dose (mg/kg/day) =
				Cw	Chemical Concentration in Groundwater	Max or 95% UCL	mg/kg	USEPA, 2002a	
				FA	Fraction Absorbed	Chemical Specific	unitless	USEPA, 2004	DAevent x EV x EF x ED x SA
				CF	Conversion factor	0.001	L/cm^3	- -	BW x AT
				Kp	Permeability coefficient	Chemical Specific	cm/hr	USEPA, 2004	
				τ	Lag time	Chemical Specific	hr/event	USEPA, 2004	For inorganics
				t*	Time it takes to reach steady state	Chemical Specific	hr/event	USEPA, 2004	DAevent = Kp x CW x CF x tevent
				tevent	Duration of event	0.33	hr/event	USEPA, 2004	
				B	Bunge model constant	Chemical Specific	unitless	USEPA, 2004	For organics if tevent <= t*
				SA	Skin Surface Available for Contact	6,600	cm2	USEPA, 2004	DAevent= 2 x FA x Kp x Cw x CF x sqrt[(6 x τ x tevent)/pi]
				EV	Event Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	350	days/year	USEPA, 1993	For organics if tevent > t*
				ED1	Exposure Duration (Age 0 - 2)	1	years	(1), USEPA, 1993, 2005	DAevent =FA x Kp x Cw x CF x [tevent/(1+B) +
				ED2	Exposure Duration (Age 2 - 6)	1	years	(1), USEPA, 1993, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	2 x τ +(1 + 3B + $3B^2$)/(1+B^2)
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	730	days	USEPA, 1989	

Notes:

1 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential children will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

USEPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Ingestion Intake = (IR-GW x EF x ED)/(BW x AT)

Dermal Intake = (SA x EV x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake = 1.21E-06 Cancer Dermal Intake = 1.21E+01

Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 2) = 6.03E-07 Cancer Dermal Intake (Age 0 - 2) = 6.03E+00

Cancer Ingestion Intake (Age 2 - 6) = 6.03E-07 Cancer Dermal Intake (Age 2 - 6) = 6.03E+00

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 4.22E-05 Noncancer Dermal Intake = 4.22E+02

Cancer risk from ingestion = Groundwater concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Groundwater concentration x Cancer Dermal Intake x DAevent x Dermal Cancer Slope Factor

Hazard Index from ingestion = Groundwater concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Groundwater concentration x Noncancer Dermal Intake x DAevent / Dermal Reference Dose

TABLE 4.14.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - CHILD RESIDENTS - SURFACE WATER/SEEPS

NAVAL SUPPORT FACILITY, INDIAN HEAD, INDIAN HEAD MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Child	Site 43	CW	Chemical Concentration in Water	Max or 95% UCL	ug/L	USEPA, 2002	Chronic Daily Intake (CDI) (mg/kg/day) =
				CR	Contact Rate	0.01	L/hr	USEPA 4, 2000	
				CF	Conversion factor	0.001	mg/ug	- -	
				ET	Exposure Time	2	hours/event	(1)	CW x CF x CR x ET x EF x ED
				EF	Exposure Frequency	26	events/year	(1)	BW x AT
				ED1	Exposure Duration (Age 0 - 2)	1	years	(2), USEPA, 1993, 2005	
				ED2	Exposure Duration (Age 2 - 6)	1	years	(2), USEPA, 1993, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	730	days	USEPA, 1989	
Dermal	Resident	Child	Site 43	DAevent	Absorbed dose per event	Calculated	mg/cm2-event	USEPA, 2004	Dermally Absorbed Dose (mg/kg/day) =
				Cw	Chemical Concentration in Water	Max or 95% UCL	mg/kg	USEPA, 2002a	
				FA	Fraction Absorbed	Chemical Specific	unitless	USEPA, 2004	DAevent x EV x EF x ED x SA
				CF	Conversion factor	0.001	L/cm^3	- -	BW x AT
				Kp	Permeability coefficient	Chemical Specific	cm/hr	USEPA, 2004	
				τ	Lag time	Chemical Specific	hr/event	USEPA, 2004	For inorganics
				t*	Time it takes to reach steady state	Chemical Specific	hr/event	USEPA, 2004	DAevent = Kp x CW x CF x tevent
				tevent	Duration of event	2	hr/event	(1)	
				B	Bunge model constant	Chemical Specific	unitless	USEPA, 2004	For organics if tevent <= t*
				SA	Skin Surface Available for Contact	2,800	cm2	USEPA, 2004	DAevent= 2 x FA x Kp x Cw x CF x sqrt[(6 x τ x tevent)/pi]
				EV	Event Frequency	1	events/day	(1)	
				EF	Exposure Frequency	26	days/year	(1)	For organics if tevent > t*
				ED1	Exposure Duration (Age 0 - 2)	1	years	(2), USEPA, 1993, 2005	DAevent =FA x Kp x Cw x CF x [tevent/(1+B) +
				ED2	Exposure Duration (Age 2 - 6)	1	years	(2), USEPA, 1993, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	2 x τ +(1 + 3B + $3B^2$)/(1+B^2)
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	730	days	USEPA, 1989	

Notes:

1 - Professional judgment. For some factors, CTE is assumed to be 50 percent of RME.

2 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, children residents will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA Region 4, 2000: Supplement Guidance to RAGS: Region 4 Bulletins.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Ingestion Intake = (CR x CF x ET x EF x ED)/(BW x AT)

Dermal Intake = (SA x EV x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake = 2.71E-09 Cancer Dermal Intake = 3.80E-01

Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 2) = 1.36E-09 Cancer Dermal Intake (Age 0 - 2) = 1.90E-01

Cancer Ingestion Intake Exposure Frequency = 1.36E-09 Cancer Dermal Intake (Age 2 - 6) = 1.90E-01

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 9.50E-08 Noncancer Dermal Intake = 1.33E+01

Cancer risk from ingestion = Surface Water concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Surface Water concentration x Cancer Dermal Intake x DAevent x Dermal Cancer Slope Factor

Hazard Index from ingestion = Surface Water concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Surface Water concentration x Noncancer Dermal Intake x DAevent / Dermal Reference Dose

TABLE 4.15.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY EXPOSURES - ADULT RESIDENTS - SOILS
NAVAL SUPPORT FACILITY, INDIAN HEAD, INDIAN HEAD MARYLAND

Scenario Timeframe: Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Adult	Site 43	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	50	mg/day	USEPA, 1993	
				RBA	Relative Bioavailability	Chemical Specific	unitless	USEPA, 1989	Cs x RBA x IRS x CF3 x FI x EF x ED
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	BW x AT
				FI	Fraction Ingested	1	unitless	USEPA, 1993	
				EF	Exposure Frequency	234	days/year	USEPA, 1993	
				ED1	Exposure Duration (Age 6 - 16)	2	years	(1), USEPA, 1993, 2005	
				ED2	Exposure Duration (Age 16 - 30)	5	years	(1), USEPA, 1993, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,555	days	USEPA, 1989	
Dermal	Resident	Adult	Site 43	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	
				SA	Skin Surface Available for Contact	5,700	cm2	USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.01	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	234	days/year	USEPA, 1993	
				ED1	Exposure Duration (Age 6 - 16)	2	years	(1), USEPA, 1993, 2005	
				ED2	Exposure Duration (Age 16 - 30)	5	years	(1), USEPA, 1993, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,555	days	USEPA, 1989	

Notes:

1 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential adults will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A.

USEPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake = 4.58E-08 Cancer Dermal Intake = 5.22E-08

Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 16) = 1.31E-08 Cancer Dermal Intake (Age 6 - 16) = 1.49E-08

Cancer Ingestion Intake (Age 16 - 30) = 3.27E-08 Cancer Dermal Intake (Age 16 - 30) = 3.73E-08

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 4.58E-07 Noncancer Dermal Intake = 5.22E-07

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.16.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - ADULT RESIDENTS - SOILS TO AIR

NAVAL SUPPORT FACILITY, INDIAN HEAD, INDIAN HEAD MARYLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Resident	Adult	Site 43	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	24	hours/day	USEPA, 2002a	CA x ET x EF x ED
				EF	Exposure Frequency	234	days/year	USEPA, 1993	AT x 24 hours/day
				ED1	Exposure Duration (Age 6 - 16)	2	years	(1), USEPA, 1993, 2005	
				ED2	Exposure Duration (Age 16 - 30)	5	years	(1), USEPA, 1993, 2005	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	CA = (1/PEF + 1/VF) x Cs
				AT-N	Averaging Time (Non-Cancer)	2555	days	USEPA, 1989	
				PEF	Particulate Emission Factor	3.23E+09	m3/kg	USEPA, 2013	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	87.36898	g/m2-s per kg/m3	USEPA, 2013	

Notes:

1 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential adults will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10.

USEPA, 2013: Soil Screening Guidance calculation Internet site at http://rais.ornl.gov/epa/ssl1.shtml. Site-specific values for Philadelphia, PA.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Non-Mutagenic Chemicals

Cancer Inhalation Intake = 6.41E-02

Noncarcinogenic Chemicals

Noncancer Inhalation Intake = 6.41E-01

Mutagenic Chemicals

Cancer Inhalation Intake (Age 6 - 16) = 1.83E-02

Cancer Inhalation Intake (Age 16 - 30) = 4.58E-02

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.17.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY EXPOSURES - ADULT RESIDENTS - GROUNDWATER
NAVAL SUPPORT FACILITY, INDIAN HEAD, INDIAN HEAD MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Residents	Adult	Site 43	CGW	Chemical Concentration in Groundwater	95% UCL or Max	ug/L	USEPA, 2002	Chronic Daily Intake (CDI) (mg/kg/day) =
				CF	Conversion Factor	0.001	mg/ug	--	
				IR-GW	Ingestion Rate of Groundwater	1.4	L/day	USEPA, 1993	CGW x CF x IR-GW x EF x ED
				EF	Exposure Frequency	350	days/year	USEPA, 1993	BW x AT
				ED1	Exposure Duration (Age 6 - 16)	2	years	(1), USEPA, 1993, 2005	
				ED2	Exposure Duration (Age 16 - 30)	5	years	(1), USEPA, 1993, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,555	days	USEPA, 1989	
Dermal	Residents	Adult	Site 43	Daevent	Dermally Absorbed Dose per Event	Calculated	mg/cm2-event	USEPA, 2004	Dermally Absorbed Dose (mg/kg/day) =
				Cw	Chemical Concentration in Groundwater	Max or 95% UCL	mg/kg	USEPA, 2002	
				FA	Fraction Absorbed	Chemical Specific	unitless	USEPA, 2004	DAevent x EV x EF x ED x SA
				CF	Conversion factor	0.001	L/cm^3	- -	BW x AT
				Kp	Permeability coefficient	Chemical Specific	cm/hr	USEPA, 2004	
				τ	Lag time	Chemical Specific	hr/event	USEPA, 2004	For inorganics
				t*	Time it takes to reach steady state	Chemical Specific	hr/event	USEPA, 2004	DAevent = Kp x CW x CF x tevent
				tevent	Duration of event	0.25	hr/event	USEPA, 2004	
				B	Bunge model constant	Chemical Specific	unitless	USEPA, 2004	For organics if tevent <= t*
				SA	Skin Surface Available for Contact	18,000	cm2	USEPA, 2004	DAevent= 2 x FA x Kp x Cw x CF x sqrt[(6 x τ x tevent)/pi]
				EV	Event Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	350	days/year	USEPA, 1993	
				ED1	Exposure Duration (Age 6 - 16)	2	years	(1), USEPA, 1993, 2005	DAevent =FA x Kp x Cw x CF x [tevent/(1+B) +
				ED2	Exposure Duration (Age 16 - 30)	5	years	(1), USEPA, 1993, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	$2 \times \tau + (1 + 3B + 3B^2)/(1+B^2)$
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,555	days	USEPA, 1989	

Notes:

1 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential adults will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Ingestion Intake = (IR-GW x EF x ED)/(BW x AT)

Dermal Intake = (SA x EV x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake = 1.92E-06 Cancer Dermal Intake = 2.47E+01

Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 16) = 5.48E-07 Cancer Dermal Intake (Age 6 - 16) = 7.05E+00

Cancer Ingestion Intake (Age 16 - 30) = 1.37E-06 Cancer Dermal Intake (Age 16 - 30) = 1.76E+01

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 1.92E-05 Noncancer Dermal Intake = 2.47E+02

Cancer risk from ingestion = Groundwater concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Groundwater concentration x Cancer Dermal Intake x DAevent x Dermal Cancer Slope Factor

Hazard Index from ingestion = Groundwater concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Groundwater concentration x Noncancer Dermal Intake x DAevent / Dermal Reference Dose

TABLE 4.18.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - ADULT RESIDENTS - INHALATION OF VOLATILES FROM GROUNDWATER

NAVAL SUPPORT FACILITY, INDIAN HEAD, INDIAN HEAD MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Residents	Adult	Site 43	S	Volatile Chemical Generation Rate	Derived	mg/m3-min-shower	Foster & Chrostowski 1987	Exposure Concentration (mg/m^3)=
				K	Masss Transfer Coefficient	Derived	min	Foster&Chrostowski 1987	
				EF	Exposure Frequency	350	showers/year	US EPA, 1993	S x K x EF x ED / AT x Ra x CF
				ED1	Exposure Duration (Age 6 - 16)	2	years	(1), USEPA, 1993, 2005	
				ED2	Exposure Duration (Age 16 - 30)	5	years	(1), USEPA, 1993, 2005	
				Ra	Air Exchange Rate	0.017	min^{-1}	Foster&Chrostowski 1987	
				CF	Conversion Factor	1440	min/day	--	
				Ds	Shower Duration	10	min	USEPA, 2004	
				Dt	Total Time in Bathroom	15	min	Professional Judgement	
				Fr	Shower Water Flow Rate	10	L/min	Foster&Chrostowski 1987	
				Sv	Shower Room Air Volume	12	m^3	Foster&Chrostowski 1987	
				ts	Shower Dropler Drop Time	0.5	sec	Foster&Chrostowski 1987	
				d	Shower Droplet Diameter	1	mm	Foster&Chrostowski 1987	
				T1	Calibration Water Temperature	293	K	Foster&Chrostowski 1987	
				Ts	Shower Water Temperature	318	K	Foster&Chrostowski 1987	
				m1	Water Viscosity at T1	1.002	cp	Foster&Chrostowski 1987	
				ms	Water Viscosity at Ts	0.596	cp	Foster&Chrostowski 1987	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Noncancer)	2555	days	USEPA, 1989	

Notes:

1 - Adults were evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential adults were evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources

U.S. EPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

U.S. EPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.

U.S. EPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

U.S. EPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Foster, S.A. and P.C. Chrostowski, 1987. Inhalation Exposure to Volatile Organic Contaminants in the Shower.

Unit Intake Calculations

Inhalation Intake = (EF x ED)/(AT x Ra x CF)

Non-Mutagenic Chemicals

Cancer Inhalation Intake = 4.00E-03

Noncarcinogenic Chemicals

Noncancer Inhalation Intake = 4.00E-02

Mutagenic Chemicals

Cancer Inhalation Intake (Age 6 - 16) = 1.14E-03

Cancer Inhalation Intake (Age 16 - 30) = 2.85E-03

TABLE 4.19.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY EXPOSURES - ADULT RESIDENTS - SURFACE WATER
NAVAL SUPPORT FACILITY, INDIAN HEAD, INDIAN HEAD MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Residents	Adult	Site 43	CW	Chemical Concentration in Water	Max or 95% UCL	ug/L	USEPA, 2002	Chronic Daily Intake (CDI) (mg/kg/day) =
				CR	Contact Rate	0.01	L/hour	USEPA 4, 2000	
				CF	Conversion factor	0.001	mg/ug	- -	
				ET	Exposure Time	2	hours/event	(1)	CW x CF x CR x ET x EF x ED
				EF	Exposure Frequency	26	events/year	(1)	BW x AT
				ED1	Exposure Duration (Age 6 - 16)	2	years	(2), USEPA, 1993, 2005	
				ED2	Exposure Duration (Age 16 - 30)	5	years	(2), USEPA, 1993, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,555	days	USEPA, 1989	
Dermal	Residents	Adult	Site 43	DAevent	Absorbed dose per event	Calculated	mg/cm2-event	USEPA, 2004	Dermally Absorbed Dose (mg/kg/day) =
				Cw	Chemical Concentration in Water	Max or 95% UCL	mg/kg	USEPA, 2002a	
				FA	Fraction Absorbed	Chemical Specific	unitless	USEPA, 2004	DAevent x EV x EF x ED x SA
				CF	Conversion factor	0.001	L/cm^3	- -	BW x AT
				Kp	Permeability coefficient	Chemical Specific	cm/hr	USEPA, 2004	
				τ	Lag time	Chemical Specific	hr/event	USEPA, 2004	For inorganics
				t*	Time it takes to reach steady state	Chemical Specific	hr/event	USEPA, 2004	DAevent = Kp x CW x CF x tevent
				tevent	Duration of event	2	hr/event	(1)	
				B	Bunge model constant	Chemical Specific	unitless	USEPA, 2004	For organics if tevent <= t*
				SA	Skin Surface Available for Contact	5,700	cm2	USEPA, 2004	DAevent= 2 x FA x Kp x Cw x CF x sqrt[(6 x τ x tevent)/pi]
				EV	Event Frequency	1	events/day	(1)	
				EF	Exposure Frequency	26	days/year	(1)	For organics if tevent > t*
				ED1	Exposure Duration (Age 6 - 16)	2	years	(2), USEPA, 1993, 2005	DAevent =FA x Kp x Cw x CF x [tevent/(1+B) +
				ED2	Exposure Duration (Age 16 - 30)	5	years	(2), USEPA, 1993, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	$2 \times \tau + (1 + 3B + 3B^2)/(1+B^2)$
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,555	days	USEPA, 1989	

Notes:
1 - Professional judgment. For some factors, CTE is assumed to be 50 percent of RME.
2 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, adult residents will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:
USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.
USEPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.
USEPA Region 4, 2000: Supplement Guidance to RAGS: Region 4 Bulletins.
USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.
USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Ingestion Intake = (CR x CF x ET x EF x ED)/(BW x AT)
Dermal Intake = (SA x EV x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake = 2.04E-09 Cancer Dermal Intake = 5.80E-01

Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 16) = 5.81E-10 Cancer Dermal Intake (Age 6 - 16) = 1.66E-01
Cancer Ingestion Intake (Age 16 - 30) = 1.45E-09 Cancer Dermal Intake (Age 16 - 30) = 4.14E-01

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 2.04E-08 Noncancer Dermal Intake = 5.80E+00

Cancer risk from ingestion = Surface Water concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor
Cancer risk from dermal contact = Surface Water concentration x Cancer Dermal Intake x DAevent x Dermal Cancer Slope Factor
Hazard Index from ingestion = Surface Water concentration x Noncancer Ingestion Intake / Oral Reference Dose
Hazard Index from dermal contact = Surface Water concentration x Noncancer Dermal Intake x DAevent / Dermal Reference Dose

Q.4 RAGS PART D TABLE 5s

Non-Cancer Toxicity Data

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RAGS PART D TABLE 5
NON-CANCER TOXICITY DATA

Table No.

5-1 Non-Cancer Toxicity Data - Oral/Dermal
5-2 Non-Cancer Toxicity Data - Inhalation

TABLE 5.1
NON-CANCER TOXICITY DATA -- ORAL/DERMAL
NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD		Oral Absorption Efficiency for Dermal[1]	Absorbed RfD for Dermal[2]		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfD:Target Organ(s)	
		Value	Units		Value	Units			Source(s)	Date(s) (MM/DD/YYYY)
Explosives										
1,3-Dinitrobenzene	Chronic	1.0E-04	mg/kg/day	1	1.0E-04	mg/kg/day	Spleen	3000/1	IRIS	8/26/2013
	Subchronic	5.0E-04	mg/kg/day	1	5.0E-04	mg/kg/day		1000	ATSDR	6/1995
2,6-Dinitrotoluene	Chronic	3.0E-04	mg/kg/day	1	3.0E-04	mg/kg/day	Central Nervous System, Blood, Liver	NA	PPRTV	8/26/2013
	Subchronic	4.0E-03	mg/kg/day	1	4.0E-03	mg/kg/day				
3-Nitrotoluene	Chronic	1.0E-04	mg/kg/day	1	1.0E-04	mg/kg/day	Spleen	10000	PPRTV	6/16/2009
	Subchronic	1.0E-03	mg/kg/day	1	1.0E-03	mg/kg/day		1000		
Metals										
Aluminum	Chronic	1.0E+00	mg/kg/day	1	1.0E+00	mg/kg/day	Central Nervous System	100	PPRTV	10/23/2006
	Subchronic	1.0E+00	mg/kg/day	1	1.0E+00	mg/kg/day		30	ATSDR	9/2008
Arsenic	Chronic	3.0E-04	mg/kg/day	1	3.0E-04	mg/kg/day	Skin, Cardiovascular System	3/1	IRIS	8/25/2013
Barium	Chronic	2.0E-01	mg/kg/day	0.07	1.4E-02	mg/kg/day	Kidney	300	IRIS	8/25/2013
	Subchronic	2.0E-01	mg/kg/day	0.07	1.4E-02	mg/kg/day		100	ATSDR	8/2007
Beryllium	Chronic	2.0E-03	mg/kg/day	0.007	1.4E-05	mg/kg/day	Gastrointestinal System	300/1	IRIS	8/25/2013
	Subchronic	5.0E-03	mg/kg/day	0.007	3.5E-05	mg/kg/day	None Observed	100	HEAST	7/1997
Cadmium	Chronic	1.0E-03	mg/kg/day	0.025	2.5E-05	mg/kg/day	Kidney	10/1	IRIS	8/25/2013
Cobalt	Chronic	3.0E-04	mg/kg/day	1	3.0E-04	mg/kg/day	Thyroid	3000	PPRTV	8/25/2008
	Subchronic	3.0E-03	mg/kg/day	1	3.0E-03	mg/kg/day		300		
Chromium	Chronic	3.0E-03	mg/kg/day	0.025	7.5E-05	mg/kg/day	None Specified	30/3	IRIS	8/25/2013
	Subchronic	5.0E-03	mg/kg/day	0.025	1.3E-04	mg/kg/day	Kidney	100	ATSDR	9/2012
Iron	Chronic	7.0E-01	mg/kg/day	1	7.0E-01	mg/kg/day	Gastrointestinal System	1.5	PPRTV	9/11/2006
	Subchronic	7.0E-01	mg/kg/day	1	7.0E-01	mg/kg/day				
Manganese	Chronic	2.4E-02	mg/kg/day	0.04	9.6E-04	mg/kg/day	Central Nervous Sytem	1	IRIS	8/25/2013
Nickel	Chronic	2.0E-02	mg/kg/day	0.04	8.0E-04	mg/kg/day	Body Weight	300/1	IRIS	8/25/2013
	Chronic	2.0E-02	mg/kg/day	0.04	8.0E-04	mg/kg/day		300	HEAST	7/1997
Thallium[3]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	Chronic	5.0E-03	mg/kg/day	0.026	1.3E-04	mg/kg/day	Kidney	3000	EPA RSL	5/2013
	Subchronic	1.0E-02	mg/kg/day	0.026	2.6E-04	mg/kg/day		10	ATSDR	9/2012
Volatiles										
1,1-Dichloroethane	Chronic	2.0E-01	mg/kg/day	1	2.0E-01	mg/kg/day	Kidney	3000	PPRTV	9/27/2006
	Subchronic	2.0E+00	mg/kg/day	1	2.0E+00	mg/kg/day		300		
1,1-Dichloroethene	Chronic	5.0E-02	mg/kg/day	1	5.0E-02	mg/kg/day	Liver	100/1	IRIS	8/25/2013
	Subchronic	9.0E-03	mg/kg/day	1	9.0E-03	mg/kg/day		1000	HEAST	7/1997
1,2-Dichloroethane	Chronic	6.0E-03	mg/kg/day	1	6.0E-03	mg/kg/day	Kidney	3000	PPRTV	10/1/2010
	Subchronic	2.0E-02	mg/kg/day	1	2.0E-02	mg/kg/day				
cis-1,2-Dichloroethene	Chronic	2.0E-03	mg/kg/day	1	2.0E-03	mg/kg/day	Kidney	3000	IRIS	8/25/2013
Trichloroethene	Chronic	5.0E-04	mg/kg/day	1	5.0E-04	mg/kg/day	Immune System, Developmental	100/1000/10	IRIS	8/25/2013
Vinyl Chloride	Chronic	3.0E-03	mg/kg/day	1	3.0E-03	mg/kg/day	Liver	30/1	IRIS	8/25/2013

Notes:

1 - U.S. EPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.

2 - Adjusted dermal RfD = Oral RfD x Oral Absorption Efficiency for Dermal.

3 - Toxicity criteria used to derive the RSLs is only suitable for screening and is not to be used for quantifying risks.

Definitions:

ATSDR = Agency for Toxic Substances and Disease Registry.

EPA RSL - EPA Regional Screening Level Table, May 2013.

HEAST = Health Effects Summary Table

IRIS = Integrated Risk Information System.

NA = Not Available.

PPRTV = Provisional Peer Reviewed Toxicity Value.

RfD = Reference Dose.

TABLE 5.2
NON-CANCER TOXICITY DATA -- INHALATION
NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Chemical of Potential Concern	Chronic/ Subchronic	Inhalation RfC		Extrapolated RfD[1]		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfC : Target Organ(s)	
		Value	Units	Value	Units			Source(s)	Date(s) (MM/DD/YYYY)
Explosives									
1,3-Dinitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dintrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals									
Aluminum	Chronic	5.0E-03	mg/m^3	1.4E-03	(mg/kg/day)	Central Nervous Sytem	300	PPRTV	10/23/2006
Arsenic	Chronic	1.5E-05	mg/m^3	4.3E-06	(mg/kg/day)	Skin, Cardiovascular System	NA	Cal EPA	9/2009
Barium	Chronic	5.0E-04	mg/m^3	1.4E-04	(mg/kg/day)	Fetotoxicity	300	HEAST	7/1997
	Subchronic	5.0E-03	mg/m^3	1.4E-03	(mg/kg/day)		100		
Beryllium	Chronic	2.0E-05	mg/m^3	5.7E-06	(mg/kg/day)	Respiratory	10/1	IRIS	8/25/2013
Cadmium	Chronic	1.0E-05	mg/m^3	2.9E-06	(mg/kg/day)	Kidney	9	ATSDR	9/2012
Cobalt	Chronic	6.0E-06	mg/m^3	1.7E-06	(mg/kg/day)	Respiratory	300	PPRTV	8/25/2008
	Subchronic	2.0E-05	mg/m^3	5.7E-06	(mg/kg/day)		100		
Chromium	Chronic	1.0E-04	mg/m^3	2.9E-05	(mg/kg/day)	Respiratory	300/1	IRIS	8/25/2013
	Subchronic	3.0E-04	mg/m^3	8.6E-05	(mg/kg/day)		30	ATSDR	9/2012
Iron	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	Chronic	5.0E-05	mg/m^3	1.4E-05	(mg/kg/day)	Central Nervous System	1000/1	IRIS	8/25/2013
Nickel	Chronic	9.0E-05	mg/m^3	2.6E-05	(mg/kg/day)	Respiratory	300/1	IRIS	8/25/2013
	Subchronic	2.0E-04	mg/m^3	5.7E-05	(mg/kg/day)		30	ATSDR	9/2005
Thallium	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	Chronic	1.0E-04	mg/m^3	2.9E-05	(mg/kg/day)	NA	10	ATSDR	9/2012
Volatiles									
1,1-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	Chronic	2.0E-01	mg/m^3	5.7E-02	(mg/kg/day)	Liver	30/1	IRIS	8/25/2013
	Subchronic	7.9E-02	mg/m^3	2.3E-02	(mg/kg/day)		1000	ATSDR	9/2005
1,2-Dichloroethane	Chronic	7.0E-03	mg/m^3	2.0E-03	(mg/kg/day)	Central Nervous System	3000	PPRTV	10/1/2010
	Subchronic	7.0E-02	mg/m^3	2.0E-02	(mg/kg/day)				
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	Chronic	2.0E-03	mg/m^3	5.7E-04	(mg/kg/day)	Liver, Kidney	100/10	IRIS	8/25/2013
Vinyl Chloride	Chronic	1.0E-01	mg/m^3	2.9E-02	(mg/kg/day)	Liver	30/1	IRIS	8/25/2013
	Subchronic	7.7E-02	mg/m^3	2.2E-02	(mg/kg/day)		30	ATSDR	7/2006

TABLE 5.2
NON-CANCER TOXICITY DATA -- INHALATION
NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Notes:
1 - Extrapolated RfD = RfC *20m^3/day / 70 kg.

Definitions:
ATSDR = Agency for Toxic Substances and Disease Registry.
Cal EPA = California Environmental Protection Agency, Technical Support Document for Describing Available Cancer Slope Factors, September 2009.
HEAST = Health Effects Summary Table
IRIS = Integrated Risk Information System.
NA = Not Available.
PPRTV = Provisional Peer Reviewed Toxicity Value.
RfC = Reference Concentration.
RfD = Reference Dose.

Q.5 RAGS PART D TABLE 6s

Cancer Toxicity Data

LIST OF TABLES
RAGS PART D TABLE 6
CANCER TOXICITY DATA

Table No.

6-1 Cancer Toxicity Data - Oral/Dermal
6-2 Cancer Toxicity Data - Inhalation

TABLE 6.1
CANCER TOXICITY DATA -- ORAL/DERMAL
NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Chemical of Potential Concern	Oral Cancer Slope Factor		Oral Absorption Efficiency for Dermal[1]	Absorbed Cancer Slope Factor for Dermal[2]		Weight of Evidence/ Cancer Guideline Description	Oral CSF	
	Value	Units		Value	Units		Source(s)	Date(s) (MM/DD/YYYY)
EXPLOSIVES								
1,3-Dinitrobenzene	NA	NA	NA	NA	NA	D (Not classifiable as to human carcinogenicity)	IRIS	8/25/2013
2,6-Dintrotoluene	1.5E+00	$(mg/kg/day)^{-1}$	1	1.5E+00	$(mg/kg/day)^{-1}$	Suggestive Evidence of carcinogenity in humans	PPRTV	8/26/2013
3-Nitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA
Metals								
Aluminum	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	1.5E+00	$(mg/kg/day)^{-1}$	1	1.5E+00	$(mg/kg/day)^{-1}$	A / Known human carcinogen	IRIS	8/25/2013
Barium	NA	NA	NA	NA	NA	D (Not classifiable as to human carcinogenicity)	IRIS	8/25/2013
Beryllium	NA	NA	NA	NA	NA	Carcinogenic potential cannot be determined	IRIS	8/25/2013
Cadmium	NA	NA	NA	NA	NA	B1 / Probable human carcinogen	IRIS	8/25/2013
Cobalt	NA	NA	NA	NA	NA	NA	NA	NA
Chromium[3]	5.0E-01	$(mg/kg/day)^{-1}$	0.025	2.0E+01	$(mg/kg/day)^{-1}$	A / Known human carcinogen	IRIS	8/25/2013
Iron	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	NA	D (Not classifiable as to human carcinogenicity)	NA	NA
Nickel	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA	NA	NA	NA
Volatiles								
1,1-Dichloroethane	5.7E-03	$(mg/kg/day)^{-1}$	1	5.7E-03	$(mg/kg/day)^{-1}$	C/ Possible carcinogen	Cal EPA	9/2009
1,1-Dichloroethene	NA	NA	NA	NA	NA	C/ Possible carcinogen	IRIS	8/25/2013
1,2-Dichloroethane	9.1E-02	$(mg/kg/day)^{-1}$	1	9.1E-02	$(mg/kg/day)^{-1}$	B2/ Probable human carcinogen	IRIS	8/25/2013
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene (Mutagenic)[3]	9.3E-03	$(mg/kg/day)^{-1}$	1	9.3E-03	$(mg/kg/day)^{-1}$	A / Known human carcinogen	IRIS	8/25/2013
Trichloroethene (Nonmutagenic)[3]	3.7E-02	$(mg/kg/day)^{-1}$	1	3.7E-02	$(mg/kg/day)^{-1}$	A / Known human carcinogen	IRIS	8/25/2013
Vinyl Chloride	7.2E-01	(mg/kg/day)-1	1	7.2E-01	$(mg/kg/day)^{-1}$	A / Known human carcinogen	IRIS	8/25/2013

Notes:
1 - USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.
2 - Adjusted cancer slope factor for dermal = Oral cancer slope factor / Oral absorption efficiency for dermal.
3 - Trichloroethene and chromium are considered to act via the mutagenic mode of action. These chemicals are evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Definitions:
Cal EPA = California Environmental Protection Agency, Technical Support Document for Describing Available Cancer Slope Factors, September 2009.
CSF = Cancer Slope Factor.
IRIS = Integrated Risk Information System.
NA = Not Available.
PPRTV = Provisional Peer Reviewed Toxicity Value.

TABLE 6.2
CANCER TOXICITY DATA -- INHALATION
NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Chemical of Potential Concern	Unit Risk		Inhalation Cancer Slope Factor[1]		Weight of Evidence/ Cancer Guideline Description	Unit Risk : Inhalation CSF	
	Value	Units	Value	Units		Source(s)	Date(s) (MM/DD/YYYY)
Explosives							
1,3-Dinitrobenzene	NA	NA	NA	NA	D (Not classifiable as to human carcinogenicity)	IRIS	8/25/2013
2,6-Dintrotoluene	NA	NA	NA	NA	NA	NA	NA
3-Nitrotoluene	NA	NA	NA	NA	NA	NA	NA
Metals							
Aluminum	NA	NA	NA	NA	NA	NA	NA
Arsenic	4.3E-03	$(ug/m^3)^{-1}$	1.5E+01	$(mg/kg/day)^{-1}$	A / Known human carcinogen	IRIS	8/25/2013
Barium	NA	NA	NA	NA	D (Not classifiable as to human carcinogenicity)	IRIS	8/25/2013
Beryllium	2.4E-03	$(ug/m^3)^{-1}$	8.4E+00	$(mg/kg/day)^{-1}$	B1 / Probable human carcinogen	IRIS	8/25/2013
Cadmium	2.0E+00	$(ug/m3)^{-1}$	7.0E+03	$(mg/kg/day)^{-1}$	B1 / Probable human carcinogen	IRIS	8/25/2013
Cobalt	9.0E-03	$(ug/m3)^{-1}$	3.2E+01	$(mg/kg/day)^{-1}$	Likely to be carcinogenic to humans	PPRTV	8/25/2008
Chromium[2]	8.4E-02	$(ug/m3)^{-1}$	2.9E+02	$(mg/kg/day)^{-1}$	A / Known human carcinogen	IRIS	8/25/2013
Iron	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	D (Not classifiable as to human carcinogenicity)	NA	NA
Nickel	2.6E-04	$(ug/m3)^{-1}$	9.1E-01	$(mg/kg/day)^{-1}$	NA	Cal EPA	9/2009
Thallium	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA	NA	NA
Volatiles							
1,1-Dichloroethane	1.6E-06	$(ug/m3)^{-1}$	5.6E-03	$(mg/kg/day)^{-1}$	C/ Possible carcinogen	Cal EPA	9/2009
1,1-Dichloroethene	NA	NA	NA	NA	C/ Possible carcinogen	IRIS	8/25/2013
1,2-Dichloroethane	2.6E-05	$(ug/m3)^{-1}$	9.1E-02	$(mg/kg/day)^{-1}$	B2/ Probable human carcinogen	IRIS	8/25/2013
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA
Trichloroethene (Mutagenic)[2]	1.0E-06	$(ug/m3)^{-1}$	3.5E-03	$(mg/kg/day)^{-1}$	A / Known human carcinogen	IRIS	8/25/2013
Trichloroethene (Nonmutagenic)[2]	3.1E-06	$(ug/m3)^{-1}$	1.1E-02	$(mg/kg/day)^{-1}$	A / Known human carcinogen	IRIS	8/25/2013
Vinyl Chloride	4.4E-06	$(ug/m3)^{-1}$	1.5E-02	$(mg/kg/day)^{-1}$	A / Known human carcinogen	IRIS	8/25/2013

Notes:

1 - Inhalation CSF = Unit Risk * 70 kg / $20m^3$/day.

2 - Trichloroethene and chromium are considered to act via the mutagenic mode of action. These chemicals are evaluated in accordance with USEPA's Supplemental Guidance Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Definitions:

Cal EPA = California Environmental Protection Agency, Technical Support Document for Describing Available Cancer Slope Factors, September 2009.

CSF = Cancer Slope Factor.

IRIS = Integrated Risk Information System.

NA = Not Available.

Q.6 RAGS PART D TABLE 7s

Calculation of Cancer Risks and Non-Cancer Hazards

LIST OF TABLES

RAGS PART D TABLE 7

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

Table No.	
	Reasonable Maximum Exposures
7.1.RME	Construction Workers
7.2.RME	Maintenace Workers
7.3.RME	Industrial Workers
7.4.RME	Child Residents
7.5.RME	Adult Residents
7.6.RME	Construction Workers Including Background Chemicals
7.7.RME	Maintenace Workers Including Background Chemicals
7.8.RME	Industrial Workers Including Background Chemicals
7.9.RME	Child Residents Including Background Chemicals
7.10.RME	Adult Residents Including Background Chemicals
	Central Tendency Exposures
7.1.CTE	Construction Workers
7.2.CTE	Maintenace Workers
7.3.CTE	Industrial Workers
7.4.CTE	Child Residents
7.5.CTE	Adult Residents
7.6.CTE	Construction Workers Including Background Chemicals
7.7.CTE	Maintenace Workers Including Background Chemicals
7.8.CTE	Industrial Workers Including Background Chemicals
7.9.CTE	Child Residents Including Background Chemicals
7.10.CTE	Adult Residents Including Background Chemicals

TABLE 7.1.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Site 43	Ingestion	Aluminum	17600	mg/kg	4.9E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.4E-02	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.03
				Cadmium	10.8	mg/kg	3.0E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.1E-05	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.02
				Chromium VI	28.1	mg/kg	7.8E-07	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	3.9E-07	5.4E-05	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.01
				Trichloroethene	2.72	mg/kg	7.5E-08	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	3.5E-09	5.3E-06	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.01
			Exp. Route Total								3.9E-07					0.08
			Dermal	Aluminum	17600	mg/kg	1.5E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.0E-03	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.001
				Cadmium	10.8	mg/kg	9.0E-10	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.3E-08	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.003
				Chromium VI	28.1	mg/kg	2.3E-08	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	5E-07	1.6E-06	(mg/kg/day)	1.3E-04	(mg/kg/day)	0.01
				Trichloroethene	2.72	mg/kg	6.8E-09	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	3E-10	4.7E-07	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.0009
			Exp. Route Total								4.7E-07					0.02
		Exposure Point Total									8.6E-07					0.09
	Exposure Medium Total										8.6E-07					0.09
	Air	Site 43	Inhalation	Aluminum	1.1E-02	mg/m^3	2.1E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.5E-03	(mg/m^3)	5.0E-03	(mg/m^3)	0.3
				Cadmium	6.7E-06	mg/m^3	1.3E-08	(mg/m^3)	1.8E-03	$(ug/m^3)^{-1}$	2.3E-08	9.1E-07	(mg/m^3)	1.0E-05	(mg/m^3)	0.09
				Chromium VI	1.7E-05	mg/m^3	3.4E-08	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	2.9E-06	2.4E-06	(mg/m^3)	3.0E-04	(mg/m^3)	0.008
				Trichloroethene	5.5E-03	mg/m^3	1.1E-05	(mg/m^3)	4.1E-06	$(ug/m^3)^{-1}$	4.4E-08	7.6E-04	(mg/m^3)	2.0E-03	(mg/m^3)	0.4
			Exp. Route Total								2.9E-06					0.8
		Exposure Point Total									2.9E-06					0.8
	Exposure Medium Total										2.9E-06					0.8
Medium Total											3.8E-06					0.9
Subsurface Soil	Subsurface Soil	Site 43	Ingestion	Manganese	92.3	mg/kg	2.6E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.8E-04	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.007
				Trichloroethene	1.37	mg/kg	3.8E-08	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	1.7E-09	2.7E-06	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.005
			Exp. Route Total								1.7E-09					0.01
			Dermal	Manganese	92.3	mg/kg	7.7E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.4E-06	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.006
				Trichloroethene	1.37	mg/kg	3.4E-09	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	1.6E-10	2.4E-07	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.0005
			Exp. Route Total								1.6E-10					0.006
		Exposure Point Total									1.9E-09					0.02
	Exposure Medium Total										1.9E-09					0.02
	Air	Site 43	Inhalation	Manganese	5.7E-05	mg/m^3	1.1E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	7.8E-06	(mg/m^3)	5.0E-05	(mg/m^3)	0.2
				Trichloroethene	2.8E-03	mg/m^3	5.5E-06	(mg/m^3)	4.1E-06	$(ug/m^3)^{-1}$	2.2E-08	3.8E-04	(mg/m^3)	2.0E-03	(mg/m^3)	0.2
			Exp. Route Total								2.2E-08					0.3
		Exposure Point Total									2.2E-08					0.3
	Exposure Medium Total										2.2E-08					0.3
Medium Total											2.4E-08					0.4

TABLE 7.1.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Groundwater	Site 43	Ingestion	1,3-Dinitrobenzene	0.212	ug/L	1.1E-10	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.5E-09	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.00001
				2,6-Dinitrotoluene	0.504	ug/L	2.5E-10	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	3.8E-10	1.8E-08	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.000004
				3-Nitrotoluene	0.378	ug/L	1.9E-10	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-08	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.00001
				Arsenic	2.8	ug/L	1.4E-09	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.1E-09	9.9E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0003
				Barium	138	ug/L	6.9E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.9E-06	(mg/kg/day)	2.0E-01	(mg/kg/day)	0.00002
				Beryllium	0.82	ug/L	4.1E-10	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.9E-08	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.000006
				Cobalt	48.9	ug/L	2.5E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.7E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0006
				Iron	24800	ug/L	1.2E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.7E-04	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.001
				Manganese	481	ug/L	2.4E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.7E-05	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.0007
				Nickel	32.8	ug/L	1.7E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-06	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.00006
				Thallium	0.803	ug/L	4.0E-10	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.8E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				1,1-Dichloroethane	4.7	ug/L	2.4E-09	(mg/kg/day)	5.7E-03	$(mg/kg/day)^{-1}$	1.3E-11	1.7E-07	(mg/kg/day)	2.0E+00	(mg/kg/day)	8.3E-8
				1,1-Dichloroethene	4.4	ug/L	2.2E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.5E-07	(mg/kg/day)	9.0E-03	(mg/kg/day)	0.00002
				1,2-Dichloroethane	0.36	ug/L	1.8E-10	(mg/kg/day)	9.1E-02	$(mg/kg/day)^{-1}$	1.6E-11	1.3E-08	(mg/kg/day)	2.0E-02	(mg/kg/day)	6.3E-7
				Cis-1,2-Dichloroethene	58	ug/L	2.9E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.0E-06	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0001
				Trichloroethene	2680	ug/L	1.3E-06	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	6.2E-08	9.4E-05	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.2
				Vinyl Chloride	8	ug/L	4.0E-09	(mg/kg/day)	7.2E-01	$(mg/kg/day)^{-1}$	2.9E-09	2.8E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0009
			Exp. Route Total								6.7E-08					0.2
			Dermal	1,3-Dinitrobenzene	0.212	ug/L	3.6E-10	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.5E-08	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.00005
				2,6-Dinitrotoluene	0.504	ug/L	1.1E-09	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.6E-09	7.5E-08	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.00002
				3-Nitrotoluene	0.378	ug/L	3.6E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.5E-07	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.0003
				Arsenic	2.8	ug/L	1.9E-09	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.8E-09	1.3E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0004
				Barium	138	ug/L	9.2E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.4E-06	(mg/kg/day)	1.4E-02	(mg/kg/day)	0.0005
				Beryllium	0.82	ug/L	5.4E-10	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.8E-08	(mg/kg/day)	3.5E-05	(mg/kg/day)	0.001
				Cobalt	48.9	ug/L	1.3E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.1E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0003
				Iron	24800	ug/L	1.6E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-03	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.002
				Manganese	481	ug/L	3.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.2E-05	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.02
				Nickel	32.8	ug/L	4.4E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.1E-07	(mg/kg/day)	8.0E-04	(mg/kg/day)	0.0004
				Thallium	0.803	ug/L	5.3E-10	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.7E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				1,1-Dichloroethane	4.7	ug/L	2.5E-08	(mg/kg/day)	5.7E-03	$(mg/kg/day)^{-1}$	1.4E-10	1.7E-06	(mg/kg/day)	2.0E+00	(mg/kg/day)	8.6E-7
				1,1-Dichloroethene	4.4	ug/L	3.9E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.7E-06	(mg/kg/day)	9.0E-03	(mg/kg/day)	0.0003
				1,2-Dichloroethane	0.36	ug/L	1.2E-09	(mg/kg/day)	9.1E-02	$(mg/kg/day)^{-1}$	1.1E-10	8.3E-08	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.000004
				Cis-1,2-Dichloroethene	58	ug/L	4.8E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.4E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.002
				Trichloroethene	2680	ug/L	2.6E-05	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	1.2E-06	1.8E-03	(mg/kg/day)	5.0E-04	(mg/kg/day)	3.6
				Vinyl Chloride	8	ug/L	3.3E-08	(mg/kg/day)	7.2E-01	$(mg/kg/day)^{-1}$	2.4E-08	2.3E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.008
			Exp. Route Total								1.2E-06					3.7
		Exposure Point Total									1.3E-06					3.9
	Exposure Medium Total										1.3E-06					3.9
	Air	Site 43	Inhalation	1,3-Dinitrobenzene	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				2,6-Dinitrotoluene	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				3-Nitrotoluene	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Arsenic	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	1.5E-05	(mg/m^3)	--
				Barium	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	5.0E-03	(mg/m^3)	--
				Beryllium	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	2.4E-03	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	2.0E-05	(mg/m^3)	--
				Cobalt	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	2.0E-05	(mg/m^3)	--
				Iron	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	5.0E-05	(mg/m^3)	--
				Nickel	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	2.6E-04	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	2.0E-04	(mg/m^3)	--
				Thallium	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				1,1-Dichloroethane	1.7E-04	mg/m^3	1.0E-07	(mg/m^3)	1.6E-06	$(ug/m^3)^{-1}$	1.6E-10	7.1E-06	(mg/m^3)	NA	(mg/m^3)	--
				1,1-Dichloroethene	1.7E-04	mg/m^3	9.7E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	6.8E-06	(mg/m^3)	7.9E-02	(mg/m^3)	0.00009
				1,2-Dichloroethane	1.3E-05	mg/m^3	7.5E-09	(mg/m^3)	2.6E-05	$(ug/m^3)^{-1}$	2.0E-10	5.3E-07	(mg/m^3)	7.0E-02	(mg/m^3)	0.000008
				Cis-1,2-Dichloroethene	2.2E-03	mg/m^3	1.3E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	8.9E-05	(mg/m^3)	NA	(mg/m^3)	--
				Trichloroethene	8.6E-02	mg/m^3	5.1E-05	(mg/m^3)	4.1E-06	$(ug/m^3)^{-1}$	2.1E-07	3.5E-03	(mg/m^3)	2.0E-03	(mg/m^3)	1.8
				Vinyl Chloride	3.7E-04	mg/m^3	2.2E-07	(mg/m^3)	4.4E-06	$(ug/m^3)^{-1}$	9.7E-10	1.5E-05	(mg/m^3)	7.7E-02	(mg/m^3)	0.0002
			Exp. Route Total								2.1E-07					1.8
		Exposure Point Total									2.1E-07					1.8
	Exposure Medium Total										2.1E-07					1.8
Medium Total											1.5E-06					5.6

TABLE 7.1.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Surface Water	Site 43	Ingestion	Arsenic	1.21	ug/L	1.4E-09	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.1E-09	9.9E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0003
				Cobalt	25.9	ug/L	3.0E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.1E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0007
				Cis-1,2-Dichloroethene	195	ug/L	2.3E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.6E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0008
				Trichloroethene	240	ug/L	2.8E-07	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	1.3E-08	2.0E-05	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.04
				Vinyl Chloride	1.26	ug/L	1.5E-09	(mg/kg/day)	7.2E-01	$(mg/kg/day)^{-1}$	1.1E-09	1.0E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0003
			Exp. Route Total								1.6E-08					0.04
			Dermal	Arsenic	1.21	ug/L	4.6E-10	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	7.0E-10	3.3E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0001
				Cobalt	25.9	ug/L	4.0E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.8E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.00009
				Cis-1,2-Dichloroethene	195	ug/L	9.4E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.6E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.003
				Trichloroethene	240	ug/L	1.3E-06	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	6.2E-08	9.4E-05	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.2
				Vinyl Chloride	1.26	ug/L	3.0E-09	(mg/kg/day)	7.2E-01	$(mg/kg/day)^{-1}$	2.2E-09	2.1E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0007
			Exp. Route Total								6.5E-08					0.2
		Exposure Point Total									8.1E-08					0.2
	Exposure Medium Total										8.1E-08					0.2
Medium Total											8.1E-08					0.2
										Total of Receptor Risks Across All Media	5.4E-06				Total of Receptor Hazards Across All Media	7.1

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.2.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Maintenance Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Site 43	Ingestion	Aluminum	17600	mg/kg	5.9E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.7E-03	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.002
				Cadmium	10.8	mg/kg	3.6E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.0E-06	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.001
				Chromium VI	28.1	mg/kg	9.4E-07	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	4.7E-07	2.6E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0009
				Trichloroethene	2.72	mg/kg	9.1E-08	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	4.2E-09	2.6E-07	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.0005
			Exp. Route Total								4.8E-07					0.004
			Dermal	Aluminum	17600	mg/kg	3.9E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-04	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.0001
				Cadmium	10.8	mg/kg	2.4E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.7E-09	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.0003
				Chromium VI	28.1	mg/kg	6.2E-08	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	1E-06	1.7E-07	(mg/kg/day)	7.5E-05	(mg/kg/day)	0.002
				Trichloroethene	2.72	mg/kg	1.8E-08	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	8E-10	5.1E-08	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.0001
			Exp. Route Total								1.2E-06					0.003
		Exposure Point Total									1.7E-06					0.007
	Exposure Medium Total										1.7E-06					0.007
	Air	Site 43	Inhalation	Aluminum	5.4E-06	mg/m^3	4.3E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.2E-07	(mg/m^3)	5.0E-03	(mg/m^3)	0.00002
				Cadmium	3.3E-09	mg/m^3	2.6E-11	(mg/m^3)	1.8E-03	$(ug/m^3)^{-1}$	4.7E-11	7.3E-11	(mg/m^3)	1.0E-05	(mg/m^3)	0.000007
				Chromium VI	8.7E-09	mg/m^3	6.8E-11	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	5.7E-09	1.9E-10	(mg/m^3)	1.0E-04	(mg/m^3)	0.000002
				Trichloroethene	8.9E-04	mg/m^3	7.0E-06	(mg/m^3)	4.1E-06	$(ug/m^3)^{-1}$	2.9E-08	2.0E-05	(mg/m^3)	2.0E-03	(mg/m^3)	0.010
			Exp. Route Total								3.4E-08					0.010
		Exposure Point Total									3.4E-08					0.010
	Exposure Medium Total										3.4E-08					0.010
Medium Total											1.8E-06					0.02
Subsurface Soil	Subsurface Soil	Site 43	Ingestion	Manganese	92.3	mg/kg	3.1E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.7E-06	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.0004
				Trichloroethene	1.37	mg/kg	4.6E-08	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	2.1E-09	1.3E-07	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.0003
			Exp. Route Total								2.1E-09					0.0006
			Dermal	Manganese	92.3	mg/kg	2.0E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.7E-07	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.0006
				Trichloroethene	1.37	mg/kg	9.1E-09	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	4.2E-10	2.5E-08	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.00005
			Exp. Route Total								4.2E-10					0.0006
		Exposure Point Total									2.5E-09					0.001
	Exposure Medium Total										2.5E-09					0.001
	Air	Site 43	Inhalation	Manganese	2.9E-08	mg/m^3	2.2E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	6.3E-10	(mg/m^3)	5.0E-05	(mg/m^3)	0.00001
				Trichloroethene	4.5E-04	mg/m^3	3.5E-06	(mg/m^3)	4.1E-06	$(ug/m^3)^{-1}$	1.4E-08	9.9E-06	(mg/m^3)	2.0E-03	(mg/m^3)	0.005
			Exp. Route Total								1.4E-08					0.005
		Exposure Point Total									1.4E-08					0.005
	Exposure Medium Total										1.4E-08					0.005
Medium Total											1.7E-08					0.006
Surface Water	Surface Water	Site 43	Ingestion	Arsenic	1.21	ug/L	1.6E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.4E-08	4.5E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0002
				Cobalt	25.9	ug/L	3.5E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.7E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.003
				Cis-1,2-Dichloroethene	195	ug/L	2.6E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.3E-06	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.004
				Trichloroethene	240	ug/L	3.2E-06	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	1.5E-07	9.0E-06	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.02
				Vinyl Chloride	1.26	ug/L	1.7E-08	(mg/kg/day)	7.2E-01	$(mg/kg/day)^{-1}$	1.2E-08	4.7E-08	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.00002
			Exp. Route Total								1.8E-07					0.03
			Dermal	Arsenic	1.21	ug/L	5.4E-09	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	8.0E-09	1.5E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.00005
				Cobalt	25.9	ug/L	4.6E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0004
				Cis-1,2-Dichloroethene	195	ug/L	1.1E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.0E-05	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.02
				Trichloroethene	240	ug/L	1.6E-05	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	7.1E-07	4.4E-05	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.09
				Vinyl Chloride	1.26	ug/L	3.5E-08	(mg/kg/day)	7.2E-01	$(mg/kg/day)^{-1}$	2.5E-08	9.7E-08	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.00003
			Exp. Route Total								7.5E-07					0.1
		Exposure Point Total									9.3E-07					0.1
	Exposure Medium Total										9.3E-07					0.1
Medium Total											9.3E-07					0.1
										Total of Receptor Risks Across All Media	2.7E-06				Total of Receptor Hazards Across All Media	0.2

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.3.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Site 43	Ingestion	Aluminum	17600	mg/kg	6.2E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.7E-02	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.02
				Cadmium	10.8	mg/kg	3.8E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-05	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.01
				Chromium VI	28.1	mg/kg	9.8E-06	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	4.9E-06	2.7E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.009
				Trichloroethene	2.72	mg/kg	9.5E-07	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	4.4E-08	2.7E-06	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.005
			Exp. Route Total								5.0E-06					0.04
			Dermal	Aluminum	17600	mg/kg	4.1E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-03	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.001
				Cadmium	10.8	mg/kg	2.5E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.0E-08	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.003
				Chromium VI	28.1	mg/kg	6.5E-07	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	1E-05	1.8E-06	(mg/kg/day)	7.5E-05	(mg/kg/day)	0.02
				Trichloroethene	2.72	mg/kg	1.9E-07	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	9E-09	5.3E-07	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.001
			Exp. Route Total								1.3E-05					0.03
		Exposure Point Total									1.8E-05					0.07
	Exposure Medium Total										1.8E-05					0.07
	Air	Site 43	Inhalation	Aluminum	5.4E-06	mg/m^3	4.4E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.2E-06	(mg/m^3)	5.0E-03	(mg/m^3)	0.0002
				Cadmium	3.3E-09	mg/m^3	2.7E-10	(mg/m^3)	1.8E-03	$(ug/m^3)^{-1}$	4.9E-10	7.6E-10	(mg/m^3)	1.0E-05	(mg/m^3)	0.00008
				Chromium VI	8.7E-09	mg/m^3	7.1E-10	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	6.0E-08	2.0E-09	(mg/m^3)	1.0E-04	(mg/m^3)	0.00002
				Trichloroethene	8.9E-04	mg/m^3	7.3E-05	(mg/m^3)	4.1E-06	$(ug/m^3)^{-1}$	3.0E-07	2.0E-04	(mg/m^3)	2.0E-03	(mg/m^3)	0.1
			Exp. Route Total								3.6E-07					0.1
		Exposure Point Total									3.6E-07					0.1
	Exposure Medium Total										3.6E-07					0.1
Medium Total											1.8E-05					0.2
Subsurface Soil	Subsurface Soil	Site 43	Ingestion	Manganese	92.3	mg/kg	3.2E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.0E-05	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.004
				Trichloroethene	1.37	mg/kg	4.8E-07	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	2.2E-08	1.3E-06	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.003
			Exp. Route Total								2.2E-08					0.006
			Dermal	Manganese	92.3	mg/kg	2.1E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.0E-06	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.006
				Trichloroethene	1.37	mg/kg	9.5E-08	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	4.4E-09	2.7E-07	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.0005
			Exp. Route Total								4.4E-09					0.007
		Exposure Point Total									2.6E-08					0.01
	Exposure Medium Total										2.6E-08					0.01
	Air	Site 43	Inhalation	Manganese	2.9E-08	mg/m^3	2.3E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	6.5E-09	(mg/m^3)	5.0E-05	(mg/m^3)	0.0001
				Trichloroethene	4.5E-04	mg/m^3	3.7E-05	(mg/m^3)	4.1E-06	$(ug/m^3)^{-1}$	1.5E-07	1.0E-04	(mg/m^3)	2.0E-03	(mg/m^3)	0.05
			Exp. Route Total								1.5E-07					0.05
		Exposure Point Total									1.5E-07					0.05
	Exposure Medium Total										1.5E-07					0.05
Medium Total											1.8E-07					0.06

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.4.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Site 43	Ingestion	Aluminum	17600	mg/kg	1.9E-02	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.3E-01	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.2
				Cadmium	10.8	mg/kg	1.2E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-04	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.1
				Chromium VI	28.1	mg/kg	1.6E-04	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	8.2E-05	3.6E-04	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.1
				Trichloroethene (Mutagenic)	2.72	mg/kg	1.6E-05	(mg/kg/day)	9.3E-03	$(mg/kg/day)^{-1}$	1.5E-07	3.5E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	2.72	mg/kg	3.0E-06	(mg/kg/day)	3.7E-02	$(mg/kg/day)^{-1}$	1.1E-07	3.5E-05	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.07
			Exp. Route Total								8.2E-05					0.6
			Dermal	Aluminum	17600	mg/kg	5.4E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.3E-03	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.006
				Cadmium	10.8	mg/kg	3.3E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.9E-07	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.02
				Chromium VI	28.1	mg/kg	4.6E-06	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	9E-05	1.0E-05	(mg/kg/day)	7.5E-05	(mg/kg/day)	0.1
				Trichloroethene (Mutagenic)	2.72	mg/kg	1.3E-06	(mg/kg/day)	9.3E-03	$(mg/kg/day)^{-1}$	1E-08	2.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	2.72	mg/kg	2.5E-07	(mg/kg/day)	3.7E-02	$(mg/kg/day)^{-1}$	9E-09	2.9E-06	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.006
			Exp. Route Total								9.2E-05					0.2
		Exposure Point Total									1.7E-04					0.7
	Exposure Medium Total										1.7E-04					0.7
	Air	Site 43	Inhalation	Aluminum	5.4E-06	mg/m^3	4.5E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.2E-06	(mg/m^3)	5.0E-03	(mg/m^3)	0.001
				Cadmium	3.3E-09	mg/m^3	2.7E-10	(mg/m^3)	1.8E-03	$(ug/m^3)^{-1}$	4.9E-10	3.2E-09	(mg/m^3)	1.0E-05	(mg/m^3)	0.0003
				Chromium VI	8.7E-09	mg/m^3	3.8E-09	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	3.2E-07	8.3E-09	(mg/m^3)	1.0E-04	(mg/m^3)	0.00008
				Trichloroethene (Mutagenic)	8.9E-04	mg/m^3	3.9E-04	(mg/m^3)	1.0E-06	$(ug/m^3)^{-1}$	3.9E-07	8.6E-04	(mg/m^3)	NA	(mg/m^3)	--
				Trichloroethene (Nonmutagenic)	8.9E-04	mg/m^3	7.4E-05	(mg/m^3)	3.1E-06	$(ug/m^3)^{-1}$	2.3E-07	8.6E-04	(mg/m^3)	2.0E-03	(mg/m^3)	0.4
			Exp. Route Total								9.4E-07					0.4
		Exposure Point Total									9.4E-07					0.4
	Exposure Medium Total										9.4E-07					0.4
Medium Total											1.8E-04					1.1
Subsurface Soil	Subsurface Soil	Site 43	Ingestion	Manganese	92.3	mg/kg	1.0E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-03	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.05
				Trichloroethene (Mutagenic)	1.37	mg/kg	8.0E-06	(mg/kg/day)	9.3E-03	$(mg/kg/day)^{-1}$	7.4E-08	1.8E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	1.37	mg/kg	1.5E-06	(mg/kg/day)	3.7E-02	$(mg/kg/day)^{-1}$	5.5E-08	1.8E-05	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.04
			Exp. Route Total								1.3E-07					0.08
			Dermal	Manganese	92.3	mg/kg	2.8E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.3E-05	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.03
				Trichloroethene (Mutagenic)	1.37	mg/kg	6.7E-07	(mg/kg/day)	9.3E-03	$(mg/kg/day)^{-1}$	6.3E-09	1.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	1.37	mg/kg	1.3E-07	(mg/kg/day)	3.7E-02	$(mg/kg/day)^{-1}$	4.6E-09	1.5E-06	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.003
			Exp. Route Total								1.1E-08					0.04
		Exposure Point Total									1.4E-07					0.1
	Exposure Medium Total										1.4E-07					0.1
	Air	Site 43	Inhalation	Manganese	2.9E-08	mg/m^3	2.3E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.7E-08	(mg/m^3)	5.0E-05	(mg/m^3)	0.0005
				Trichloroethene (Mutagenic)	4.5E-04	mg/m^3	2.0E-04	(mg/m^3)	1.0E-06	$(ug/m^3)^{-1}$	2.0E-07	4.3E-04	(mg/m^3)	NA	(mg/m^3)	--
				Trichloroethene (Nonmutagenic)	4.5E-04	mg/m^3	3.7E-05	(mg/m^3)	3.1E-06	$(ug/m^3)^{-1}$	1.1E-07	4.3E-04	(mg/m^3)	2.0E-03	(mg/m^3)	0.2
			Exp. Route Total								3.1E-07					0.2
		Exposure Point Total									3.1E-07					0.2
	Exposure Medium Total										3.1E-07					0.2
Medium Total											4.5E-07					0.3

TABLE 7.4.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Groundwater	Site 43	Ingestion	1,3-Dinitrobenzene	0.212	ug/L	1.2E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.4E-05	(mg/kg/day)	1.0E-04	(mg/kg/day)	0.1
				2,6-Dinitrotoluene	0.504	ug/L	2.8E-06	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	4.1E-06	3.2E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.1
				3-Nitrotoluene	0.378	ug/L	2.1E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.4E-05	(mg/kg/day)	1.0E-04	(mg/kg/day)	0.2
				Arsenic	2.8	ug/L	1.5E-05	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	2.3E-05	1.8E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.6
				Barium	138	ug/L	7.6E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	8.8E-03	(mg/kg/day)	2.0E-01	(mg/kg/day)	0.04
				Beryllium	0.82	ug/L	4.5E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	5.2E-05	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.03
				Cobalt	48.9	ug/L	2.7E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.1E-03	(mg/kg/day)	3.0E-04	(mg/kg/day)	10
				Iron	24800	ug/L	1.4E-01	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.6E+00	(mg/kg/day)	7.0E-01	(mg/kg/day)	2.3
				Manganese	481	ug/L	2.6E-03	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.1E-02	(mg/kg/day)	2.4E-02	(mg/kg/day)	1.3
				Nickel	32.8	ug/L	1.8E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.1E-03	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.1
				Thallium	0.803	ug/L	4.4E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	5.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				1,1-Dichloroethane	4.7	ug/L	2.6E-05	(mg/kg/day)	5.7E-03	(mg/kg/day)$^{-1}$	1.5E-07	3.0E-04	(mg/kg/day)	2.0E-01	(mg/kg/day)	0.002
				1,1-Dichloroethene	4.4	ug/L	2.4E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.8E-04	(mg/kg/day)	5.0E-02	(mg/kg/day)	0.006
				1,2-Dichloroethane	0.36	ug/L	2.0E-06	(mg/kg/day)	9.1E-02	(mg/kg/day)$^{-1}$	1.8E-07	2.3E-05	(mg/kg/day)	6.0E-03	(mg/kg/day)	0.004
				Cis-1,2-Dichloroethene	58	ug/L	3.2E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.7E-03	(mg/kg/day)	2.0E-03	(mg/kg/day)	1.9
				Trichloroethene (Mutagenic)	2680	ug/L	7.8E-02	(mg/kg/day)	9.3E-03	(mg/kg/day)$^{-1}$	7.3E-04	1.7E-01	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	2680	ug/L	1.5E-02	(mg/kg/day)	3.7E-02	(mg/kg/day)$^{-1}$	5.4E-04	1.7E-01	(mg/kg/day)	5.0E-04	(mg/kg/day)	343
				Vinyl Chloride	8	ug/L	5.8E-04	(mg/kg/day)	7.2E-01	(mg/kg/day)$^{-1}$	4.2E-04	5.1E-04	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.2
			Exp. Route Total								1.7E-03					360
			Dermal	1,3-Dinitrobenzene	0.212	ug/L	1.1E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.3E-07	(mg/kg/day)	1.0E-04	(mg/kg/day)	0.001
				2,6-Dinitrotoluene	0.504	ug/L	3.5E-08	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	5.2E-08	4.1E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.001
				3-Nitrotoluene	0.378	ug/L	1.0E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.2E-06	(mg/kg/day)	1.0E-04	(mg/kg/day)	0.01
				Arsenic	2.8	ug/L	1.0E-08	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	1.5E-08	1.2E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0004
				Barium	138	ug/L	5.0E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	5.8E-06	(mg/kg/day)	1.4E-02	(mg/kg/day)	0.0004
				Beryllium	0.82	ug/L	3.0E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.5E-08	(mg/kg/day)	1.4E-05	(mg/kg/day)	0.002
				Cobalt	48.9	ug/L	7.1E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	8.3E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.003
				Iron	24800	ug/L	9.0E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.0E-03	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.001
				Manganese	481	ug/L	1.7E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.0E-05	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.02
				Nickel	32.8	ug/L	2.4E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.8E-07	(mg/kg/day)	8.0E-04	(mg/kg/day)	0.0003
				Thallium	0.803	ug/L	2.9E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.4E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				1,1-Dichloroethane	4.7	ug/L	6.2E-07	(mg/kg/day)	5.7E-03	(mg/kg/day)$^{-1}$	3.5E-09	7.2E-06	(mg/kg/day)	2.0E-01	(mg/kg/day)	0.00004
				1,1-Dichloroethene	4.4	ug/L	9.9E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.2E-05	(mg/kg/day)	5.0E-02	(mg/kg/day)	0.0002
				1,2-Dichloroethane	0.36	ug/L	3.0E-08	(mg/kg/day)	9.1E-02	(mg/kg/day)$^{-1}$	2.7E-09	3.4E-07	(mg/kg/day)	6.0E-03	(mg/kg/day)	0.00006
				Cis-1,2-Dichloroethene	58	ug/L	1.2E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.4E-04	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.07
				Trichloroethene (Mutagenic)	2680	ug/L	4.0E-03	(mg/kg/day)	9.3E-03	(mg/kg/day)$^{-1}$	3.7E-05	8.8E-03	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	2680	ug/L	7.5E-04	(mg/kg/day)	3.7E-02	(mg/kg/day)$^{-1}$	2.8E-05	8.8E-03	(mg/kg/day)	5.0E-04	(mg/kg/day)	18
				Vinyl Chloride	8	ug/L	9.1E-06	(mg/kg/day)	7.2E-01	(mg/kg/day)$^{-1}$	6.6E-06	8.1E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.003
			Exp. Route Total								7.1E-05					18
		Exposure Point Total									1.8E-03					378
	Exposure Medium Total										1.8E-03					378
Medium Total											1.8E-03					378
Surface Water	Surface Water	Site 43	Ingestion	Arsenic	1.21	ug/L	3.9E-08	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	5.9E-08	4.6E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.002
				Cobalt	25.9	ug/L	8.4E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	9.8E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.03
				Cis-1,2-Dichloroethene	195	ug/L	6.3E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	7.4E-05	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.04
				Trichloroethene (Mutagenic)	240	ug/L	4.2E-05	(mg/kg/day)	9.3E-03	(mg/kg/day)$^{-1}$	3.9E-07	9.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	240	ug/L	7.8E-06	(mg/kg/day)	3.7E-02	(mg/kg/day)$^{-1}$	2.9E-07	9.1E-05	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.2
				Vinyl Chloride	1.26	ug/L	3.4E-06	(mg/kg/day)	7.2E-01	(mg/kg/day)$^{-1}$	2.4E-06	4.8E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0002
			Exp. Route Total								3.2E-06					0.3
			Dermal	Arsenic	1.21	ug/L	1.1E-08	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	1.7E-08	1.3E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0004
				Cobalt	25.9	ug/L	9.4E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.1E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.004
				Cis-1,2-Dichloroethene	195	ug/L	2.2E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.6E-04	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.1
				Trichloroethene (Mutagenic)	240	ug/L	1.7E-04	(mg/kg/day)	9.3E-03	(mg/kg/day)$^{-1}$	1.6E-06	3.7E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	240	ug/L	3.2E-05	(mg/kg/day)	3.7E-02	(mg/kg/day)$^{-1}$	1.2E-06	3.7E-04	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.7
				Vinyl Chloride	1.26	ug/L	5.9E-06	(mg/kg/day)	7.2E-01	(mg/kg/day)$^{-1}$	4.2E-06	8.3E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0003
			Exp. Route Total								7.0E-06					0.9
		Exposure Point Total									1.0E-05					1.1
	Exposure Medium Total										1.0E-05					1.1
Medium Total											1.0E-05					1.1
										Total of Receptor Risks Across All Media	2.0E-03				Total of Receptor Hazards Across All Media	380

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.5.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Site 43	Ingestion	Aluminum	17600	mg/kg	8.3E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.4E-02	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.02
				Cadmium	10.8	mg/kg	5.1E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.5E-05	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.01
				Chromium VI	28.1	mg/kg	2.4E-05	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	1.2E-05	3.8E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.01
				Trichloroethene (Mutagenic)	2.72	mg/kg	2.3E-06	(mg/kg/day)	9.3E-03	$(mg/kg/day)^{-1}$	2.2E-08	3.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	2.72	mg/kg	1.3E-06	(mg/kg/day)	3.7E-02	$(mg/kg/day)^{-1}$	4.7E-08	3.7E-06	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.007
			Exp. Route Total								1.2E-05					0.06
			Dermal	Aluminum	17600	mg/kg	3.3E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.6E-04	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.0010
				Cadmium	10.8	mg/kg	2.0E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.9E-08	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.002
				Chromium VI	28.1	mg/kg	9.7E-07	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	2E-05	1.5E-06	(mg/kg/day)	7.5E-05	(mg/kg/day)	0.02
				Trichloroethene (Mutagenic)	2.72	mg/kg	2.8E-07	(mg/kg/day)	9.3E-03	$(mg/kg/day)^{-1}$	3E-09	4.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	2.72	mg/kg	1.5E-07	(mg/kg/day)	3.7E-02	$(mg/kg/day)^{-1}$	6E-09	4.5E-07	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.0009
			Exp. Route Total								1.9E-05					0.02
		Exposure Point Total									3.1E-05					0.08
	Exposure Medium Total										3.1E-05					0.08
	Air	Site 43	Inhalation	Aluminum	5.4E-06	mg/m^3	1.8E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.2E-06	(mg/m^3)	5.0E-03	(mg/m^3)	0.001
				Cadmium	3.3E-09	mg/m^3	1.1E-09	(mg/m^3)	1.8E-03	$(ug/m^3)^{-1}$	2.0E-09	3.2E-09	(mg/m^3)	1.0E-05	(mg/m^3)	0.0003
				Chromium VI	8.7E-09	mg/m^3	5.2E-09	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	4.4E-07	8.3E-09	(mg/m^3)	1.0E-04	(mg/m^3)	0.00008
				Trichloroethene (Mutagenic)	8.9E-04	mg/m^3	5.4E-04	(mg/m^3)	1.0E-06	$(ug/m^3)^{-1}$	5.4E-07	8.6E-04	(mg/m^3)	NA	(mg/m^3)	--
				Trichloroethene (Nonmutagenic)	8.9E-04	mg/m^3	2.9E-04	(mg/m^3)	3.1E-06	$(ug/m^3)^{-1}$	9.1E-07	8.6E-04	(mg/m^3)	2.0E-03	(mg/m^3)	0.4
			Exp. Route Total								1.9E-06					0.4
		Exposure Point Total									1.9E-06					0.4
	Exposure Medium Total										1.9E-06					0.4
Medium Total											3.3E-05					0.5
Subsurface Soil	Subsurface Soil	Site 43	Ingestion	Manganese	92.3	mg/kg	4.3E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-04	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.005
				Trichloroethene (Mutagenic)	1.37	mg/kg	1.2E-06	(mg/kg/day)	9.3E-03	$(mg/kg/day)^{-1}$	1.1E-08	1.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	1.37	mg/kg	6.4E-07	(mg/kg/day)	3.7E-02	$(mg/kg/day)^{-1}$	2.4E-08	1.9E-06	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.004
			Exp. Route Total								3.5E-08					0.009
			Dermal	Manganese	92.3	mg/kg	1.7E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.0E-06	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.005
				Trichloroethene (Mutagenic)	1.37	mg/kg	1.4E-07	(mg/kg/day)	9.3E-03	$(mg/kg/day)^{-1}$	1.3E-09	2.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	1.37	mg/kg	7.7E-08	(mg/kg/day)	3.7E-02	$(mg/kg/day)^{-1}$	2.8E-09	2.2E-07	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.0004
			Exp. Route Total								4.1E-09					0.006
		Exposure Point Total									3.9E-08					0.01
	Exposure Medium Total										3.9E-08					0.01
	Air	Site 43	Inhalation	Manganese	2.9E-08	mg/m^3	9.4E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.7E-08	(mg/m^3)	5.0E-05	(mg/m^3)	0.0005
				Trichloroethene (Mutagenic)	4.5E-04	mg/m^3	2.7E-04	(mg/m^3)	1.0E-06	$(ug/m^3)^{-1}$	2.7E-07	4.3E-04	(mg/m^3)	NA	(mg/m^3)	--
				Trichloroethene (Nonmutagenic)	4.5E-04	mg/m^3	1.5E-04	(mg/m^3)	3.1E-06	$(ug/m^3)^{-1}$	4.6E-07	4.3E-04	(mg/m^3)	2.0E-03	(mg/m^3)	0.2
			Exp. Route Total								7.3E-07					0.2
		Exposure Point Total									7.3E-07					0.2
	Exposure Medium Total										7.3E-07					0.2
Medium Total											7.7E-07					0.2
Groundwater	Groundwater	Site 43	Ingestion	1,3-Dinitrobenzene	0.212	ug/L	2.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.8E-06	(mg/kg/day)	1.0E-04	(mg/kg/day)	0.06
				2,6-Dinitrotoluene	0.504	ug/L	4.7E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	7.1E-06	1.4E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.05
				3-Nitrotoluene	0.378	ug/L	3.6E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.0E-05	(mg/kg/day)	1.0E-04	(mg/kg/day)	0.1
				Arsenic	2.8	ug/L	2.6E-05	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	3.9E-05	7.7E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.3
				Barium	138	ug/L	1.3E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.8E-03	(mg/kg/day)	2.0E-01	(mg/kg/day)	0.02
				Beryllium	0.82	ug/L	7.7E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.2E-05	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.01
				Cobalt	48.9	ug/L	4.6E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-03	(mg/kg/day)	3.0E-04	(mg/kg/day)	4.5
				Iron	24800	ug/L	2.3E-01	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.8E-01	(mg/kg/day)	7.0E-01	(mg/kg/day)	1.0
				Manganese	481	ug/L	4.5E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-02	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.5
				Nickel	32.8	ug/L	3.1E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.0E-04	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.04
				Thallium	0.803	ug/L	7.5E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.2E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				1,1-Dichloroethane	4.7	ug/L	4.4E-05	(mg/kg/day)	5.7E-03	$(mg/kg/day)^{-1}$	2.5E-07	1.3E-04	(mg/kg/day)	2.0E-01	(mg/kg/day)	0.0006
				1,1-Dichloroethene	4.4	ug/L	4.1E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-04	(mg/kg/day)	5.0E-02	(mg/kg/day)	0.002
				1,2-Dichloroethane	0.36	ug/L	3.4E-06	(mg/kg/day)	9.1E-02	$(mg/kg/day)^{-1}$	3.1E-07	9.9E-06	(mg/kg/day)	6.0E-03	(mg/kg/day)	0.002
				Cis-1,2-Dichloroethene	58	ug/L	5.4E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.6E-03	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.8
				Trichloroethene (Mutagenic)	2680	ug/L	4.6E-02	(mg/kg/day)	9.3E-03	$(mg/kg/day)^{-1}$	4.3E-04	7.3E-02	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	2680	ug/L	2.5E-02	(mg/kg/day)	3.7E-02	$(mg/kg/day)^{-1}$	9.2E-04	7.3E-02	(mg/kg/day)	5.0E-04	(mg/kg/day)	147
				Vinyl Chloride	8	ug/L	7.5E-05	(mg/kg/day)	7.2E-01	$(mg/kg/day)^{-1}$	5.4E-05	2.2E-04	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.07
			Exp. Route Total								1.5E-03					154

TABLE 7.5.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Groundwater	Site 43	Dermal	1,3-Dinitrobenzene	0.212	ug/L	6.3E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.8E-07	(mg/kg/day)	1.0E-04	(mg/kg/day)	0.002
				2,6-Dinitrotoluene	0.504	ug/L	2.0E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.9E-07	5.7E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.002
				3-Nitrotoluene	0.378	ug/L	5.9E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.7E-06	(mg/kg/day)	1.0E-04	(mg/kg/day)	0.02
				Arsenic	2.8	ug/L	1.4E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.1E-07	4.0E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.001
				Barium	138	ug/L	6.8E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.0E-05	(mg/kg/day)	1.4E-02	(mg/kg/day)	0.001
				Beryllium	0.82	ug/L	4.0E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-07	(mg/kg/day)	1.4E-05	(mg/kg/day)	0.008
				Cobalt	48.9	ug/L	9.6E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.8E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.009
				Iron	24800	ug/L	1.2E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.5E-03	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.005
				Manganese	481	ug/L	2.4E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.9E-05	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.07
				Nickel	32.8	ug/L	3.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.4E-07	(mg/kg/day)	8.0E-04	(mg/kg/day)	0.001
				Thallium	0.803	ug/L	3.9E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				1,1-Dichloroethane	4.7	ug/L	3.5E-06	(mg/kg/day)	5.7E-03	$(mg/kg/day)^{-1}$	2.0E-08	1.0E-05	(mg/kg/day)	2.0E-01	(mg/kg/day)	0.00005
				1,1-Dichloroethene	4.4	ug/L	5.6E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.6E-05	(mg/kg/day)	5.0E-02	(mg/kg/day)	0.0003
				1,2-Dichloroethane	0.36	ug/L	1.7E-07	(mg/kg/day)	9.1E-02	$(mg/kg/day)^{-1}$	1.5E-08	4.8E-07	(mg/kg/day)	6.0E-03	(mg/kg/day)	0.00008
				Cis-1,2-Dichloroethene	58	ug/L	6.8E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.0E-04	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.10
				Trichloroethene (Mutagenic)	2680	ug/L	7.8E-03	(mg/kg/day)	9.3E-03	$(mg/kg/day)^{-1}$	7.2E-05	1.2E-02	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	2680	ug/L	4.2E-03	(mg/kg/day)	3.7E-02	$(mg/kg/day)^{-1}$	1.6E-04	1.2E-02	(mg/kg/day)	5.0E-04	(mg/kg/day)	25
				Vinyl Chloride	8	ug/L	4.0E-06	(mg/kg/day)	7.2E-01	$(mg/kg/day)^{-1}$	2.9E-06	1.2E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.004
			Exp. Route Total								2.3E-04					25
		Exposure Point Total									1.7E-03					179
	Exposure Medium Total										1.7E-03					179
	Air	Site 43	Inhalation	1,3-Dinitrobenzene	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				2,6-Dinitrotoluene	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				3-Nitrotoluene	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Arsenic	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	1.5E-05	(mg/m^3)	--
				Barium	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	5.0E-04	(mg/m^3)	--
				Beryllium	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	2.4E-03	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	2.0E-05	(mg/m^3)	--
				Cobalt	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	6.0E-06	(mg/m^3)	--
				Iron	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	5.0E-05	(mg/m^3)	--
				Nickel	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	2.6E-04	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	9.0E-05	(mg/m^3)	--
				Thallium	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				1,1-Dichloroethane	8.2E-03	mg/m^3	1.1E-04	(mg/m^3)	1.6E-06	$(ug/m^3)^{-1}$	1.8E-07	3.3E-04	(mg/m^3)	NA	(mg/m^3)	--
				1,1-Dichloroethene	8.0E-03	mg/m^3	1.1E-04	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.2E-04	(mg/m^3)	2.0E-01	(mg/m^3)	0.002
				1,2-Dichloroethane	5.5E-04	mg/m^3	7.5E-06	(mg/m^3)	2.6E-05	$(ug/m^3)^{-1}$	2.0E-07	2.2E-05	(mg/m^3)	7.0E-03	(mg/m^3)	0.003
				Cis-1,2-Dichloroethene	1.0E-01	mg/m^3	1.4E-03	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.0E-03	(mg/m^3)	NA	(mg/m^3)	--
				Trichloroethene (Mutagenic)	4.2E+00	mg/m^3	1.0E-01	(mg/m^3)	1.0E-06	$(ug/m^3)^{-1}$	1.0E-04	1.7E-01	(mg/m^3)	NA	(mg/m^3)	--
				Trichloroethene (Nonmutagenic)	4.2E+00	mg/m^3	5.7E-02	(mg/m^3)	3.1E-06	$(ug/m^3)^{-1}$	1.8E-04	1.7E-01	(mg/m^3)	2.0E-03	(mg/m^3)	83
				Vinyl Chloride	1.8E-02	mg/m^3	2.4E-04	(mg/m^3)	4.4E-06	$(ug/m^3)^{-1}$	1.1E-06	7.1E-04	(mg/m^3)	1.0E-01	(mg/m^3)	0.007
			Exp. Route Total								2.8E-04					83
		Exposure Point Total									2.8E-04					83
	Exposure Medium Total										2.8E-04					83
Medium Total											2.0E-03					263

TABLE 7.5.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Surface Water	Site 43	Ingestion	Arsenic	1.21	ug/L	3.4E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	5.1E-08	9.9E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0003
				Cobalt	25.9	ug/L	7.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.1E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.007
				Cis-1,2-Dichloroethene	195	ug/L	5.4E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.6E-05	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.008
				Trichloroethene (Mutagenic)	240	ug/L	1.2E-05	(mg/kg/day)	9.3E-03	$(mg/kg/day)^{-1}$	1.1E-07	2.0E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	240	ug/L	6.7E-06	(mg/kg/day)	3.7E-02	$(mg/kg/day)^{-1}$	2.5E-07	2.0E-05	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.04
				Vinyl Chloride	1.26	ug/L	3.5E-08	(mg/kg/day)	7.2E-01	$(mg/kg/day)^{-1}$	2.5E-08	1.0E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.00003
			Exp. Route Total								4.4E-07					0.05
			Dermal	Arsenic	1.21	ug/L	1.9E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.9E-08	5.6E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0002
				Cobalt	25.9	ug/L	1.6E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.8E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.002
				Cis-1,2-Dichloroethene	195	ug/L	3.9E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-04	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.06
				Trichloroethene (Mutagenic)	240	ug/L	1.0E-04	(mg/kg/day)	9.3E-03	$(mg/kg/day)^{-1}$	9.5E-07	1.6E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	240	ug/L	5.6E-05	(mg/kg/day)	3.7E-02	$(mg/kg/day)^{-1}$	2.0E-06	1.6E-04	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.3
				Vinyl Chloride	1.26	ug/L	1.2E-07	(mg/kg/day)	7.2E-01	$(mg/kg/day)^{-1}$	8.9E-08	3.6E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0001
			Exp. Route Total								3.1E-06					0.4
		Exposure Point Total									3.6E-06					0.4
	Exposure Medium Total										3.6E-06					0.4
Medium Total											3.6E-06					0.4
										Total of Receptor Risks Across All Media	2.0E-03				Total of Receptor Hazards Across All Media	264

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.6.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Site 43 including Background	Ingestion	Aluminum	17600	mg/kg	4.9E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.4E-02	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.03
				Arsenic	7.2	mg/kg	1.2E-07	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	1.8E-07	8.4E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.03
				Cadmium	10.8	mg/kg	3.0E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.1E-05	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.02
				Chromium VI	28.1	mg/kg	7.8E-07	(mg/kg/day)	5.0E-01	(mg/kg/day)$^{-1}$	3.9E-07	5.4E-05	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.01
				Cobalt	12.1	mg/kg	3.3E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.3E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.008
				Iron	22800	mg/kg	6.3E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	4.4E-02	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.06
				Manganese	1200	mg/kg	3.3E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.3E-03	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.10
				Thallium	0.664	mg/kg	1.8E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Vanadium	38.5	mg/kg	1.1E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	7.5E-05	(mg/kg/day)	1.0E-02	(mg/kg/day)	0.007
				Trichloroethene	2.72	mg/kg	7.5E-08	(mg/kg/day)	4.6E-02	(mg/kg/day)$^{-1}$	3.5E-09	5.3E-06	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.01
			Exp. Route Total								5.7E-07					0.3
			Dermal	Aluminum	17600	mg/kg	1.5E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.0E-03	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.001
				Arsenic	7.2	mg/kg	1.8E-08	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	3E-08	1.3E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.004
				Cadmium	10.8	mg/kg	9.0E-10	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	6.3E-08	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.003
				Chromium VI	28.1	mg/kg	2.3E-08	(mg/kg/day)	2.0E+01	(mg/kg/day)$^{-1}$	5E-07	1.6E-06	(mg/kg/day)	1.3E-04	(mg/kg/day)	0.01
				Cobalt	12.1	mg/kg	1.0E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	7.0E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0002
				Iron	22800	mg/kg	1.9E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.3E-03	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.002
				Manganese	1200	mg/kg	1.0E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	7.0E-05	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.07
				Thallium	0.664	mg/kg	5.5E-10	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.9E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Vanadium	38.5	mg/kg	3.2E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.2E-06	(mg/kg/day)	2.6E-04	(mg/kg/day)	0.009
				Trichloroethene	2.72	mg/kg	6.8E-09	(mg/kg/day)	4.6E-02	(mg/kg/day)$^{-1}$	3E-10	4.7E-07	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.0009
			Exp. Route Total								4.9E-07					0.1
		Exposure Point Total									1.1E-06					0.4
	Exposure Medium Total										1.1E-06					0.4
	Air	Site 43 including Background	Inhalation	Aluminum	1.1E-02	mg/m^3	2.1E-05	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	1.5E-03	(mg/m^3)	5.0E-03	(mg/m^3)	0.3
				Arsenic	4.4E-06	mg/m^3	8.7E-09	(mg/m^3)	4.3E-03	(ug/m^3)$^{-1}$	3.7E-08	6.1E-07	(mg/m^3)	1.5E-05	(mg/m^3)	0.04
				Cadmium	6.7E-06	mg/m^3	1.3E-08	(mg/m^3)	1.8E-03	(ug/m^3)$^{-1}$	2.3E-08	9.1E-07	(mg/m^3)	1.0E-05	(mg/m^3)	0.09
				Chromium VI	1.7E-05	mg/m^3	3.4E-08	(mg/m^3)	8.4E-02	(ug/m^3)$^{-1}$	2.9E-06	2.4E-06	(mg/m^3)	3.0E-04	(mg/m^3)	0.008
				Cobalt	7.5E-06	mg/m^3	1.5E-08	(mg/m^3)	9.0E-03	(ug/m^3)$^{-1}$	1.3E-07	1.0E-06	(mg/m^3)	2.0E-05	(mg/m^3)	0.05
				Iron	1.4E-02	mg/m^3	2.8E-05	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	1.9E-03	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	7.4E-04	mg/m^3	1.4E-06	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	1.0E-04	(mg/m^3)	5.0E-05	(mg/m^3)	2.0
				Thallium	4.1E-07	mg/m^3	8.0E-10	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	5.6E-08	(mg/m^3)	NA	(mg/m^3)	--
				Vanadium	2.4E-05	mg/m^3	4.7E-08	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	3.3E-06	(mg/m^3)	NA	(mg/m^3)	--
				Trichloroethene	5.5E-03	mg/m^3	1.1E-05	(mg/m^3)	4.1E-06	(ug/m^3)$^{-1}$	4.4E-08	7.6E-04	(mg/m^3)	2.0E-03	(mg/m^3)	0.4
			Exp. Route Total								3.1E-06					2.9
		Exposure Point Total									3.1E-06					2.9
	Exposure Medium Total										3.1E-06					2.9
Medium Total											4.2E-06					3.3
Subsurface Soil	Subsurface Soil	Site 43 including Background	Ingestion	Aluminum	8950	mg/kg	2.5E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.7E-02	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.02
				Arsenic	2.38	mg/kg	4.0E-08	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	5.9E-08	2.8E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.009
				Chromium VI	15.4	mg/kg	4.3E-07	(mg/kg/day)	5.0E-01	(mg/kg/day)$^{-1}$	2.1E-07	3.0E-05	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.006
				Cobalt	4.9	mg/kg	1.4E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	9.5E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.003
				Iron	13000	mg/kg	3.6E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.5E-02	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.04
				Manganese	92.3	mg/kg	2.6E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.8E-04	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.007
				Trichloroethene	1.37	mg/kg	3.8E-08	(mg/kg/day)	4.6E-02	(mg/kg/day)$^{-1}$	1.7E-09	2.7E-06	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.005
			Exp. Route Total								2.7E-07					0.08
			Dermal	Aluminum	8950	mg/kg	7.4E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	5.2E-04	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.0005
				Arsenic	2.38	mg/kg	5.9E-09	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	8.9E-09	4.1E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.001
				Chromium VI	15.4	mg/kg	1.3E-08	(mg/kg/day)	2.0E+01	(mg/kg/day)$^{-1}$	2.6E-07	9.0E-07	(mg/kg/day)	1.3E-04	(mg/kg/day)	0.007
				Cobalt	4.9	mg/kg	4.1E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.8E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.00009
				Iron	13000	mg/kg	1.1E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	7.6E-04	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.001
				Manganese	92.3	mg/kg	7.7E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	5.4E-06	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.006
				Trichloroethene	1.37	mg/kg	3.4E-09	(mg/kg/day)	4.6E-02	(mg/kg/day)$^{-1}$	1.6E-10	2.4E-07	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.0005
			Exp. Route Total								2.6E-07					0.02
		Exposure Point Total									5.4E-07					0.1
	Exposure Medium Total										5.4E-07					0.1

TABLE 7.6.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Subsurface Soil	Air	Site 43 including Background	Inhalation	Aluminum	5.5E-03	mg/m^3	1.1E-05	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	7.6E-04	(mg/m^3)	5.0E-03	(mg/m^3)	0.2
				Arsenic	1.5E-06	mg/m^3	2.9E-09	(mg/m^3)	4.3E-03	(ug/m^3)$^{-1}$	1.2E-08	2.0E-07	(mg/m^3)	1.5E-05	(mg/m^3)	0.01
				Chromium VI	9.5E-06	mg/m^3	1.9E-08	(mg/m^3)	8.4E-02	(ug/m^3)$^{-1}$	1.6E-06	1.3E-06	(mg/m^3)	3.0E-04	(mg/m^3)	0.004
				Cobalt	3.0E-06	mg/m^3	5.9E-09	(mg/m^3)	9.0E-03	(ug/m^3)$^{-1}$	5.3E-08	4.1E-07	(mg/m^3)	2.0E-05	(mg/m^3)	0.02
				Iron	8.0E-03	mg/m^3	1.6E-05	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	1.1E-03	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	5.7E-05	mg/m^3	1.1E-07	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	7.8E-06	(mg/m^3)	5.0E-05	(mg/m^3)	0.2
				Trichloroethene	2.8E-03	mg/m^3	5.5E-06	(mg/m^3)	4.1E-06	(ug/m^3)$^{-1}$	2.2E-08	3.8E-04	(mg/m^3)	2.0E-03	(mg/m^3)	0.2
			Exp. Route Total								1.7E-06					0.5
		Exposure Point Total									1.7E-06					0.5
	Exposure Medium Total										1.7E-06					0.5
Medium Total											2.2E-06					0.6
Groundwater	Groundwater	Site 43 including Background	Ingestion	1,3-Dinitrobenzene	0.212	ug/L	1.1E-10	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	7.5E-09	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.00001
				2,6-Dinitrotoluene	0.504	ug/L	2.5E-10	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	3.8E-10	1.8E-08	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.000004
				3-Nitrotoluene	0.378	ug/L	1.9E-10	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.3E-08	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.00001
				Arsenic	2.8	ug/L	1.4E-09	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	2.1E-09	9.9E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0003
				Barium	138	ug/L	6.9E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	4.9E-06	(mg/kg/day)	2.0E-01	(mg/kg/day)	0.00002
				Beryllium	0.82	ug/L	4.1E-10	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.9E-08	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.000006
				Cadmium	0.422	ug/L	2.1E-10	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.5E-08	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.00001
				Chromium VI	1.5	ug/L	7.5E-10	(mg/kg/day)	5.0E-01	(mg/kg/day)$^{-1}$	3.8E-10	5.3E-08	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.00001
				Cobalt	48.9	ug/L	2.5E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.7E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0006
				Iron	24800	ug/L	1.2E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	8.7E-04	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.001
				Manganese	481	ug/L	2.4E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.7E-05	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.0007
				Nickel	32.8	ug/L	1.7E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.2E-06	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.00006
				Thallium	0.803	ug/L	4.0E-10	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.8E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Vanadium	2.5	ug/L	1.3E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	8.8E-08	(mg/kg/day)	1.0E-02	(mg/kg/day)	0.000009
				1,1-Dichloroethane	4.7	ug/L	2.4E-09	(mg/kg/day)	5.7E-03	(mg/kg/day)$^{-1}$	1.3E-11	1.7E-07	(mg/kg/day)	2.0E+00	(mg/kg/day)	8.3E-8
				1,1-Dichloroethene	4.4	ug/L	2.2E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.5E-07	(mg/kg/day)	9.0E-03	(mg/kg/day)	0.00002
				1,2-Dichloroethane	0.36	ug/L	1.8E-10	(mg/kg/day)	9.1E-02	(mg/kg/day)$^{-1}$	1.6E-11	1.3E-08	(mg/kg/day)	2.0E-02	(mg/kg/day)	6.3E-7
				Cis-1,2-Dichloroethene	58	ug/L	2.9E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.0E-06	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0001
				Trichloroethene	2680	ug/L	1.3E-06	(mg/kg/day)	4.6E-02	(mg/kg/day)$^{-1}$	6.2E-08	9.4E-05	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.2
				Vinyl Chloride	8	ug/L	4.0E-09	(mg/kg/day)	7.2E-01	(mg/kg/day)$^{-1}$	2.9E-09	2.8E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0009
			Exp. Route Total								6.8E-08					0.2
			Dermal	1,3-Dinitrobenzene	0.212	ug/L	3.6E-10	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.5E-08	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.00005
				2,6-Dinitrotoluene	0.504	ug/L	1.1E-09	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	1.6E-09	7.5E-08	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.00002
				3-Nitrotoluene	0.378	ug/L	3.6E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.5E-07	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.0003
				Arsenic	2.8	ug/L	1.9E-09	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	2.8E-09	1.3E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0004
				Barium	138	ug/L	9.2E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	6.4E-06	(mg/kg/day)	1.4E-02	(mg/kg/day)	0.0005
				Beryllium	0.82	ug/L	5.4E-10	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.8E-08	(mg/kg/day)	3.5E-05	(mg/kg/day)	0.001
				Cadmium	0.422	ug/L	2.8E-10	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.0E-08	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.0008
				Chromium VI	1.5	ug/L	2.0E-09	(mg/kg/day)	2.0E+01	(mg/kg/day)$^{-1}$	4.0E-08	1.4E-07	(mg/kg/day)	1.3E-04	(mg/kg/day)	0.001
				Cobalt	48.9	ug/L	1.3E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	9.1E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0003
				Iron	24800	ug/L	1.6E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.2E-03	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.002
				Manganese	481	ug/L	3.2E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.2E-05	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.02
				Nickel	32.8	ug/L	4.4E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.1E-07	(mg/kg/day)	8.0E-04	(mg/kg/day)	0.0004
				Thallium	0.803	ug/L	5.3E-10	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.7E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Vanadium	2.5	ug/L	1.7E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.2E-07	(mg/kg/day)	2.6E-04	(mg/kg/day)	0.0004
				1,1-Dichloroethane	4.7	ug/L	2.5E-08	(mg/kg/day)	5.7E-03	(mg/kg/day)$^{-1}$	1.4E-10	1.7E-06	(mg/kg/day)	2.0E+00	(mg/kg/day)	8.6E-7
				1,1-Dichloroethene	4.4	ug/L	3.9E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.7E-06	(mg/kg/day)	9.0E-03	(mg/kg/day)	0.0003
				1,2-Dichloroethane	0.36	ug/L	1.2E-09	(mg/kg/day)	9.1E-02	(mg/kg/day)$^{-1}$	1.1E-10	8.3E-08	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.000004
				Cis-1,2-Dichloroethene	58	ug/L	4.8E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.4E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.002
				Trichloroethene	2680	ug/L	2.6E-05	(mg/kg/day)	4.6E-02	(mg/kg/day)$^{-1}$	1.2E-06	1.8E-03	(mg/kg/day)	5.0E-04	(mg/kg/day)	3.6
				Vinyl Chloride	8	ug/L	3.3E-08	(mg/kg/day)	7.2E-01	(mg/kg/day)$^{-1}$	2.4E-08	2.3E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.008
			Exp. Route Total								1.3E-06					3.7
		Exposure Point Total									1.3E-06					3.9
	Exposure Medium Total										1.3E-06					3.9

TABLE 7.6.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Air	Site 43 including Background	Inhalation	1,3-Dinitrobenzene	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				2,6-Dinitrotoluene	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				3-Nitrotoluene	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Arsenic	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	4.3E-03	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	1.5E-05	(mg/m^3)	--
				Barium	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	5.0E-03	(mg/m^3)	--
				Beryllium	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	2.4E-03	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	2.0E-05	(mg/m^3)	--
				Cadmium	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	1.8E-03	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	1.0E-05	(mg/m^3)	--
				Chromium VI	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	8.4E-02	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	3.0E-04	(mg/m^3)	--
				Cobalt	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	9.0E-03	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	2.0E-05	(mg/m^3)	--
				Iron	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	5.0E-05	(mg/m^3)	--
				Nickel	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	2.6E-04	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	2.0E-04	(mg/m^3)	--
				Thallium	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Vanadium	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				1,1-Dichloroethane	1.7E-04	mg/m^3	1.0E-07	(mg/m^3)	1.6E-06	(ug/m^3)$^{-1}$	1.6E-10	7.1E-06	(mg/m^3)	NA	(mg/m^3)	--
				1,1-Dichloroethene	1.7E-04	mg/m^3	9.7E-08	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	6.8E-06	(mg/m^3)	7.9E-02	(mg/m^3)	0.00009
				1,2-Dichloroethane	1.3E-05	mg/m^3	7.5E-09	(mg/m^3)	2.6E-05	(ug/m^3)$^{-1}$	2.0E-10	5.3E-07	(mg/m^3)	7.0E-02	(mg/m^3)	0.000008
				Cis-1,2-Dichloroethene	2.2E-03	mg/m^3	1.3E-06	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	8.9E-05	(mg/m^3)	NA	(mg/m^3)	--
				Trichloroethene	8.6E-02	mg/m^3	5.1E-05	(mg/m^3)	4.1E-06	(ug/m^3)$^{-1}$	2.1E-07	3.5E-03	(mg/m^3)	2.0E-03	(mg/m^3)	1.8
				Vinyl Chloride	3.7E-04	mg/m^3	2.2E-07	(mg/m^3)	4.4E-06	(ug/m^3)$^{-1}$	9.7E-10	1.5E-05	(mg/m^3)	7.7E-02	(mg/m^3)	0.0002
			Exp. Route Total								2.1E-07					1.8
		Exposure Point Total									2.1E-07					1.8
	Exposure Medium Total										2.1E-07					1.8
Medium Total											1.5E-06					5.7
Surface Water	Surface Water	Site 43	Ingestion	Arsenic	1.21	ug/L	1.4E-09	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	2.1E-09	9.9E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0003
				Cobalt	25.9	ug/L	3.0E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.1E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0007
				Cis-1,2-Dichloroethene	195	ug/L	2.3E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.6E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0008
				Trichloroethene	240	ug/L	2.8E-07	(mg/kg/day)	4.6E-02	(mg/kg/day)$^{-1}$	1.3E-08	2.0E-05	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.04
				Vinyl Chloride	1.26	ug/L	1.5E-09	(mg/kg/day)	7.2E-01	(mg/kg/day)$^{-1}$	1.1E-09	1.0E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0003
			Exp. Route Total								1.6E-08					0.04
			Dermal	Arsenic	1.21	ug/L	4.6E-10	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	7.0E-10	3.3E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0001
				Cobalt	25.9	ug/L	4.0E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.8E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.00009
				Cis-1,2-Dichloroethene	195	ug/L	9.4E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	6.6E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.003
				Trichloroethene	240	ug/L	1.3E-06	(mg/kg/day)	4.6E-02	(mg/kg/day)$^{-1}$	6.2E-08	9.4E-05	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.2
				Vinyl Chloride	1.26	ug/L	3.0E-09	(mg/kg/day)	7.2E-01	(mg/kg/day)$^{-1}$	2.2E-09	2.1E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0007
			Exp. Route Total								6.5E-08					0.2
		Exposure Point Total									8.1E-08					0.2
	Exposure Medium Total										8.1E-08					0.2
Medium Total											8.1E-08					0.2
										Total of Receptor Risks Across All Media	8.0E-06				Total of Receptor Hazards Across All Media	9.8

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.7.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Maintenance Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Site 43	Ingestion	Aluminum	17600	mg/kg	5.9E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.7E-03	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.002
				Arsenic	7.2	mg/kg	1.4E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.2E-07	4.1E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.001
				Cadmium	10.8	mg/kg	3.6E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.0E-06	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.001
				Chromium VI	28.1	mg/kg	9.4E-07	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	4.7E-07	2.6E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0009
				Cobalt	12.1	mg/kg	4.1E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.004
				Iron	22800	mg/kg	7.6E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.1E-03	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.003
				Manganese	1200	mg/kg	4.0E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-04	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.005
				Thallium	0.664	mg/kg	2.2E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.2E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Vanadium	38.5	mg/kg	1.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.6E-06	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.0007
				Trichloroethene	2.72	mg/kg	9.1E-08	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	4.2E-09	2.6E-07	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.0005
			Exp. Route Total								6.9E-07					0.02
			Dermal	Aluminum	17600	mg/kg	3.9E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-04	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.0001
				Arsenic	7.2	mg/kg	4.8E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	7E-08	1.3E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0004
				Cadmium	10.8	mg/kg	2.4E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.7E-09	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.0003
				Chromium VI	28.1	mg/kg	6.2E-08	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	1E-06	1.7E-07	(mg/kg/day)	7.5E-05	(mg/kg/day)	0.002
				Cobalt	12.1	mg/kg	2.7E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.5E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0003
				Iron	22800	mg/kg	5.0E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-04	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.0002
				Manganese	1200	mg/kg	2.7E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.4E-06	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.008
				Thallium	0.664	mg/kg	1.5E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.1E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Vanadium	38.5	mg/kg	8.5E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.4E-07	(mg/kg/day)	1.3E-04	(mg/kg/day)	0.002
				Trichloroethene	2.72	mg/kg	1.8E-08	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	8E-10	5.1E-08	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.0001
			Exp. Route Total								1.3E-06					0.01
		Exposure Point Total									2.0E-06					0.03
	Exposure Medium Total										2.0E-06					0.03
	Air	Site 43	Inhalation	Aluminum	5.4E-06	mg/m^3	4.3E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.2E-07	(mg/m^3)	5.0E-03	(mg/m^3)	0.00002
				Arsenic	2.2E-09	mg/m^3	1.7E-11	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	7.5E-11	4.9E-11	(mg/m^3)	1.5E-05	(mg/m^3)	0.000003
				Cadmium	3.3E-09	mg/m^3	2.6E-11	(mg/m^3)	1.8E-03	$(ug/m^3)^{-1}$	4.7E-11	7.3E-11	(mg/m^3)	1.0E-05	(mg/m^3)	0.000007
				Chromium VI	8.7E-09	mg/m^3	6.8E-11	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	5.7E-09	1.9E-10	(mg/m^3)	1.0E-04	(mg/m^3)	0.000002
				Cobalt	3.7E-09	mg/m^3	2.9E-11	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	2.6E-10	8.2E-11	(mg/m^3)	6.0E-06	(mg/m^3)	0.00001
				Iron	7.1E-06	mg/m^3	5.5E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.5E-07	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	3.7E-07	mg/m^3	2.9E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	8.1E-09	(mg/m^3)	5.0E-05	(mg/m^3)	0.0002
				Thallium	2.1E-10	mg/m^3	1.6E-12	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.5E-12	(mg/m^3)	NA	(mg/m^3)	--
				Vanadium	1.2E-08	mg/m^3	9.3E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.6E-10	(mg/m^3)	1.0E-04	(mg/m^3)	0.000003
				Trichloroethene	8.9E-04	mg/m^3	7.0E-06	(mg/m^3)	4.1E-06	$(ug/m^3)^{-1}$	2.9E-08	2.0E-05	(mg/m^3)	2.0E-03	(mg/m^3)	0.010
			Exp. Route Total								3.5E-08					0.01
		Exposure Point Total									3.5E-08					0.01
	Exposure Medium Total										3.5E-08					0.01
Medium Total											2.0E-06					0.04

TABLE 7.7.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Maintenance Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Subsurface Soil	Subsurface Soil	Site 43	Ingestion	Aluminum	8950	mg/kg	3.0E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.4E-04	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.0008
				Arsenic	2.38	mg/kg	4.8E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	7.2E-08	1.3E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0004
				Chromium VI	15.4	mg/kg	5.2E-07	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	2.6E-07	1.4E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0005
				Cobalt	4.9	mg/kg	1.6E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.6E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.002
				Iron	13000	mg/kg	4.4E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-03	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.002
				Manganese	92.3	mg/kg	3.1E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.7E-06	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.0004
				Trichloroethene	1.37	mg/kg	4.6E-08	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	2.1E-09	1.3E-07	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.0003
			Exp. Route Total								3.3E-07					0.006
			Dermal	Aluminum	8950	mg/kg	2.0E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.5E-05	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.00006
				Arsenic	2.38	mg/kg	1.6E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.4E-08	4.4E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0001
				Chromium VI	15.4	mg/kg	3.4E-08	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	6.8E-07	9.5E-08	(mg/kg/day)	7.5E-05	(mg/kg/day)	0.001
				Cobalt	4.9	mg/kg	1.1E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.0E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0001
				Iron	13000	mg/kg	2.9E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.1E-05	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.0001
				Manganese	92.3	mg/kg	2.0E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.7E-07	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.0006
				Trichloroethene	1.37	mg/kg	9.1E-09	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	4.2E-10	2.5E-08	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.00005
			Exp. Route Total								7.1E-07					0.002
		Exposure Point Total									1.0E-06					0.008
	Exposure Medium Total										1.0E-06					0.008
	Air	Site 43	Inhalation	Aluminum	2.8E-06	mg/m^3	2.2E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	6.1E-08	(mg/m^3)	5.0E-03	(mg/m^3)	0.00001
				Arsenic	7.4E-10	mg/m^3	5.8E-12	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	2.5E-11	1.6E-11	(mg/m^3)	1.5E-05	(mg/m^3)	0.000001
				Chromium VI	4.8E-09	mg/m^3	3.7E-11	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	3.1E-09	1.0E-10	(mg/m^3)	1.0E-04	(mg/m^3)	0.000001
				Cobalt	1.5E-09	mg/m^3	1.2E-11	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	1.1E-10	3.3E-11	(mg/m^3)	6.0E-06	(mg/m^3)	0.000006
				Iron	4.0E-06	mg/m^3	3.2E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	8.8E-08	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	2.9E-08	mg/m^3	2.2E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	6.3E-10	(mg/m^3)	5.0E-05	(mg/m^3)	0.00001
				Trichloroethene	4.5E-04	mg/m^3	3.5E-06	(mg/m^3)	4.1E-06	$(ug/m^3)^{-1}$	1.4E-08	9.9E-06	(mg/m^3)	2.0E-03	(mg/m^3)	0.005
			Exp. Route Total								1.8E-08					0.005
		Exposure Point Total									1.8E-08					0.005
	Exposure Medium Total										1.8E-08					0.005
Medium Total											1.1E-06					0.01
Surface Water	Surface Water	Site 43	Ingestion	Arsenic	1.21	ug/L	1.6E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.4E-08	4.5E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0002
				Cobalt	25.9	ug/L	3.5E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.7E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.003
				Cis-1,2-Dichloroethene	195	ug/L	2.6E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.3E-06	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.004
				Trichloroethene	240	ug/L	3.2E-06	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	1.5E-07	9.0E-06	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.02
				Vinyl Chloride	1.26	ug/L	1.7E-08	(mg/kg/day)	7.2E-01	$(mg/kg/day)^{-1}$	1.2E-08	4.7E-08	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.00002
			Exp. Route Total								1.8E-07					0.03
			Dermal	Arsenic	1.21	ug/L	5.4E-09	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	8.0E-09	1.5E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.00005
				Cobalt	25.9	ug/L	4.6E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0004
				Cis-1,2-Dichloroethene	195	ug/L	1.1E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.0E-05	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.02
				Trichloroethene	240	ug/L	1.6E-05	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	7.1E-07	4.4E-05	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.09
				Vinyl Chloride	1.26	ug/L	3.5E-08	(mg/kg/day)	7.2E-01	$(mg/kg/day)^{-1}$	2.5E-08	9.7E-08	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.00003
			Exp. Route Total								7.5E-07					0.1
		Exposure Point Total									9.3E-07					0.1
	Exposure Medium Total										9.3E-07					0.1
Medium Total											9.3E-07					0.1
										Total of Receptor Risks Across All Media	4.0E-06				Total of Receptor Hazards Across All Media	0.2

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.8.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Site 43	Ingestion	Aluminum	17600	mg/kg	6.2E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.7E-02	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.02
				Arsenic	7.2	mg/kg	1.5E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.3E-06	4.2E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.01
				Cadmium	10.8	mg/kg	3.8E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-05	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.01
				Chromium VI	28.1	mg/kg	9.8E-06	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	4.9E-06	2.7E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.009
				Cobalt	12.1	mg/kg	4.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.04
				Iron	22800	mg/kg	8.0E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.2E-02	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.03
				Manganese	1200	mg/kg	4.2E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-03	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.05
				Thallium	0.664	mg/kg	2.3E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Vanadium	38.5	mg/kg	1.3E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.8E-05	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.007
				Trichloroethene	2.72	mg/kg	9.5E-07	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	4.4E-08	2.7E-06	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.005
			Exp. Route Total								7.2E-06					0.2
			Dermal	Aluminum	17600	mg/kg	4.1E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-03	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.001
				Arsenic	7.2	mg/kg	5.0E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	7E-07	1.4E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.005
				Cadmium	10.8	mg/kg	2.5E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.0E-08	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.003
				Chromium VI	28.1	mg/kg	6.5E-07	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	1E-05	1.8E-06	(mg/kg/day)	7.5E-05	(mg/kg/day)	0.02
				Cobalt	12.1	mg/kg	2.8E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.8E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.003
				Iron	22800	mg/kg	5.3E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.5E-03	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.002
				Manganese	1200	mg/kg	2.8E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.7E-05	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.08
				Thallium	0.664	mg/kg	1.5E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.3E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Vanadium	38.5	mg/kg	8.9E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.5E-06	(mg/kg/day)	1.3E-04	(mg/kg/day)	0.02
				Trichloroethene	2.72	mg/kg	1.9E-07	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	9E-09	5.3E-07	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.001
			Exp. Route Total								1.4E-05					0.1
		Exposure Point Total									2.1E-05					0.3
	Exposure Medium Total										2.1E-05					0.3
	Air	Site 43	Inhalation	Aluminum	5.4E-06	mg/m^3	4.4E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.2E-06	(mg/m^3)	5.0E-03	(mg/m^3)	0.0002
				Arsenic	2.2E-09	mg/m^3	1.8E-10	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	7.8E-10	5.1E-10	(mg/m^3)	1.5E-05	(mg/m^3)	0.00003
				Cadmium	3.3E-09	mg/m^3	2.7E-10	(mg/m^3)	1.8E-03	$(ug/m^3)^{-1}$	4.9E-10	7.6E-10	(mg/m^3)	1.0E-05	(mg/m^3)	0.00008
				Chromium VI	8.7E-09	mg/m^3	7.1E-10	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	6.0E-08	2.0E-09	(mg/m^3)	1.0E-04	(mg/m^3)	0.00002
				Cobalt	3.7E-09	mg/m^3	3.1E-10	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	2.7E-09	8.6E-10	(mg/m^3)	6.0E-06	(mg/m^3)	0.0001
				Iron	7.1E-06	mg/m^3	5.8E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.6E-06	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	3.7E-07	mg/m^3	3.0E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	8.5E-08	(mg/m^3)	5.0E-05	(mg/m^3)	0.002
				Thallium	2.1E-10	mg/m^3	1.7E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.7E-11	(mg/m^3)	NA	(mg/m^3)	--
				Vanadium	1.2E-08	mg/m^3	9.7E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.7E-09	(mg/m^3)	1.0E-04	(mg/m^3)	0.00003
				Trichloroethene	8.9E-04	mg/m^3	7.3E-05	(mg/m^3)	4.1E-06	$(ug/m^3)^{-1}$	3.0E-07	2.0E-04	(mg/m^3)	2.0E-03	(mg/m^3)	0.1
			Exp. Route Total								3.6E-07					0.1
		Exposure Point Total									3.6E-07					0.1
	Exposure Medium Total										3.6E-07					0.1
Medium Total											2.1E-05					0.4

TABLE 7.8.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Subsurface Soil	Subsurface Soil	Site 43	Ingestion	Aluminum	8950	mg/kg	3.1E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.8E-03	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.009
				Arsenic	2.38	mg/kg	5.0E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	7.5E-07	1.4E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.005
				Chromium VI	15.4	mg/kg	5.4E-06	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	2.7E-06	1.5E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.005
				Cobalt	4.9	mg/kg	1.7E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.8E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.02
				Iron	13000	mg/kg	4.5E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-02	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.02
				Manganese	92.3	mg/kg	3.2E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.0E-05	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.004
				Trichloroethene	1.37	mg/kg	4.8E-07	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	2.2E-08	1.3E-06	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.003
			Exp. Route Total								3.5E-06					0.06
			Dermal	Aluminum	8950	mg/kg	2.1E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.8E-04	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.0006
				Arsenic	2.38	mg/kg	1.6E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.5E-07	4.6E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.002
				Chromium VI	15.4	mg/kg	3.6E-07	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	7.1E-06	9.9E-07	(mg/kg/day)	7.5E-05	(mg/kg/day)	0.01
				Cobalt	4.9	mg/kg	1.1E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.2E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.001
				Iron	13000	mg/kg	3.0E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.4E-04	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.001
				Manganese	92.3	mg/kg	2.1E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.0E-06	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.006
				Trichloroethene	1.37	mg/kg	9.5E-08	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	4.4E-09	2.7E-07	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.0005
			Exp. Route Total								7.4E-06					0.02
		Exposure Point Total									1.1E-05					0.08
	Exposure Medium Total										1.1E-05					0.08
	Air	Site 43	Inhalation	Aluminum	2.8E-06	mg/m^3	2.3E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	6.3E-07	(mg/m^3)	5.0E-03	(mg/m^3)	0.0001
				Arsenic	7.4E-10	mg/m^3	6.0E-11	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	2.6E-10	1.7E-10	(mg/m^3)	1.5E-05	(mg/m^3)	0.00001
				Chromium VI	4.8E-09	mg/m^3	3.9E-10	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	3.3E-08	1.1E-09	(mg/m^3)	1.0E-04	(mg/m^3)	0.00001
				Cobalt	1.5E-09	mg/m^3	1.2E-10	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	1.1E-09	3.5E-10	(mg/m^3)	6.0E-06	(mg/m^3)	0.00006
				Iron	4.0E-06	mg/m^3	3.3E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	9.2E-07	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	2.9E-08	mg/m^3	2.3E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	6.5E-09	(mg/m^3)	5.0E-05	(mg/m^3)	0.0001
				Trichloroethene	4.5E-04	mg/m^3	3.7E-05	(mg/m^3)	4.1E-06	$(ug/m^3)^{-1}$	1.5E-07	1.0E-04	(mg/m^3)	2.0E-03	(mg/m^3)	0.05
			Exp. Route Total								1.8E-07					0.05
		Exposure Point Total									1.8E-07					0.05
	Exposure Medium Total										1.8E-07					0.05
Medium Total											1.1E-05					0.1

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.9.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Site 43	Ingestion	Aluminum	17600	mg/kg	1.9E-02	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.3E-01	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.2
				Arsenic	7.2	mg/kg	4.7E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	7.1E-06	5.5E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.2
				Cadmium	10.8	mg/kg	1.2E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-04	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.1
				Chromium VI	28.1	mg/kg	1.6E-04	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	8.2E-05	3.6E-04	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.1
				Cobalt	12.1	mg/kg	1.3E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.5E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.5
				Iron	22800	mg/kg	2.5E-02	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.9E-01	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.4
				Manganese	1200	mg/kg	1.3E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.5E-02	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.6
				Thallium	0.664	mg/kg	7.3E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Vanadium	38.5	mg/kg	4.2E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.9E-04	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.10
				Trichloroethene (Mutagenic)	2.72	mg/kg	1.6E-05	(mg/kg/day)	9.3E-03	$(mg/kg/day)^{-1}$	1.5E-07	3.5E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	2.72	mg/kg	3.0E-06	(mg/kg/day)	3.7E-02	$(mg/kg/day)^{-1}$	1.1E-07	3.5E-05	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.07
			Exp. Route Total								8.9E-05					2.4
			Dermal	Aluminum	17600	mg/kg	5.4E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.3E-03	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.006
				Arsenic	7.2	mg/kg	6.6E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1E-06	7.7E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.03
				Cadmium	10.8	mg/kg	3.3E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.9E-07	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.02
				Chromium VI	28.1	mg/kg	4.6E-06	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	9E-05	1.0E-05	(mg/kg/day)	7.5E-05	(mg/kg/day)	0.1
				Cobalt	12.1	mg/kg	3.7E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.3E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.01
				Iron	22800	mg/kg	7.0E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.2E-03	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.01
				Manganese	1200	mg/kg	3.7E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.3E-04	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.4
				Thallium	0.664	mg/kg	2.0E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Vanadium	38.5	mg/kg	1.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-05	(mg/kg/day)	1.3E-04	(mg/kg/day)	0.1
				Trichloroethene (Mutagenic)	2.72	mg/kg	1.3E-06	(mg/kg/day)	9.3E-03	$(mg/kg/day)^{-1}$	1E-08	2.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	2.72	mg/kg	2.5E-07	(mg/kg/day)	3.7E-02	$(mg/kg/day)^{-1}$	9E-09	2.9E-06	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.006
			Exp. Route Total								9.3E-05					0.8
		Exposure Point Total									1.8E-04					3.2
	Exposure Medium Total										1.8E-04					3.2
	Air	Site 43	Inhalation	Aluminum	5.4E-06	mg/m^3	4.5E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.2E-06	(mg/m^3)	5.0E-03	(mg/m^3)	0.001
				Arsenic	2.2E-09	mg/m^3	1.8E-10	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	7.9E-10	2.1E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.0001
				Cadmium	3.3E-09	mg/m^3	2.7E-10	(mg/m^3)	1.8E-03	$(ug/m^3)^{-1}$	4.9E-10	3.2E-09	(mg/m^3)	1.0E-05	(mg/m^3)	0.0003
				Chromium VI	8.7E-09	mg/m^3	3.8E-09	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	3.2E-07	8.3E-09	(mg/m^3)	1.0E-04	(mg/m^3)	0.00008
				Cobalt	3.7E-09	mg/m^3	3.1E-10	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	2.8E-09	3.6E-09	(mg/m^3)	6.0E-06	(mg/m^3)	0.0006
				Iron	7.1E-06	mg/m^3	5.8E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	6.8E-06	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	3.7E-07	mg/m^3	3.1E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.6E-07	(mg/m^3)	5.0E-05	(mg/m^3)	0.007
				Thallium	2.1E-10	mg/m^3	1.7E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.0E-10	(mg/m^3)	NA	(mg/m^3)	--
				Vanadium	1.2E-08	mg/m^3	9.8E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.1E-08	(mg/m^3)	1.0E-04	(mg/m^3)	0.0001
				Trichloroethene (Mutagenic)	8.9E-04	mg/m^3	3.9E-04	(mg/m^3)	1.0E-06	$(ug/m^3)^{-1}$	3.9E-07	8.6E-04	(mg/m^3)	NA	(mg/m^3)	--
				Trichloroethene (Nonmutagenic)	8.9E-04	mg/m^3	7.4E-05	(mg/m^3)	3.1E-06	$(ug/m^3)^{-1}$	2.3E-07	8.6E-04	(mg/m^3)	2.0E-03	(mg/m^3)	0.4
			Exp. Route Total								9.4E-07					0.4
		Exposure Point Total									9.4E-07					0.4
	Exposure Medium Total										9.4E-07					0.4
Medium Total											1.8E-04					3.6
Subsurface Soil	Subsurface Soil	Site 43	Ingestion	Aluminum	8950	mg/kg	9.8E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-01	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.1
				Arsenic	2.38	mg/kg	1.6E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.3E-06	1.8E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.06
				Chromium VI	15.4	mg/kg	9.0E-05	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	4.5E-05	2.0E-04	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.07
				Cobalt	4.9	mg/kg	5.4E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.3E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.2
				Iron	13000	mg/kg	1.4E-02	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.7E-01	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.2
				Manganese	92.3	mg/kg	1.0E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-03	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.05
				Trichloroethene (Mutagenic)	1.37	mg/kg	8.0E-06	(mg/kg/day)	9.3E-03	$(mg/kg/day)^{-1}$	7.4E-08	1.8E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	1.37	mg/kg	1.5E-06	(mg/kg/day)	3.7E-02	$(mg/kg/day)^{-1}$	5.5E-08	1.8E-05	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.04
			Exp. Route Total								4.7E-05					0.8
			Dermal	Aluminum	8950	mg/kg	2.7E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.2E-03	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.003
				Arsenic	2.38	mg/kg	2.2E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	3.3E-07	2.6E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.009
				Chromium VI	15.4	mg/kg	2.5E-06	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	5.0E-05	5.5E-06	(mg/kg/day)	7.5E-05	(mg/kg/day)	0.07
				Cobalt	4.9	mg/kg	1.5E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.8E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.006
				Iron	13000	mg/kg	4.0E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.7E-03	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.007
				Manganese	92.3	mg/kg	2.8E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.3E-05	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.03
				Trichloroethene (Mutagenic)	1.37	mg/kg	6.7E-07	(mg/kg/day)	9.3E-03	$(mg/kg/day)^{-1}$	6.3E-09	1.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	1.37	mg/kg	1.3E-07	(mg/kg/day)	3.7E-02	$(mg/kg/day)^{-1}$	4.6E-09	1.5E-06	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.003
			Exp. Route Total								5.1E-05					0.1
		Exposure Point Total									9.8E-05					0.9
	Exposure Medium Total										9.8E-05					0.9

TABLE 7.9.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Subsurface Soil	Air	Site 43	Inhalation	Aluminum	2.8E-06	mg/m^3	2.3E-07	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	2.7E-06	(mg/m^3)	5.0E-03	(mg/m^3)	0.0005
				Arsenic	7.4E-10	mg/m^3	6.1E-11	(mg/m^3)	4.3E-03	(ug/m^3)$^{-1}$	2.6E-10	7.1E-10	(mg/m^3)	1.5E-05	(mg/m^3)	0.00005
				Chromium VI	4.8E-09	mg/m^3	2.1E-09	(mg/m^3)	8.4E-02	(ug/m^3)$^{-1}$	1.8E-07	4.6E-09	(mg/m^3)	1.0E-04	(mg/m^3)	0.00005
				Cobalt	1.5E-09	mg/m^3	1.2E-10	(mg/m^3)	9.0E-03	(ug/m^3)$^{-1}$	1.1E-09	1.5E-09	(mg/m^3)	6.0E-06	(mg/m^3)	0.0002
				Iron	4.0E-06	mg/m^3	3.3E-07	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	3.9E-06	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	2.9E-08	mg/m^3	2.3E-09	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	2.7E-08	(mg/m^3)	5.0E-05	(mg/m^3)	0.0005
				Trichloroethene (Mutagenic)	4.5E-04	mg/m^3	2.0E-04	(mg/m^3)	1.0E-06	(ug/m^3)$^{-1}$	2.0E-07	4.3E-04	(mg/m^3)	NA	(mg/m^3)	--
				Trichloroethene (Nonmutagenic)	4.5E-04	mg/m^3	3.7E-05	(mg/m^3)	3.1E-06	(ug/m^3)$^{-1}$	1.1E-07	4.3E-04	(mg/m^3)	2.0E-03	(mg/m^3)	0.2
			Exp. Route Total								4.9E-07					0.2
		Exposure Point Total									4.9E-07					0.2
	Exposure Medium Total										4.9E-07					0.2
Medium Total											9.9E-05					1.1
Groundwater	Groundwater	Site 43	Ingestion	1,3-Dinitrobenzene	0.212	ug/L	1.2E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.4E-05	(mg/kg/day)	1.0E-04	(mg/kg/day)	0.1
				2,6-Dinitrotoluene	0.504	ug/L	2.8E-06	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	4.1E-06	3.2E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.1
				3-Nitrotoluene	0.378	ug/L	2.1E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.4E-05	(mg/kg/day)	1.0E-04	(mg/kg/day)	0.2
				Arsenic	2.8	ug/L	1.5E-05	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	2.3E-05	1.8E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.6
				Barium	138	ug/L	7.6E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	8.8E-03	(mg/kg/day)	2.0E-01	(mg/kg/day)	0.04
				Beryllium	0.82	ug/L	4.5E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	5.2E-05	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.03
				Cadmium	0.422	ug/L	2.3E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.7E-05	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.03
				Chromium VI	1.5	ug/L	4.4E-05	(mg/kg/day)	5.0E-01	(mg/kg/day)$^{-1}$	2.2E-05	9.6E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.03
				Cobalt	48.9	ug/L	2.7E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.1E-03	(mg/kg/day)	3.0E-04	(mg/kg/day)	10
				Iron	24800	ug/L	1.4E-01	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.6E+00	(mg/kg/day)	7.0E-01	(mg/kg/day)	2.3
				Manganese	481	ug/L	2.6E-03	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.1E-02	(mg/kg/day)	2.4E-02	(mg/kg/day)	1.3
				Nickel	32.8	ug/L	1.8E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.1E-03	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.1
				Thallium	0.803	ug/L	4.4E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	5.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Vanadium	2.5	ug/L	1.4E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.6E-04	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.03
				1,1-Dichloroethane	4.7	ug/L	2.6E-05	(mg/kg/day)	5.7E-03	(mg/kg/day)$^{-1}$	1.5E-07	3.0E-04	(mg/kg/day)	2.0E-01	(mg/kg/day)	0.002
				1,1-Dichloroethene	4.4	ug/L	2.4E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.8E-04	(mg/kg/day)	5.0E-02	(mg/kg/day)	0.006
				1,2-Dichloroethane	0.36	ug/L	2.0E-06	(mg/kg/day)	9.1E-02	(mg/kg/day)$^{-1}$	1.8E-07	2.3E-05	(mg/kg/day)	6.0E-03	(mg/kg/day)	0.004
				Cis-1,2-Dichloroethene	58	ug/L	3.2E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.7E-03	(mg/kg/day)	2.0E-03	(mg/kg/day)	1.9
				Trichloroethene (Mutagenic)	2680	ug/L	7.8E-02	(mg/kg/day)	9.3E-03	(mg/kg/day)$^{-1}$	7.3E-04	1.7E-01	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	2680	ug/L	1.5E-02	(mg/kg/day)	3.7E-02	(mg/kg/day)$^{-1}$	5.4E-04	1.7E-01	(mg/kg/day)	5.0E-04	(mg/kg/day)	343
				Vinyl Chloride	8	ug/L	5.8E-04	(mg/kg/day)	7.2E-01	(mg/kg/day)$^{-1}$	4.2E-04	5.1E-04	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.2
			Exp. Route Total								1.7E-03					360
			Dermal	1,3-Dinitrobenzene	0.212	ug/L	1.1E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.3E-07	(mg/kg/day)	1.0E-04	(mg/kg/day)	0.001
				2,6-Dinitrotoluene	0.504	ug/L	3.5E-08	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	5.2E-08	4.1E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.001
				3-Nitrotoluene	0.378	ug/L	1.0E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.2E-06	(mg/kg/day)	1.0E-04	(mg/kg/day)	0.01
				Arsenic	2.8	ug/L	1.0E-08	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	1.5E-08	1.2E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0004
				Barium	138	ug/L	5.0E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	5.8E-06	(mg/kg/day)	1.4E-02	(mg/kg/day)	0.0004
				Beryllium	0.82	ug/L	3.0E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.5E-08	(mg/kg/day)	1.4E-05	(mg/kg/day)	0.002
				Cadmium	0.422	ug/L	1.5E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.8E-08	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.0007
				Chromium VI	1.5	ug/L	5.8E-08	(mg/kg/day)	2.0E+01	(mg/kg/day)$^{-1}$	1.2E-06	1.3E-07	(mg/kg/day)	7.5E-05	(mg/kg/day)	0.002
				Cobalt	48.9	ug/L	7.1E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	8.3E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.003
				Iron	24800	ug/L	9.0E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.0E-03	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.001
				Manganese	481	ug/L	1.7E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.0E-05	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.02
				Nickel	32.8	ug/L	2.4E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.8E-07	(mg/kg/day)	8.0E-04	(mg/kg/day)	0.0003
				Thallium	0.803	ug/L	2.9E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.4E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Vanadium	2.5	ug/L	9.0E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.1E-07	(mg/kg/day)	1.3E-04	(mg/kg/day)	0.0008
				1,1-Dichloroethane	4.7	ug/L	6.2E-07	(mg/kg/day)	5.7E-03	(mg/kg/day)$^{-1}$	3.5E-09	7.2E-06	(mg/kg/day)	2.0E-01	(mg/kg/day)	0.00004
				1,1-Dichloroethene	4.4	ug/L	9.9E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.2E-05	(mg/kg/day)	5.0E-02	(mg/kg/day)	0.0002
				1,2-Dichloroethane	0.36	ug/L	3.0E-08	(mg/kg/day)	9.1E-02	(mg/kg/day)$^{-1}$	2.7E-09	3.4E-07	(mg/kg/day)	6.0E-03	(mg/kg/day)	0.00006
				Cis-1,2-Dichloroethene	58	ug/L	1.2E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.4E-04	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.07
				Trichloroethene (Mutagenic)	2680	ug/L	4.0E-03	(mg/kg/day)	9.3E-03	(mg/kg/day)$^{-1}$	3.7E-05	8.8E-03	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	2680	ug/L	7.5E-04	(mg/kg/day)	3.7E-02	(mg/kg/day)$^{-1}$	2.8E-05	8.8E-03	(mg/kg/day)	5.0E-04	(mg/kg/day)	18
				Vinyl Chloride	8	ug/L	9.1E-06	(mg/kg/day)	7.2E-01	(mg/kg/day)$^{-1}$	6.6E-06	8.1E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.003
			Exp. Route Total								7.3E-05					18
		Exposure Point Total									1.8E-03					378
	Exposure Medium Total										1.8E-03					378
Medium Total											1.8E-03					378

TABLE 7.9.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Surface Water	Site 43	Ingestion	Arsenic	1.21	ug/L	3.9E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	5.9E-08	4.6E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.002
				Cobalt	25.9	ug/L	8.4E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.8E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.03
				Cis-1,2-Dichloroethene	195	ug/L	6.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.4E-05	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.04
				Trichloroethene (Mutagenic)	240	ug/L	4.2E-05	(mg/kg/day)	9.3E-03	$(mg/kg/day)^{-1}$	3.9E-07	9.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	240	ug/L	7.8E-06	(mg/kg/day)	3.7E-02	$(mg/kg/day)^{-1}$	2.9E-07	9.1E-05	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.2
				Vinyl Chloride	1.26	ug/L	3.4E-06	(mg/kg/day)	7.2E-01	$(mg/kg/day)^{-1}$	2.4E-06	4.8E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0002
			Exp. Route Total								3.2E-06					0.3
			Dermal	Arsenic	1.21	ug/L	1.1E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.7E-08	1.3E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0004
				Cobalt	25.9	ug/L	9.4E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.004
				Cis-1,2-Dichloroethene	195	ug/L	2.2E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.6E-04	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.1
				Trichloroethene (Mutagenic)	240	ug/L	1.7E-04	(mg/kg/day)	9.3E-03	$(mg/kg/day)^{-1}$	1.6E-06	3.7E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	240	ug/L	3.2E-05	(mg/kg/day)	3.7E-02	$(mg/kg/day)^{-1}$	1.2E-06	3.7E-04	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.7
				Vinyl Chloride	1.26	ug/L	5.9E-06	(mg/kg/day)	7.2E-01	$(mg/kg/day)^{-1}$	4.2E-06	8.3E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0003
			Exp. Route Total								7.0E-06					0.9
		Exposure Point Total									1.0E-05					1.1
	Exposure Medium Total										1.0E-05					1.1
Medium Total											1.0E-05					1.1
										Total of Receptor Risks Across All Media	2.1E-03				Total of Receptor Hazards Across All Media	384

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.10.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
							Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Site 43	Ingestion	Aluminum	17600	mg/kg	8.3E-03	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.4E-02	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.02
				Arsenic	7.2	mg/kg	2.0E-06	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	3.0E-06	5.9E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.02
				Cadmium	10.8	mg/kg	5.1E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.5E-05	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.01
				Chromium VI	28.1	mg/kg	2.4E-05	(mg/kg/day)	5.0E-01	(mg/kg/day)$^{-1}$	1.2E-05	3.8E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.01
				Cobalt	12.1	mg/kg	5.7E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.7E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.06
				Iron	22800	mg/kg	1.1E-02	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.1E-02	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.04
				Manganese	1200	mg/kg	5.6E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.6E-03	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.07
				Thallium	0.664	mg/kg	3.1E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	9.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Vanadium	38.5	mg/kg	1.8E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	5.3E-05	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.01
				Trichloroethene (Mutagenic)	2.72	mg/kg	2.3E-06	(mg/kg/day)	9.3E-03	(mg/kg/day)$^{-1}$	2.2E-08	3.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	2.72	mg/kg	1.3E-06	(mg/kg/day)	3.7E-02	(mg/kg/day)$^{-1}$	4.7E-08	3.7E-06	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.007
			Exp. Route Total								1.5E-05					0.3
			Dermal	Aluminum	17600	mg/kg	3.3E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	9.6E-04	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.0010
				Arsenic	7.2	mg/kg	4.0E-07	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	6E-07	1.2E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.004
				Cadmium	10.8	mg/kg	2.0E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	5.9E-08	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.002
				Chromium VI	28.1	mg/kg	9.7E-07	(mg/kg/day)	2.0E+01	(mg/kg/day)$^{-1}$	2E-05	1.5E-06	(mg/kg/day)	7.5E-05	(mg/kg/day)	0.02
				Cobalt	12.1	mg/kg	2.3E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	6.6E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.002
				Iron	22800	mg/kg	4.3E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.2E-03	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.002
				Manganese	1200	mg/kg	2.2E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	6.6E-05	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.07
				Thallium	0.664	mg/kg	1.2E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.6E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Vanadium	38.5	mg/kg	7.2E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.1E-06	(mg/kg/day)	1.3E-04	(mg/kg/day)	0.02
				Trichloroethene (Mutagenic)	2.72	mg/kg	2.8E-07	(mg/kg/day)	9.3E-03	(mg/kg/day)$^{-1}$	3E-09	4.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	2.72	mg/kg	1.5E-07	(mg/kg/day)	3.7E-02	(mg/kg/day)$^{-1}$	6E-09	4.5E-07	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.0009
			Exp. Route Total								2.0E-05					0.1
		Exposure Point Total									3.5E-05					0.4
	Exposure Medium Total										3.5E-05					0.4
	Air	Site 43	Inhalation	Aluminum	5.4E-06	mg/m^3	1.8E-06	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	5.2E-06	(mg/m^3)	5.0E-03	(mg/m^3)	0.001
				Arsenic	2.2E-09	mg/m^3	7.3E-10	(mg/m^3)	4.3E-03	(ug/m^3)$^{-1}$	3.2E-09	2.1E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.0001
				Cadmium	3.3E-09	mg/m^3	1.1E-09	(mg/m^3)	1.8E-03	(ug/m^3)$^{-1}$	2.0E-09	3.2E-09	(mg/m^3)	1.0E-05	(mg/m^3)	0.0003
				Chromium VI	8.7E-09	mg/m^3	5.2E-09	(mg/m^3)	8.4E-02	(ug/m^3)$^{-1}$	4.4E-07	8.3E-09	(mg/m^3)	1.0E-04	(mg/m^3)	0.00008
				Cobalt	3.7E-09	mg/m^3	1.2E-09	(mg/m^3)	9.0E-03	(ug/m^3)$^{-1}$	1.1E-08	3.6E-09	(mg/m^3)	6.0E-06	(mg/m^3)	0.0006
				Iron	7.1E-06	mg/m^3	2.3E-06	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	6.8E-06	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	3.7E-07	mg/m^3	1.2E-07	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	3.6E-07	(mg/m^3)	5.0E-05	(mg/m^3)	0.007
				Thallium	2.1E-10	mg/m^3	6.8E-11	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	2.0E-10	(mg/m^3)	NA	(mg/m^3)	--
				Vanadium	1.2E-08	mg/m^3	3.9E-09	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	1.1E-08	(mg/m^3)	1.0E-04	(mg/m^3)	0.0001
				Trichloroethene (Mutagenic)	8.9E-04	mg/m^3	5.4E-04	(mg/m^3)	1.0E-06	(ug/m^3)$^{-1}$	5.4E-07	8.6E-04	(mg/m^3)	NA	(mg/m^3)	--
				Trichloroethene (Nonmutagenic)	8.9E-04	mg/m^3	2.9E-04	(mg/m^3)	3.1E-06	(ug/m^3)$^{-1}$	9.1E-07	8.6E-04	(mg/m^3)	2.0E-03	(mg/m^3)	0.4
			Exp. Route Total								1.9E-06					0.4
		Exposure Point Total									1.9E-06					0.4
	Exposure Medium Total										1.9E-06					0.4
Medium Total											3.7E-05					0.8
Subsurface Soil	Subsurface Soil	Site 43	Ingestion	Aluminum	8950	mg/kg	4.2E-03	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.2E-02	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.01
				Arsenic	2.38	mg/kg	6.7E-07	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	1.0E-06	2.0E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.007
				Chromium VI	15.4	mg/kg	1.3E-05	(mg/kg/day)	5.0E-01	(mg/kg/day)$^{-1}$	6.6E-06	2.1E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.007
				Cobalt	4.9	mg/kg	2.3E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	6.7E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.02
				Iron	13000	mg/kg	6.1E-03	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.8E-02	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.03
				Manganese	92.3	mg/kg	4.3E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.3E-04	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.005
				Trichloroethene (Mutagenic)	1.37	mg/kg	1.2E-06	(mg/kg/day)	9.3E-03	(mg/kg/day)$^{-1}$	1.1E-08	1.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	1.37	mg/kg	6.4E-07	(mg/kg/day)	3.7E-02	(mg/kg/day)$^{-1}$	2.4E-08	1.9E-06	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.004
			Exp. Route Total								7.7E-06					0.08
			Dermal	Aluminum	8950	mg/kg	1.7E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	4.9E-04	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.0005
				Arsenic	2.38	mg/kg	1.3E-07	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	2.0E-07	3.9E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.001
				Chromium VI	15.4	mg/kg	5.3E-07	(mg/kg/day)	2.0E+01	(mg/kg/day)$^{-1}$	1.1E-05	8.4E-07	(mg/kg/day)	7.5E-05	(mg/kg/day)	0.01
				Cobalt	4.9	mg/kg	9.2E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.7E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0009
				Iron	13000	mg/kg	2.4E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	7.1E-04	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.001
				Manganese	92.3	mg/kg	1.7E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	5.0E-06	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.005
				Trichloroethene (Mutagenic)	1.37	mg/kg	1.4E-07	(mg/kg/day)	9.3E-03	(mg/kg/day)$^{-1}$	1.3E-09	2.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	1.37	mg/kg	7.7E-08	(mg/kg/day)	3.7E-02	(mg/kg/day)$^{-1}$	2.8E-09	2.2E-07	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.0004
			Exp. Route Total								1.1E-05					0.02
		Exposure Point Total									1.8E-05					0.1
	Exposure Medium Total										1.8E-05					0.1

TABLE 7.10.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
							Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Subsurface Soil	Air	Site 43	Inhalation	Aluminum	2.8E-06	mg/m^3	9.1E-07	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	2.7E-06	(mg/m^3)	5.0E-03	(mg/m^3)	0.0005
				Arsenic	7.4E-10	mg/m^3	2.4E-10	(mg/m^3)	4.3E-03	(ug/m^3)$^{-1}$	1.0E-09	7.1E-10	(mg/m^3)	1.5E-05	(mg/m^3)	0.00005
				Chromium VI	4.8E-09	mg/m^3	2.9E-09	(mg/m^3)	8.4E-02	(ug/m^3)$^{-1}$	2.4E-07	4.6E-09	(mg/m^3)	1.0E-04	(mg/m^3)	0.00005
				Cobalt	1.5E-09	mg/m^3	5.0E-10	(mg/m^3)	9.0E-03	(ug/m^3)$^{-1}$	4.5E-09	1.5E-09	(mg/m^3)	6.0E-06	(mg/m^3)	0.0002
				Iron	4.0E-06	mg/m^3	1.3E-06	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	3.9E-06	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	2.9E-08	mg/m^3	9.4E-09	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	2.7E-08	(mg/m^3)	5.0E-05	(mg/m^3)	0.0005
				Trichloroethene (Mutagenic)	4.5E-04	mg/m^3	2.7E-04	(mg/m^3)	1.0E-06	(ug/m^3)$^{-1}$	2.7E-07	4.3E-04	(mg/m^3)	NA	(mg/m^3)	--
				Trichloroethene (Nonmutagenic)	4.5E-04	mg/m^3	1.5E-04	(mg/m^3)	3.1E-06	(ug/m^3)$^{-1}$	4.6E-07	4.3E-04	(mg/m^3)	2.0E-03	(mg/m^3)	0.2
			Exp. Route Total								9.8E-07					0.2
		Exposure Point Total									9.8E-07					0.2
	Exposure Medium Total										9.8E-07					0.2
Medium Total											1.9E-05					0.3
Groundwater	Groundwater	Site 43	Ingestion	1,3-Dinitrobenzene	0.212	ug/L	2.0E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	5.8E-06	(mg/kg/day)	1.0E-04	(mg/kg/day)	0.06
				2,6-Dinitrotoluene	0.504	ug/L	4.7E-06	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	7.1E-06	1.4E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.05
				3-Nitrotoluene	0.378	ug/L	3.6E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.0E-05	(mg/kg/day)	1.0E-04	(mg/kg/day)	0.1
				Arsenic	2.8	ug/L	2.6E-05	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	3.9E-05	7.7E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.3
				Barium	138	ug/L	1.3E-03	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.8E-03	(mg/kg/day)	2.0E-01	(mg/kg/day)	0.02
				Beryllium	0.82	ug/L	7.7E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.2E-05	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.01
				Cadmium	0.422	ug/L	4.0E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.2E-05	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.01
				Chromium VI	1.5	ug/L	2.6E-05	(mg/kg/day)	5.0E-01	(mg/kg/day)$^{-1}$	1.3E-05	4.1E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.01
				Cobalt	48.9	ug/L	4.6E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.3E-03	(mg/kg/day)	3.0E-04	(mg/kg/day)	4.5
				Iron	24800	ug/L	2.3E-01	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	6.8E-01	(mg/kg/day)	7.0E-01	(mg/kg/day)	1.0
				Manganese	481	ug/L	4.5E-03	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.3E-02	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.5
				Nickel	32.8	ug/L	3.1E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	9.0E-04	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.04
				Thallium	0.803	ug/L	7.5E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.2E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Vanadium	2.5	ug/L	2.3E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	6.8E-05	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.01
				1,1-Dichloroethane	4.7	ug/L	4.4E-05	(mg/kg/day)	5.7E-03	(mg/kg/day)$^{-1}$	2.5E-07	1.3E-04	(mg/kg/day)	2.0E-01	(mg/kg/day)	0.0006
				1,1-Dichloroethene	4.4	ug/L	4.1E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.2E-04	(mg/kg/day)	5.0E-02	(mg/kg/day)	0.002
				1,2-Dichloroethane	0.36	ug/L	3.4E-06	(mg/kg/day)	9.1E-02	(mg/kg/day)$^{-1}$	3.1E-07	9.9E-06	(mg/kg/day)	6.0E-03	(mg/kg/day)	0.002
				Cis-1,2-Dichloroethene	58	ug/L	5.4E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.6E-03	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.8
				Trichloroethene (Mutagenic)	2680	ug/L	4.6E-02	(mg/kg/day)	9.3E-03	(mg/kg/day)$^{-1}$	4.3E-04	7.3E-02	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	2680	ug/L	2.5E-02	(mg/kg/day)	3.7E-02	(mg/kg/day)$^{-1}$	9.2E-04	7.3E-02	(mg/kg/day)	5.0E-04	(mg/kg/day)	147
				Vinyl Chloride	8	ug/L	7.5E-05	(mg/kg/day)	7.2E-01	(mg/kg/day)$^{-1}$	5.4E-05	2.2E-04	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.07
			Exp. Route Total								1.5E-03					154
			Dermal	1,3-Dinitrobenzene	0.212	ug/L	6.3E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.8E-07	(mg/kg/day)	1.0E-04	(mg/kg/day)	0.002
				2,6-Dinitrotoluene	0.504	ug/L	2.0E-07	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	2.9E-07	5.7E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.002
				3-Nitrotoluene	0.378	ug/L	5.9E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.7E-06	(mg/kg/day)	1.0E-04	(mg/kg/day)	0.02
				Arsenic	2.8	ug/L	1.4E-07	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	2.1E-07	4.0E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.001
				Barium	138	ug/L	6.8E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.0E-05	(mg/kg/day)	1.4E-02	(mg/kg/day)	0.001
				Beryllium	0.82	ug/L	4.0E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.2E-07	(mg/kg/day)	1.4E-05	(mg/kg/day)	0.008
				Cadmium	0.422	ug/L	2.1E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	6.0E-08	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.002
				Chromium VI	1.5	ug/L	2.7E-07	(mg/kg/day)	2.0E+01	(mg/kg/day)$^{-1}$	5.4E-06	4.3E-07	(mg/kg/day)	7.5E-05	(mg/kg/day)	0.006
				Cobalt	48.9	ug/L	9.6E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.8E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.009
				Iron	24800	ug/L	1.2E-03	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.5E-03	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.005
				Manganese	481	ug/L	2.4E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	6.9E-05	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.07
				Nickel	32.8	ug/L	3.2E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	9.4E-07	(mg/kg/day)	8.0E-04	(mg/kg/day)	0.001
				Thallium	0.803	ug/L	3.9E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Vanadium	2.5	ug/L	1.2E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.6E-07	(mg/kg/day)	1.3E-04	(mg/kg/day)	0.003
				1,1-Dichloroethane	4.7	ug/L	3.5E-06	(mg/kg/day)	5.7E-03	(mg/kg/day)$^{-1}$	2.0E-08	1.0E-05	(mg/kg/day)	2.0E-01	(mg/kg/day)	0.00005
				1,1-Dichloroethene	4.4	ug/L	5.6E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.6E-05	(mg/kg/day)	5.0E-02	(mg/kg/day)	0.0003
				1,2-Dichloroethane	0.36	ug/L	1.7E-07	(mg/kg/day)	9.1E-02	(mg/kg/day)$^{-1}$	1.5E-08	4.8E-07	(mg/kg/day)	6.0E-03	(mg/kg/day)	0.00008
				Cis-1,2-Dichloroethene	58	ug/L	6.8E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.0E-04	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.10
				Trichloroethene (Mutagenic)	2680	ug/L	7.8E-03	(mg/kg/day)	9.3E-03	(mg/kg/day)$^{-1}$	7.2E-05	1.2E-02	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	2680	ug/L	4.2E-03	(mg/kg/day)	3.7E-02	(mg/kg/day)$^{-1}$	1.6E-04	1.2E-02	(mg/kg/day)	5.0E-04	(mg/kg/day)	25
				Vinyl Chloride	8	ug/L	4.0E-06	(mg/kg/day)	7.2E-01	(mg/kg/day)$^{-1}$	2.9E-06	1.2E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.004
			Exp. Route Total								2.4E-04					25
		Exposure Point Total									1.7E-03					179
	Exposure Medium Total										1.7E-03					179

TABLE 7.10.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Air	Site 43	Inhalation	1,3-Dinitrobenzene	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				2,6-Dinitrotoluene	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				3-Nitrotoluene	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Arsenic	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	4.3E-03	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	1.5E-05	(mg/m^3)	--
				Barium	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	5.0E-04	(mg/m^3)	--
				Beryllium	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	2.4E-03	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	2.0E-05	(mg/m^3)	--
				Cadmium	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	1.8E-03	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	1.0E-05	(mg/m^3)	--
				Chromium VI	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	8.4E-02	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	1.0E-04	(mg/m^3)	--
				Cobalt	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	9.0E-03	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	6.0E-06	(mg/m^3)	--
				Iron	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	5.0E-05	(mg/m^3)	--
				Nickel	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	2.6E-04	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	9.0E-05	(mg/m^3)	--
				Thallium	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Vanadium	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	1.0E-04	(mg/m^3)	--
				1,1-Dichloroethane	1.7E-04	mg/m^3	5.7E-05	(mg/m^3)	1.6E-06	(ug/m^3)$^{-1}$	9.1E-08	1.7E-04	(mg/m^3)	NA	(mg/m^3)	--
				1,1-Dichloroethene	1.7E-04	mg/m^3	5.4E-05	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	1.6E-04	(mg/m^3)	2.0E-01	(mg/m^3)	0.0008
				1,2-Dichloroethane	1.3E-05	mg/m^3	4.2E-06	(mg/m^3)	2.6E-05	(ug/m^3)$^{-1}$	1.1E-07	1.3E-05	(mg/m^3)	7.0E-03	(mg/m^3)	0.002
				Cis-1,2-Dichloroethene	2.2E-03	mg/m^3	7.1E-04	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	2.1E-03	(mg/m^3)	NA	(mg/m^3)	--
				Trichloroethene (Mutagenic)	8.6E-02	mg/m^3	5.2E-02	(mg/m^3)	1.0E-06	(ug/m^3)$^{-1}$	5.2E-05	8.5E-02	(mg/m^3)	NA	(mg/m^3)	--
				Trichloroethene (Nonmutagenic)	8.6E-02	mg/m^3	2.8E-02	(mg/m^3)	3.1E-06	(ug/m^3)$^{-1}$	8.8E-05	8.5E-02	(mg/m^3)	2.0E-03	(mg/m^3)	43
				Vinyl Chloride	3.7E-04	mg/m^3	1.2E-04	(mg/m^3)	4.4E-06	(ug/m^3)$^{-1}$	5.4E-07	3.7E-04	(mg/m^3)	1.0E-01	(mg/m^3)	0.004
			Exp. Route Total								1.4E-04					43
		Exposure Point Total									1.4E-04					43
	Exposure Medium Total										1.4E-04					43
Medium Total											1.8E-03					222
Surface Water	Surface Water	Site 43	Ingestion	Arsenic	1.21	ug/L	3.4E-08	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	5.1E-08	9.9E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0003
				Cobalt	25.9	ug/L	7.2E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.1E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.007
				Cis-1,2-Dichloroethene	195	ug/L	5.4E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.6E-05	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.008
				Trichloroethene (Mutagenic)	240	ug/L	1.2E-05	(mg/kg/day)	9.3E-03	(mg/kg/day)$^{-1}$	1.1E-07	2.0E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	240	ug/L	6.7E-06	(mg/kg/day)	3.7E-02	(mg/kg/day)$^{-1}$	2.5E-07	2.0E-05	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.04
				Vinyl Chloride	1.26	ug/L	3.5E-08	(mg/kg/day)	7.2E-01	(mg/kg/day)$^{-1}$	2.5E-08	1.0E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.00003
			Exp. Route Total								4.4E-07					0.05
			Dermal	Arsenic	1.21	ug/L	1.9E-08	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	2.9E-08	5.6E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0002
				Cobalt	25.9	ug/L	1.6E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	4.8E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.002
				Cis-1,2-Dichloroethene	195	ug/L	3.9E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.1E-04	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.06
				Trichloroethene (Mutagenic)	240	ug/L	1.0E-04	(mg/kg/day)	9.3E-03	(mg/kg/day)$^{-1}$	9.5E-07	1.6E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	240	ug/L	5.6E-05	(mg/kg/day)	3.7E-02	(mg/kg/day)$^{-1}$	2.0E-06	1.6E-04	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.3
				Vinyl Chloride	1.26	ug/L	1.2E-07	(mg/kg/day)	7.2E-01	(mg/kg/day)$^{-1}$	8.9E-08	3.6E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0001
			Exp. Route Total								3.1E-06					0.4
		Exposure Point Total									3.6E-06					0.4
	Exposure Medium Total										3.6E-06					0.4
Medium Total											3.6E-06					0.4
										Total of Receptor Risks Across All Media	1.9E-03				Total of Receptor Hazards Across All Media	223

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.1.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Site 43	Ingestion	Aluminum	17600	mg/kg	2.4E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.7E-02	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.02
				Cadmium	10.8	mg/kg	1.5E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.0E-05	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.01
				Chromium VI	28.1	mg/kg	3.9E-07	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	1.9E-07	2.7E-05	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.005
				Trichloroethene	2.72	mg/kg	3.8E-08	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	1.7E-09	2.6E-06	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.005
			Exp. Route Total								2.0E-07					0.04
			Dermal	Aluminum	17600	mg/kg	4.9E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.4E-04	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.0003
				Cadmium	10.8	mg/kg	3.0E-10	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.1E-08	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.0008
				Chromium VI	28.1	mg/kg	7.8E-09	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	1.6E-07	5.4E-07	(mg/kg/day)	1.3E-04	(mg/kg/day)	0.004
				Trichloroethene	2.72	mg/kg	2.3E-09	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	1.0E-10	1.6E-07	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.0003
			Exp. Route Total								1.6E-07					0.006
		Exposure Point Total									3.5E-07					0.04
	Exposure Medium Total										3.5E-07					0.04
	Air	Site 43	Inhalation	Aluminum	1.1E-02	mg/m^3	2.1E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.5E-03	(mg/m^3)	5.0E-03	(mg/m^3)	0.3
				Cadmium	6.7E-06	mg/m^3	1.3E-08	(mg/m^3)	1.8E-03	$(ug/m^3)^{-1}$	2.3E-08	9.1E-07	(mg/m^3)	1.0E-05	(mg/m^3)	0.09
				Chromium VI	1.7E-05	mg/m^3	3.4E-08	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	2.9E-06	2.4E-06	(mg/m^3)	3.0E-04	(mg/m^3)	0.008
				Trichloroethene	5.5E-03	mg/m^3	1.1E-05	(mg/m^3)	4.1E-06	$(ug/m^3)^{-1}$	4.4E-08	7.6E-04	(mg/m^3)	2.0E-03	(mg/m^3)	0.4
			Exp. Route Total								2.9E-06					0.8
		Exposure Point Total									2.9E-06					0.8
	Exposure Medium Total										2.9E-06					0.8
Medium Total											3.3E-06					0.8
Subsurface Soil	Subsurface Soil	Site 43	Ingestion	Manganese	92.3	mg/kg	1.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.9E-05	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.004
				Trichloroethene	1.37	mg/kg	1.9E-08	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	8.7E-10	1.3E-06	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.003
			Exp. Route Total								8.7E-10					0.006
			Dermal	Manganese	92.3	mg/kg	2.6E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.8E-06	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.002
				Trichloroethene	1.37	mg/kg	1.1E-09	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	5.2E-11	8.0E-08	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.0002
			Exp. Route Total								5.2E-11					0.002
		Exposure Point Total									9.2E-10					0.008
	Exposure Medium Total										9.2E-10					0.008
	Air	Site 43	Inhalation	Manganese	5.7E-05	mg/m^3	1.1E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	7.8E-06	(mg/m^3)	5.0E-05	(mg/m^3)	0.2
				Trichloroethene	2.8E-03	mg/m^3	5.5E-06	(mg/m^3)	4.1E-06	$(ug/m^3)^{-1}$	2.2E-08	3.8E-04	(mg/m^3)	2.0E-03	(mg/m^3)	0.2
			Exp. Route Total								2.2E-08					0.3
		Exposure Point Total									2.2E-08					0.3
	Exposure Medium Total										2.2E-08					0.3
Medium Total											2.3E-08					0.4

TABLE 7.1.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Groundwater	Site 43	Ingestion	1,3-Dinitrobenzene	0.212	ug/L	3.6E-11	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.5E-09	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.000005
				2,6-Dinitrotoluene	0.504	ug/L	8.5E-11	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	1.3E-10	5.9E-09	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.000001
				3-Nitrotoluene	0.378	ug/L	6.3E-11	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	4.4E-09	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.000004
				Arsenic	2.8	ug/L	4.7E-10	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	7.0E-10	3.3E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0001
				Barium	138	ug/L	2.3E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.6E-06	(mg/kg/day)	2.0E-01	(mg/kg/day)	0.000008
				Beryllium	0.82	ug/L	1.4E-10	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	9.6E-09	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.000002
				Cobalt	48.9	ug/L	8.2E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	5.7E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0002
				Iron	24800	ug/L	4.2E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.9E-04	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.0004
				Manganese	481	ug/L	8.1E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	5.6E-06	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.0002
				Nickel	32.8	ug/L	5.5E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.9E-07	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.00002
				Thallium	0.803	ug/L	1.3E-10	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	9.4E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				1,1-Dichloroethane	4.7	ug/L	7.9E-10	(mg/kg/day)	5.7E-03	(mg/kg/day)$^{-1}$	4.5E-12	5.5E-08	(mg/kg/day)	2.0E+00	(mg/kg/day)	2.8E-8
				1,1-Dichloroethene	4.4	ug/L	7.4E-10	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	5.2E-08	(mg/kg/day)	9.0E-03	(mg/kg/day)	0.000006
				1,2-Dichloroethane	0.36	ug/L	6.0E-11	(mg/kg/day)	9.1E-02	(mg/kg/day)$^{-1}$	5.5E-12	4.2E-09	(mg/kg/day)	2.0E-02	(mg/kg/day)	2.1E-7
				Cis-1,2-Dichloroethene	58	ug/L	9.7E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	6.8E-07	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.00003
				Trichloroethene	2680	ug/L	4.5E-07	(mg/kg/day)	4.6E-02	(mg/kg/day)$^{-1}$	2.1E-08	3.1E-05	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.06
				Vinyl Chloride	8	ug/L	1.3E-09	(mg/kg/day)	7.2E-01	(mg/kg/day)$^{-1}$	9.7E-10	9.4E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0003
			Exp. Route Total								2.2E-08					0.06
			Dermal	1,3-Dinitrobenzene	0.212	ug/L	7.7E-11	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	5.4E-09	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.00001
				2,6-Dinitrotoluene	0.504	ug/L	2.4E-10	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	3.6E-10	1.7E-08	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.000004
				3-Nitrotoluene	0.378	ug/L	7.5E-10	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	5.2E-08	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.00005
				Arsenic	2.8	ug/L	3.1E-10	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	4.6E-10	2.2E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.00007
				Barium	138	ug/L	1.5E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.1E-06	(mg/kg/day)	1.4E-02	(mg/kg/day)	0.00008
				Beryllium	0.82	ug/L	9.1E-11	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	6.4E-09	(mg/kg/day)	3.5E-05	(mg/kg/day)	0.0002
				Cobalt	48.9	ug/L	2.2E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.5E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.00005
				Iron	24800	ug/L	2.7E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.9E-04	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.0003
				Manganese	481	ug/L	5.3E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.7E-06	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.004
				Nickel	32.8	ug/L	7.3E-10	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	5.1E-08	(mg/kg/day)	8.0E-04	(mg/kg/day)	0.00006
				Thallium	0.803	ug/L	8.9E-11	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	6.2E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				1,1-Dichloroethane	4.7	ug/L	4.8E-09	(mg/kg/day)	5.7E-03	(mg/kg/day)$^{-1}$	2.7E-11	3.4E-07	(mg/kg/day)	2.0E+00	(mg/kg/day)	1.7E-7
				1,1-Dichloroethene	4.4	ug/L	7.6E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	5.4E-07	(mg/kg/day)	9.0E-03	(mg/kg/day)	0.00006
				1,2-Dichloroethane	0.36	ug/L	2.3E-10	(mg/kg/day)	9.1E-02	(mg/kg/day)$^{-1}$	2.1E-11	1.6E-08	(mg/kg/day)	2.0E-02	(mg/kg/day)	8.0E-7
				Cis-1,2-Dichloroethene	58	ug/L	9.4E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	6.6E-06	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0003
				Trichloroethene	2680	ug/L	5.4E-06	(mg/kg/day)	4.6E-02	(mg/kg/day)$^{-1}$	2.5E-07	3.8E-04	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.8
				Vinyl Chloride	8	ug/L	6.1E-09	(mg/kg/day)	7.2E-01	(mg/kg/day)$^{-1}$	4.4E-09	4.3E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.001
			Exp. Route Total								2.5E-07					0.8
		Exposure Point Total									2.8E-07					0.8
	Exposure Medium Total										2.8E-07					0.8
	Air	Site 43	Inhalation	1,3-Dinitrobenzene	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				2,6-Dinitrotoluene	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				3-Nitrotoluene	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Arsenic	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	4.3E-03	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	1.5E-05	(mg/m^3)	--
				Barium	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	5.0E-03	(mg/m^3)	--
				Beryllium	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	2.4E-03	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	2.0E-05	(mg/m^3)	--
				Cobalt	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	9.0E-03	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	2.0E-05	(mg/m^3)	--
				Iron	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	5.0E-05	(mg/m^3)	--
				Nickel	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	2.6E-04	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	2.0E-04	(mg/m^3)	--
				Thallium	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				1,1-Dichloroethane	1.7E-04	mg/m^3	1.7E-08	(mg/m^3)	1.6E-06	(ug/m^3)$^{-1}$	2.7E-11	1.2E-06	(mg/m^3)	NA	(mg/m^3)	--
				1,1-Dichloroethene	1.7E-04	mg/m^3	1.6E-08	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	1.1E-06	(mg/m^3)	7.9E-02	(mg/m^3)	0.00001
				1,2-Dichloroethane	1.3E-05	mg/m^3	1.3E-09	(mg/m^3)	2.6E-05	(ug/m^3)$^{-1}$	3.3E-11	8.8E-08	(mg/m^3)	7.0E-02	(mg/m^3)	0.000001
				Cis-1,2-Dichloroethene	2.2E-03	mg/m^3	2.1E-07	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	1.5E-05	(mg/m^3)	NA	(mg/m^3)	--
				Trichloroethene	8.6E-02	mg/m^3	8.4E-06	(mg/m^3)	4.1E-06	(ug/m^3)$^{-1}$	3.5E-08	5.9E-04	(mg/m^3)	2.0E-03	(mg/m^3)	0.3
				Vinyl Chloride	3.7E-04	mg/m^3	3.7E-08	(mg/m^3)	4.4E-06	(ug/m^3)$^{-1}$	1.6E-10	2.6E-06	(mg/m^3)	7.7E-02	(mg/m^3)	0.00003
			Exp. Route Total								3.5E-08					0.3
		Exposure Point Total									3.5E-08					0.3
	Exposure Medium Total										3.5E-08					0.3
Medium Total											3.1E-07					1.1

TABLE 7.1.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Surface Water	Site 43	Ingestion	Arsenic	1.21	ug/L	3.5E-10	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	5.3E-10	2.5E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.00008
				Cobalt	25.9	ug/L	7.5E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.3E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0002
				Cis-1,2-Dichloroethene	195	ug/L	5.7E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.0E-06	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0002
				Trichloroethene	240	ug/L	7.0E-08	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	3.2E-09	4.9E-06	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.010
				Vinyl Chloride	1.26	ug/L	3.7E-10	(mg/kg/day)	7.2E-01	$(mg/kg/day)^{-1}$	2.6E-10	2.6E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.00009
			Exp. Route Total								4.0E-09					0.01
			Dermal	Arsenic	1.21	ug/L	1.2E-10	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.7E-10	8.1E-09	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.00003
				Cobalt	25.9	ug/L	9.9E-10	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.0E-08	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.00002
				Cis-1,2-Dichloroethene	195	ug/L	2.7E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.9E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0010
				Trichloroethene	240	ug/L	4.2E-07	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	1.9E-08	2.9E-05	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.06
				Vinyl Chloride	1.26	ug/L	8.3E-10	(mg/kg/day)	7.2E-01	$(mg/kg/day)^{-1}$	6.0E-10	5.8E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0002
			Exp. Route Total								2.0E-08					0.06
		Exposure Point Total									2.4E-08					0.07
	Exposure Medium Total										2.4E-08					0.07
Medium Total											2.4E-08					0.07
										Total of Receptor Risks Across All Media	3.6E-06				Total of Receptor Hazards Across All Media	2.4

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.2.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Maintenance Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Site 43	Ingestion	Aluminum	17600	mg/kg	5.3E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.1E-04	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.0004
				Cadmium	10.8	mg/kg	3.3E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.5E-07	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.0003
				Chromium VI	28.1	mg/kg	8.5E-08	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	4.2E-08	6.6E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0002
				Trichloroethene	2.72	mg/kg	8.2E-09	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	3.8E-10	6.4E-08	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.0001
			Exp. Route Total								4.3E-08					0.001
			Dermal	Aluminum	17600	mg/kg	7.0E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.5E-06	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.000005
				Cadmium	10.8	mg/kg	4.3E-11	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.3E-10	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.00001
				Chromium VI	28.1	mg/kg	1.1E-09	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	2.2E-08	8.7E-09	(mg/kg/day)	7.5E-05	(mg/kg/day)	0.0001
				Trichloroethene	2.72	mg/kg	3.3E-10	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	1.5E-11	2.5E-09	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.000005
			Exp. Route Total								2.2E-08					0.0001
		Exposure Point Total									6.5E-08					0.001
	Exposure Medium Total										6.5E-08					0.001
	Air	Site 43	Inhalation	Aluminum	5.4E-06	mg/m^3	7.7E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	6.0E-08	(mg/m^3)	5.0E-03	(mg/m^3)	0.00001
				Cadmium	3.3E-09	mg/m^3	4.7E-12	(mg/m^3)	1.8E-03	$(ug/m^3)^{-1}$	8.5E-12	3.7E-11	(mg/m^3)	1.0E-05	(mg/m^3)	0.000004
				Chromium VI	8.7E-09	mg/m^3	1.2E-11	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	1.0E-09	9.5E-11	(mg/m^3)	1.0E-04	(mg/m^3)	9.5E-7
				Trichloroethene	8.9E-04	mg/m^3	1.3E-06	(mg/m^3)	4.1E-06	$(ug/m^3)^{-1}$	5.2E-09	9.8E-06	(mg/m^3)	2.0E-03	(mg/m^3)	0.005
			Exp. Route Total								6.2E-09					0.005
		Exposure Point Total									6.2E-09					0.005
	Exposure Medium Total										6.2E-09					0.005
Medium Total											7.1E-08					0.006
Subsurface Soil	Subsurface Soil	Site 43	Ingestion	Manganese	92.3	mg/kg	2.8E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.2E-06	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.00009
				Trichloroethene	1.37	mg/kg	4.1E-09	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	1.9E-10	3.2E-08	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.00006
			Exp. Route Total								1.9E-10					0.0002
			Dermal	Manganese	92.3	mg/kg	3.7E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.9E-08	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.00003
				Trichloroethene	1.37	mg/kg	1.6E-10	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	7.5E-12	1.3E-09	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.000003
			Exp. Route Total								7.5E-12					0.00003
		Exposure Point Total									2.0E-10					0.0002
	Exposure Medium Total										2.0E-10					0.0002
	Air	Site 43	Inhalation	Manganese	2.9E-08	mg/m^3	4.0E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.1E-10	(mg/m^3)	5.0E-05	(mg/m^3)	0.000006
				Trichloroethene	4.5E-04	mg/m^3	6.3E-07	(mg/m^3)	4.1E-06	$(ug/m^3)^{-1}$	2.6E-09	4.9E-06	(mg/m^3)	2.0E-03	(mg/m^3)	0.002
			Exp. Route Total								2.6E-09					0.002
		Exposure Point Total									2.6E-09					0.002
	Exposure Medium Total										2.6E-09					0.002
Medium Total											2.8E-09					0.003
Surface Water	Surface Water	Site 43	Ingestion	Arsenic	1.21	ug/L	1.5E-09	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.2E-09	1.1E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.00004
				Cobalt	25.9	ug/L	3.1E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.4E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0008
				Cis-1,2-Dichloroethene	195	ug/L	2.4E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.8E-06	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.0009
				Trichloroethene	240	ug/L	2.9E-07	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	1.3E-08	2.3E-06	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.005
				Vinyl Chloride	1.26	ug/L	1.5E-09	(mg/kg/day)	7.2E-01	$(mg/kg/day)^{-1}$	1.1E-09	1.2E-08	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.000004
			Exp. Route Total								1.7E-08					0.006
			Dermal	Arsenic	1.21	ug/L	4.8E-10	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	7.2E-10	3.8E-09	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.00001
				Cobalt	25.9	ug/L	4.1E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.2E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0001
				Cis-1,2-Dichloroethene	195	ug/L	1.1E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.8E-06	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.004
				Trichloroethene	240	ug/L	1.7E-06	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	8.0E-08	1.4E-05	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.03
				Vinyl Chloride	1.26	ug/L	3.4E-09	(mg/kg/day)	7.2E-01	$(mg/kg/day)^{-1}$	2.5E-09	2.7E-08	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.000009
			Exp. Route Total								8.3E-08					0.03
		Exposure Point Total									1.0E-07					0.04
	Exposure Medium Total										1.0E-07					0.04
Medium Total											1.0E-07					0.04
										Total of Receptor Risks Across All Media	1.7E-07				Total of Receptor Hazards Across All Media	0.05

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.3.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Site 43	Ingestion	Aluminum	17600	mg/kg	9.7E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.5E-03	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.008
				Cadmium	10.8	mg/kg	6.0E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.6E-06	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.005
				Chromium VI	28.1	mg/kg	1.5E-06	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	7.7E-07	1.2E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.004
				Trichloroethene	2.72	mg/kg	1.5E-07	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	6.9E-09	1.2E-06	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.002
			Exp. Route Total								7.8E-07					0.02
			Dermal	Aluminum	17600	mg/kg	1.3E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.0E-04	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.00010
				Cadmium	10.8	mg/kg	7.9E-10	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.1E-09	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.0002
				Chromium VI	28.1	mg/kg	2.0E-08	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	4.1E-07	1.6E-07	(mg/kg/day)	7.5E-05	(mg/kg/day)	0.002
				Trichloroethene	2.72	mg/kg	5.9E-09	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	2.7E-10	4.6E-08	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.00009
			Exp. Route Total								4.1E-07					0.003
		Exposure Point Total									1.2E-06					0.02
	Exposure Medium Total										1.2E-06					0.02
	Air	Site 43	Inhalation	Aluminum	5.4E-06	mg/m^3	1.4E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.1E-06	(mg/m^3)	5.0E-03	(mg/m^3)	0.0002
				Cadmium	3.3E-09	mg/m^3	8.6E-11	(mg/m^3)	1.8E-03	$(ug/m^3)^{-1}$	1.5E-10	6.7E-10	(mg/m^3)	1.0E-05	(mg/m^3)	0.00007
				Chromium VI	8.7E-09	mg/m^3	2.2E-10	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	1.9E-08	1.7E-09	(mg/m^3)	1.0E-04	(mg/m^3)	0.00002
				Trichloroethene	8.9E-04	mg/m^3	2.3E-05	(mg/m^3)	4.1E-06	$(ug/m^3)^{-1}$	9.4E-08	1.8E-04	(mg/m^3)	2.0E-03	(mg/m^3)	0.09
			Exp. Route Total								1.1E-07					0.09
		Exposure Point Total									1.1E-07					0.09
	Exposure Medium Total										1.1E-07					0.09
Medium Total											1.3E-06					0.1
Subsurface Soil	Subsurface Soil	Site 43	Ingestion	Manganese	92.3	mg/kg	5.1E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.0E-05	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.002
				Trichloroethene	1.37	mg/kg	7.5E-08	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	3.5E-09	5.9E-07	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.001
			Exp. Route Total								3.5E-09					0.003
			Dermal	Manganese	92.3	mg/kg	6.7E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.2E-07	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.0005
				Trichloroethene	1.37	mg/kg	3.0E-09	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	1.4E-10	2.3E-08	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.00005
			Exp. Route Total								1.4E-10					0.0006
		Exposure Point Total									3.6E-09					0.003
	Exposure Medium Total										3.6E-09					0.003
	Air	Site 43	Inhalation	Manganese	2.9E-08	mg/m^3	7.3E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.7E-09	(mg/m^3)	5.0E-05	(mg/m^3)	0.0001
				Trichloroethene	4.5E-04	mg/m^3	1.2E-05	(mg/m^3)	4.1E-06	$(ug/m^3)^{-1}$	4.8E-08	9.0E-05	(mg/m^3)	2.0E-03	(mg/m^3)	0.05
			Exp. Route Total								4.8E-08					0.05
		Exposure Point Total									4.8E-08					0.05
	Exposure Medium Total										4.8E-08					0.05
Medium Total											5.1E-08					0.05

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.4.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Site 43	Ingestion	Aluminum	17600	mg/kg	2.1E-03	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	7.5E-02	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.08
				Cadmium	10.8	mg/kg	1.3E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	4.6E-05	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.05
				Chromium VI	28.1	mg/kg	2.2E-05	(mg/kg/day)	5.0E-01	(mg/kg/day)$^{-1}$	1.1E-05	1.2E-04	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.04
				Trichloroethene (Mutagenic)	2.72	mg/kg	2.2E-06	(mg/kg/day)	9.3E-03	(mg/kg/day)$^{-1}$	2.0E-08	1.2E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	2.72	mg/kg	3.3E-07	(mg/kg/day)	3.7E-02	(mg/kg/day)$^{-1}$	1.2E-08	1.2E-05	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.02
			Exp. Route Total								1.1E-05					0.2
			Dermal	Aluminum	17600	mg/kg	2.4E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	8.4E-04	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.0008
				Cadmium	10.8	mg/kg	1.5E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	5.2E-08	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.002
				Chromium VI	28.1	mg/kg	2.5E-07	(mg/kg/day)	2.0E+01	(mg/kg/day)$^{-1}$	5.0E-06	1.3E-06	(mg/kg/day)	7.5E-05	(mg/kg/day)	0.02
				Trichloroethene (Mutagenic)	2.72	mg/kg	7.3E-08	(mg/kg/day)	9.3E-03	(mg/kg/day)$^{-1}$	6.7E-10	3.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	2.72	mg/kg	1.1E-08	(mg/kg/day)	3.7E-02	(mg/kg/day)$^{-1}$	4.1E-10	3.9E-07	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.0008
			Exp. Route Total								5.0E-06					0.02
		Exposure Point Total									1.6E-05					0.2
	Exposure Medium Total										1.6E-05					0.2
	Air	Site 43	Inhalation	Aluminum	5.4E-06	mg/m^3	1.0E-07	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	3.5E-06	(mg/m^3)	5.0E-03	(mg/m^3)	0.0007
				Cadmium	3.3E-09	mg/m^3	6.1E-11	(mg/m^3)	1.8E-03	(ug/m^3)$^{-1}$	1.1E-10	2.1E-09	(mg/m^3)	1.0E-05	(mg/m^3)	0.0002
				Chromium VI	8.7E-09	mg/m^3	1.0E-09	(mg/m^3)	8.4E-02	(ug/m^3)$^{-1}$	8.7E-08	5.6E-09	(mg/m^3)	1.0E-04	(mg/m^3)	0.00006
				Trichloroethene (Mutagenic)	8.9E-04	mg/m^3	1.1E-04	(mg/m^3)	1.0E-06	(ug/m^3)$^{-1}$	1.1E-07	5.7E-04	(mg/m^3)	NA	(mg/m^3)	--
				Trichloroethene (Nonmutagenic)	8.9E-04	mg/m^3	1.6E-05	(mg/m^3)	3.1E-06	(ug/m^3)$^{-1}$	5.1E-08	5.7E-04	(mg/m^3)	2.0E-03	(mg/m^3)	0.3
			Exp. Route Total								2.4E-07					0.3
		Exposure Point Total									2.4E-07					0.3
	Exposure Medium Total										2.4E-07					0.3
Medium Total											1.6E-05					0.5
Subsurface Soil	Subsurface Soil	Site 43	Ingestion	Manganese	92.3	mg/kg	1.1E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.9E-04	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.02
				Trichloroethene (Mutagenic)	1.37	mg/kg	1.1E-06	(mg/kg/day)	9.3E-03	(mg/kg/day)$^{-1}$	1.0E-08	5.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	1.37	mg/kg	1.7E-07	(mg/kg/day)	3.7E-02	(mg/kg/day)$^{-1}$	6.1E-09	5.9E-06	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.01
			Exp. Route Total								1.6E-08					0.03
			Dermal	Manganese	92.3	mg/kg	1.3E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	4.4E-06	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.005
				Trichloroethene (Mutagenic)	1.37	mg/kg	3.7E-08	(mg/kg/day)	9.3E-03	(mg/kg/day)$^{-1}$	3.4E-10	2.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	1.37	mg/kg	5.6E-09	(mg/kg/day)	3.7E-02	(mg/kg/day)$^{-1}$	2.1E-10	2.0E-07	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.0004
			Exp. Route Total								5.5E-10					0.005
		Exposure Point Total									1.7E-08					0.03
	Exposure Medium Total										1.7E-08					0.03
	Air	Site 43	Inhalation	Manganese	2.9E-08	mg/m^3	5.2E-10	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	1.8E-08	(mg/m^3)	5.0E-05	(mg/m^3)	0.0004
				Trichloroethene (Mutagenic)	4.5E-04	mg/m^3	5.4E-05	(mg/m^3)	1.0E-06	(ug/m^3)$^{-1}$	5.4E-08	2.9E-04	(mg/m^3)	NA	(mg/m^3)	--
				Trichloroethene (Nonmutagenic)	4.5E-04	mg/m^3	8.3E-06	(mg/m^3)	3.1E-06	(ug/m^3)$^{-1}$	2.6E-08	2.9E-04	(mg/m^3)	2.0E-03	(mg/m^3)	0.1
			Exp. Route Total								7.9E-08					0.1
		Exposure Point Total									7.9E-08					0.1
	Exposure Medium Total										7.9E-08					0.1
Medium Total											9.6E-08					0.2

TABLE 7.4.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Groundwater	Site 43	Ingestion	1,3-Dinitrobenzene	0.212	ug/L	2.6E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	8.9E-06	(mg/kg/day)	1.0E-04	(mg/kg/day)	0.09
				2,6-Dinitrotoluene	0.504	ug/L	6.1E-07	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	9.1E-07	2.1E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.07
				3-Nitrotoluene	0.378	ug/L	4.6E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.6E-05	(mg/kg/day)	1.0E-04	(mg/kg/day)	0.2
				Arsenic	2.8	ug/L	3.4E-06	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	5.1E-06	1.2E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.4
				Barium	138	ug/L	1.7E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	5.8E-03	(mg/kg/day)	2.0E-01	(mg/kg/day)	0.03
				Beryllium	0.82	ug/L	9.9E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.5E-05	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.02
				Cobalt	48.9	ug/L	5.9E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.1E-03	(mg/kg/day)	3.0E-04	(mg/kg/day)	6.9
				Iron	24800	ug/L	3.0E-02	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.0E+00	(mg/kg/day)	7.0E-01	(mg/kg/day)	1.5
				Manganese	481	ug/L	5.8E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.0E-02	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.8
				Nickel	32.8	ug/L	4.0E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.4E-03	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.07
				Thallium	0.803	ug/L	9.7E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.4E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				1,1-Dichloroethane	4.7	ug/L	5.7E-06	(mg/kg/day)	5.7E-03	(mg/kg/day)$^{-1}$	3.2E-08	2.0E-04	(mg/kg/day)	2.0E-01	(mg/kg/day)	0.0010
				1,1-Dichloroethene	4.4	ug/L	5.3E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.9E-04	(mg/kg/day)	5.0E-02	(mg/kg/day)	0.004
				1,2-Dichloroethane	0.36	ug/L	4.3E-07	(mg/kg/day)	9.1E-02	(mg/kg/day)$^{-1}$	3.9E-08	1.5E-05	(mg/kg/day)	6.0E-03	(mg/kg/day)	0.003
				Cis-1,2-Dichloroethene	58	ug/L	7.0E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.4E-03	(mg/kg/day)	2.0E-03	(mg/kg/day)	1.2
				Trichloroethene (Mutagenic)	2680	ug/L	2.1E-02	(mg/kg/day)	9.3E-03	(mg/kg/day)$^{-1}$	2.0E-04	1.1E-01	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	2680	ug/L	3.2E-03	(mg/kg/day)	3.7E-02	(mg/kg/day)$^{-1}$	1.2E-04	1.1E-01	(mg/kg/day)	5.0E-04	(mg/kg/day)	226
				Vinyl Chloride	8	ug/L	3.6E-04	(mg/kg/day)	7.2E-01	(mg/kg/day)$^{-1}$	2.6E-04	3.4E-04	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.1
			Exp. Route Total								5.8E-04					238
			Dermal	1,3-Dinitrobenzene	0.212	ug/L	6.8E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.4E-07	(mg/kg/day)	1.0E-04	(mg/kg/day)	0.002
				2,6-Dinitrotoluene	0.504	ug/L	2.1E-08	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	3.2E-08	7.4E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.002
				3-Nitrotoluene	0.378	ug/L	6.4E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.2E-06	(mg/kg/day)	1.0E-04	(mg/kg/day)	0.02
				Arsenic	2.8	ug/L	1.1E-08	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	1.7E-08	3.9E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.001
				Barium	138	ug/L	5.5E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.9E-05	(mg/kg/day)	1.4E-02	(mg/kg/day)	0.001
				Beryllium	0.82	ug/L	3.3E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.1E-07	(mg/kg/day)	1.4E-05	(mg/kg/day)	0.008
				Cobalt	48.9	ug/L	7.8E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.7E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.009
				Iron	24800	ug/L	9.9E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.5E-03	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.005
				Manganese	481	ug/L	1.9E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	6.7E-05	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.07
				Nickel	32.8	ug/L	2.6E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	9.1E-07	(mg/kg/day)	8.0E-04	(mg/kg/day)	0.001
				Thallium	0.803	ug/L	3.2E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				1,1-Dichloroethane	4.7	ug/L	3.8E-07	(mg/kg/day)	5.7E-03	(mg/kg/day)$^{-1}$	2.1E-09	1.3E-05	(mg/kg/day)	2.0E-01	(mg/kg/day)	0.00007
				1,1-Dichloroethene	4.4	ug/L	6.0E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.1E-05	(mg/kg/day)	5.0E-02	(mg/kg/day)	0.0004
				1,2-Dichloroethane	0.36	ug/L	1.8E-08	(mg/kg/day)	9.1E-02	(mg/kg/day)$^{-1}$	1.6E-09	6.3E-07	(mg/kg/day)	6.0E-03	(mg/kg/day)	0.0001
				Cis-1,2-Dichloroethene	58	ug/L	7.3E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.6E-04	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.1
				Trichloroethene (Mutagenic)	2680	ug/L	3.0E-03	(mg/kg/day)	9.3E-03	(mg/kg/day)$^{-1}$	2.8E-05	1.6E-02	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	2680	ug/L	4.6E-04	(mg/kg/day)	3.7E-02	(mg/kg/day)$^{-1}$	1.7E-05	1.6E-02	(mg/kg/day)	5.0E-04	(mg/kg/day)	32
				Vinyl Chloride	8	ug/L	1.6E-05	(mg/kg/day)	7.2E-01	(mg/kg/day)$^{-1}$	1.1E-05	1.5E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.005
			Exp. Route Total								5.6E-05					32
		Exposure Point Total									6.4E-04					270
	Exposure Medium Total										6.4E-04					270
Medium Total											6.4E-04					270
Surface Water	Surface Water	Site 43	Ingestion	Arsenic	1.21	ug/L	3.3E-09	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	4.9E-09	1.1E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0004
				Cobalt	25.9	ug/L	7.0E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.5E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.008
				Cis-1,2-Dichloroethene	195	ug/L	5.3E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.9E-05	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.009
				Trichloroethene (Mutagenic)	240	ug/L	4.2E-06	(mg/kg/day)	9.3E-03	(mg/kg/day)$^{-1}$	3.9E-08	2.3E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	240	ug/L	6.5E-07	(mg/kg/day)	3.7E-02	(mg/kg/day)$^{-1}$	2.4E-08	2.3E-05	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.05
				Vinyl Chloride	1.26	ug/L	1.7E-06	(mg/kg/day)	7.2E-01	(mg/kg/day)$^{-1}$	1.2E-06	1.2E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.00004
			Exp. Route Total								1.3E-06					0.06
			Dermal	Arsenic	1.21	ug/L	9.2E-10	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	1.4E-09	3.2E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0001
				Cobalt	25.9	ug/L	7.9E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.8E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0009
				Cis-1,2-Dichloroethene	195	ug/L	2.2E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	7.6E-05	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.04
				Trichloroethene (Mutagenic)	240	ug/L	2.2E-05	(mg/kg/day)	9.3E-03	(mg/kg/day)$^{-1}$	2.0E-07	1.2E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	240	ug/L	3.3E-06	(mg/kg/day)	3.7E-02	(mg/kg/day)$^{-1}$	1.2E-07	1.2E-04	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.2
				Vinyl Chloride	1.26	ug/L	3.2E-06	(mg/kg/day)	7.2E-01	(mg/kg/day)$^{-1}$	2.3E-06	2.3E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.00008
			Exp. Route Total								2.7E-06					0.3
		Exposure Point Total									3.9E-06					0.3
	Exposure Medium Total										3.9E-06					0.3
Medium Total											3.9E-06					0.3
										Total of Receptor Risks Across All Media	6.6E-04				Total of Receptor Hazards Across All Media	271

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.5.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Site 43	Ingestion	Aluminum	17600	mg/kg	8.1E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	8.1E-03	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.008
				Cadmium	10.8	mg/kg	4.9E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	4.9E-06	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.005
				Chromium VI	28.1	mg/kg	2.0E-06	(mg/kg/day)	5.0E-01	(mg/kg/day)$^{-1}$	1.0E-06	1.3E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.004
				Trichloroethene (Mutagenic)	2.72	mg/kg	2.0E-07	(mg/kg/day)	9.3E-03	(mg/kg/day)$^{-1}$	1.8E-09	1.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	2.72	mg/kg	1.2E-07	(mg/kg/day)	3.7E-02	(mg/kg/day)$^{-1}$	4.6E-09	1.2E-06	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.002
			Exp. Route Total								1.0E-06					0.02
			Dermal	Aluminum	17600	mg/kg	9.2E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	9.2E-05	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.00009
				Cadmium	10.8	mg/kg	5.6E-10	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	5.6E-09	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.0002
				Chromium VI	28.1	mg/kg	2.3E-08	(mg/kg/day)	2.0E+01	(mg/kg/day)$^{-1}$	4.6E-07	1.5E-07	(mg/kg/day)	7.5E-05	(mg/kg/day)	0.002
				Trichloroethene (Mutagenic)	2.72	mg/kg	6.7E-09	(mg/kg/day)	9.3E-03	(mg/kg/day)$^{-1}$	6.2E-11	4.3E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	2.72	mg/kg	4.3E-09	(mg/kg/day)	3.7E-02	(mg/kg/day)$^{-1}$	1.6E-10	4.3E-08	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.00009
			Exp. Route Total								4.6E-07					0.002
		Exposure Point Total									1.5E-06					0.02
	Exposure Medium Total										1.5E-06					0.02
	Air	Site 43	Inhalation	Aluminum	5.4E-06	mg/m^3	3.5E-07	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	3.5E-06	(mg/m^3)	5.0E-03	(mg/m^3)	0.0007
				Cadmium	3.3E-09	mg/m^3	2.1E-10	(mg/m^3)	1.8E-03	(ug/m^3)$^{-1}$	3.9E-10	2.1E-09	(mg/m^3)	1.0E-05	(mg/m^3)	0.0002
				Chromium VI	8.7E-09	mg/m^3	8.8E-10	(mg/m^3)	8.4E-02	(ug/m^3)$^{-1}$	7.4E-08	5.6E-09	(mg/m^3)	1.0E-04	(mg/m^3)	0.00006
				Trichloroethene (Mutagenic)	8.9E-04	mg/m^3	9.0E-05	(mg/m^3)	1.0E-06	(ug/m^3)$^{-1}$	9.0E-08	5.7E-04	(mg/m^3)	NA	(mg/m^3)	--
				Trichloroethene (Nonmutagenic)	8.9E-04	mg/m^3	5.7E-05	(mg/m^3)	3.1E-06	(ug/m^3)$^{-1}$	1.8E-07	5.7E-04	(mg/m^3)	2.0E-03	(mg/m^3)	0.3
			Exp. Route Total								3.4E-07					0.3
		Exposure Point Total									3.4E-07					0.3
	Exposure Medium Total										3.4E-07					0.3
Medium Total											1.8E-06					0.3
Subsurface Soil	Subsurface Soil	Site 43	Ingestion	Manganese	92.3	mg/kg	4.2E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	4.2E-05	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.002
				Trichloroethene (Mutagenic)	1.37	mg/kg	9.9E-08	(mg/kg/day)	9.3E-03	(mg/kg/day)$^{-1}$	9.2E-10	6.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	1.37	mg/kg	6.3E-08	(mg/kg/day)	3.7E-02	(mg/kg/day)$^{-1}$	2.3E-09	6.3E-07	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.001
			Exp. Route Total								3.2E-09					0.003
			Dermal	Manganese	92.3	mg/kg	4.8E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	4.8E-07	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.0005
				Trichloroethene (Mutagenic)	1.37	mg/kg	3.4E-09	(mg/kg/day)	9.3E-03	(mg/kg/day)$^{-1}$	3.1E-11	2.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	1.37	mg/kg	2.1E-09	(mg/kg/day)	3.7E-02	(mg/kg/day)$^{-1}$	7.9E-11	2.1E-08	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.00004
			Exp. Route Total								1.1E-10					0.0005
		Exposure Point Total									3.3E-09					0.004
	Exposure Medium Total										3.3E-09					0.004
	Air	Site 43	Inhalation	Manganese	2.9E-08	mg/m^3	1.8E-09	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	1.8E-08	(mg/m^3)	5.0E-05	(mg/m^3)	0.0004
				Trichloroethene (Mutagenic)	4.5E-04	mg/m^3	4.5E-05	(mg/m^3)	1.0E-06	(ug/m^3)$^{-1}$	4.5E-08	2.9E-04	(mg/m^3)	NA	(mg/m^3)	--
				Trichloroethene (Nonmutagenic)	4.5E-04	mg/m^3	2.9E-05	(mg/m^3)	3.1E-06	(ug/m^3)$^{-1}$	9.0E-08	2.9E-04	(mg/m^3)	2.0E-03	(mg/m^3)	0.1
			Exp. Route Total								1.3E-07					0.1
		Exposure Point Total									1.3E-07					0.1
	Exposure Medium Total										1.3E-07					0.1
Medium Total											1.4E-07					0.1
Groundwater	Groundwater	Site 43	Ingestion	1,3-Dinitrobenzene	0.212	ug/L	4.1E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	4.1E-06	(mg/kg/day)	1.0E-04	(mg/kg/day)	0.04
				2,6-Dinitrotoluene	0.504	ug/L	9.7E-07	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	1.4E-06	9.7E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.03
				3-Nitrotoluene	0.378	ug/L	7.2E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	7.2E-06	(mg/kg/day)	1.0E-04	(mg/kg/day)	0.07
				Arsenic	2.8	ug/L	5.4E-06	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	8.1E-06	5.4E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.2
				Barium	138	ug/L	2.6E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.6E-03	(mg/kg/day)	2.0E-01	(mg/kg/day)	0.01
				Beryllium	0.82	ug/L	1.6E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.6E-05	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.008
				Cobalt	48.9	ug/L	9.4E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	9.4E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	3.1
				Iron	24800	ug/L	4.8E-02	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	4.8E-01	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.7
				Manganese	481	ug/L	9.2E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	9.2E-03	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.4
				Nickel	32.8	ug/L	6.3E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	6.3E-04	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.03
				Thallium	0.803	ug/L	1.5E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.5E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				1,1-Dichloroethane	4.7	ug/L	9.0E-06	(mg/kg/day)	5.7E-03	(mg/kg/day)$^{-1}$	5.1E-08	9.0E-05	(mg/kg/day)	2.0E-01	(mg/kg/day)	0.0005
				1,1-Dichloroethene	4.4	ug/L	8.4E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	8.4E-05	(mg/kg/day)	5.0E-02	(mg/kg/day)	0.002
				1,2-Dichloroethane	0.36	ug/L	6.9E-07	(mg/kg/day)	9.1E-02	(mg/kg/day)$^{-1}$	6.3E-08	6.9E-06	(mg/kg/day)	6.0E-03	(mg/kg/day)	0.001
				Cis-1,2-Dichloroethene	58	ug/L	1.1E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.1E-03	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.6
				Trichloroethene (Mutagenic)	2680	ug/L	8.1E-03	(mg/kg/day)	9.3E-03	(mg/kg/day)$^{-1}$	7.5E-05	5.1E-02	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	2680	ug/L	5.1E-03	(mg/kg/day)	3.7E-02	(mg/kg/day)$^{-1}$	1.9E-04	5.1E-02	(mg/kg/day)	5.0E-04	(mg/kg/day)	103
				Vinyl Chloride	8	ug/L	1.5E-05	(mg/kg/day)	7.2E-01	(mg/kg/day)$^{-1}$	1.1E-05	1.5E-04	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.05
			Exp. Route Total								2.8E-04					108

TABLE 7.5.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Groundwater	Site 43	Dermal	1,3-Dinitrobenzene	0.212	ug/L	1.2E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-07	(mg/kg/day)	1.0E-04	(mg/kg/day)	0.001
				2,6-Dinitrotoluene	0.504	ug/L	3.8E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	5.6E-08	3.8E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.001
				3-Nitrotoluene	0.378	ug/L	1.1E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-06	(mg/kg/day)	1.0E-04	(mg/kg/day)	0.01
				Arsenic	2.8	ug/L	1.7E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.6E-08	1.7E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0006
				Barium	138	ug/L	8.5E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.5E-06	(mg/kg/day)	1.4E-02	(mg/kg/day)	0.0006
				Beryllium	0.82	ug/L	5.1E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.1E-08	(mg/kg/day)	1.4E-05	(mg/kg/day)	0.004
				Cobalt	48.9	ug/L	1.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.004
				Iron	24800	ug/L	1.5E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.5E-03	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.002
				Manganese	481	ug/L	3.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.0E-05	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.03
				Nickel	32.8	ug/L	4.0E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.0E-07	(mg/kg/day)	8.0E-04	(mg/kg/day)	0.0005
				Thallium	0.803	ug/L	5.0E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.0E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				1,1-Dichloroethane	4.7	ug/L	6.7E-07	(mg/kg/day)	5.7E-03	$(mg/kg/day)^{-1}$	3.8E-09	6.7E-06	(mg/kg/day)	2.0E-01	(mg/kg/day)	0.00003
				1,1-Dichloroethene	4.4	ug/L	1.1E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-05	(mg/kg/day)	5.0E-02	(mg/kg/day)	0.0002
				1,2-Dichloroethane	0.36	ug/L	3.2E-08	(mg/kg/day)	9.1E-02	$(mg/kg/day)^{-1}$	2.9E-09	3.2E-07	(mg/kg/day)	6.0E-03	(mg/kg/day)	0.00005
				Cis-1,2-Dichloroethene	58	ug/L	1.3E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-04	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.07
				Trichloroethene (Mutagenic)	2680	ug/L	1.3E-03	(mg/kg/day)	9.3E-03	$(mg/kg/day)^{-1}$	1.2E-05	8.1E-03	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	2680	ug/L	8.1E-04	(mg/kg/day)	3.7E-02	$(mg/kg/day)^{-1}$	3.0E-05	8.1E-03	(mg/kg/day)	5.0E-04	(mg/kg/day)	16
				Vinyl Chloride	8	ug/L	7.5E-07	(mg/kg/day)	7.2E-01	$(mg/kg/day)^{-1}$	5.4E-07	7.5E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.002
			Exp. Route Total								4.2E-05					16
		Exposure Point Total									3.3E-04					124
	Exposure Medium Total										3.3E-04					124
	Air	Site 43	Inhalation	1,3-Dinitrobenzene	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				2,6-Dinitrotoluene	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				3-Nitrotoluene	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Arsenic	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	1.5E-05	(mg/m^3)	--
				Barium	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	5.0E-04	(mg/m^3)	--
				Beryllium	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	2.4E-03	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	2.0E-05	(mg/m^3)	--
				Cobalt	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	6.0E-06	(mg/m^3)	--
				Iron	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	5.0E-05	(mg/m^3)	--
				Nickel	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	2.6E-04	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	9.0E-05	(mg/m^3)	--
				Thallium	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				1,1-Dichloroethane	8.0E-04	mg/m^3	3.2E-06	(mg/m^3)	1.6E-06	$(ug/m^3)^{-1}$	5.1E-09	3.2E-05	(mg/m^3)	NA	(mg/m^3)	--
				1,1-Dichloroethene	7.8E-04	mg/m^3	3.1E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.1E-05	(mg/m^3)	2.0E-01	(mg/m^3)	0.0002
				1,2-Dichloroethane	5.3E-05	mg/m^3	2.1E-07	(mg/m^3)	2.6E-05	$(ug/m^3)^{-1}$	5.5E-09	2.1E-06	(mg/m^3)	7.0E-03	(mg/m^3)	0.0003
				Cis-1,2-Dichloroethene	9.8E-03	mg/m^3	3.9E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.9E-04	(mg/m^3)	NA	(mg/m^3)	--
				Trichloroethene (Mutagenic)	4.1E-01	mg/m^3	2.6E-03	(mg/m^3)	1.0E-06	$(ug/m^3)^{-1}$	2.6E-06	1.6E-02	(mg/m^3)	NA	(mg/m^3)	--
				Trichloroethene (Nonmutagenic)	4.1E-01	mg/m^3	1.6E-03	(mg/m^3)	3.1E-06	$(ug/m^3)^{-1}$	5.0E-06	1.6E-02	(mg/m^3)	2.0E-03	(mg/m^3)	8.1
				Vinyl Chloride	1.7E-03	mg/m^3	6.9E-06	(mg/m^3)	4.4E-06	$(ug/m^3)^{-1}$	3.1E-08	6.9E-05	(mg/m^3)	1.0E-01	(mg/m^3)	0.0007
			Exp. Route Total								7.6E-06					8.1
		Exposure Point Total									7.6E-06					8.1
	Exposure Medium Total										7.6E-06					8.1
Medium Total											3.3E-04					132

TABLE 7.5.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Surface Water	Site 43	Ingestion	Arsenic	1.21	ug/L	2.5E-09	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	3.7E-09	2.5E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.00008
				Cobalt	25.9	ug/L	5.3E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.3E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.002
				Cis-1,2-Dichloroethene	195	ug/L	4.0E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.0E-06	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.002
				Trichloroethene (Mutagenic)	240	ug/L	7.7E-07	(mg/kg/day)	9.3E-03	$(mg/kg/day)^{-1}$	7.1E-09	4.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	240	ug/L	4.9E-07	(mg/kg/day)	3.7E-02	$(mg/kg/day)^{-1}$	1.8E-08	4.9E-06	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.010
				Vinyl Chloride	1.26	ug/L	2.6E-09	(mg/kg/day)	7.2E-01	$(mg/kg/day)^{-1}$	1.8E-09	2.6E-08	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.000009
			Exp. Route Total								3.1E-08					0.01
			Dermal	Arsenic	1.21	ug/L	1.4E-09	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.1E-09	1.4E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.00005
				Cobalt	25.9	ug/L	1.2E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0004
				Cis-1,2-Dichloroethene	195	ug/L	3.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.3E-05	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.02
				Trichloroethene (Mutagenic)	240	ug/L	8.0E-06	(mg/kg/day)	9.3E-03	$(mg/kg/day)^{-1}$	7.4E-08	5.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	240	ug/L	5.1E-06	(mg/kg/day)	3.7E-02	$(mg/kg/day)^{-1}$	1.9E-07	5.1E-05	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.1
				Vinyl Chloride	1.26	ug/L	1.0E-08	(mg/kg/day)	7.2E-01	$(mg/kg/day)^{-1}$	7.2E-09	1.0E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.00003
			Exp. Route Total								2.7E-07					0.1
		Exposure Point Total									3.0E-07					0.1
	Exposure Medium Total										3.0E-07					0.1
Medium Total											3.0E-07					0.1
										Total of Receptor Risks Across All Media	3.4E-04				Total of Receptor Hazards Across All Media	133

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.6.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Site 43 including Background	Ingestion	Aluminum	17600	mg/kg	2.4E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.7E-02	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.02
				Arsenic	7.2	mg/kg	6.0E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	9.0E-08	4.2E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.01
				Cadmium	10.8	mg/kg	1.5E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.0E-05	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.01
				Chromium VI	28.1	mg/kg	3.9E-07	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	1.9E-07	2.7E-05	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.005
				Cobalt	12.1	mg/kg	1.7E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.004
				Iron	22800	mg/kg	3.2E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.2E-02	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.03
				Manganese	1200	mg/kg	1.7E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-03	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.05
				Thallium	0.664	mg/kg	9.2E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Vanadium	38.5	mg/kg	5.3E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.7E-05	(mg/kg/day)	1.0E-02	(mg/kg/day)	0.004
				Trichloroethene	2.72	mg/kg	3.8E-08	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	1.7E-09	2.6E-06	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.005
			Exp. Route Total								2.9E-07					0.1
			Dermal	Aluminum	17600	mg/kg	4.9E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.4E-04	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.0003
				Arsenic	7.2	mg/kg	6.0E-09	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	9.0E-09	4.2E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.001
				Cadmium	10.8	mg/kg	3.0E-10	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.1E-08	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.0008
				Chromium VI	28.1	mg/kg	7.8E-09	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	1.6E-07	5.4E-07	(mg/kg/day)	1.3E-04	(mg/kg/day)	0.004
				Cobalt	12.1	mg/kg	3.3E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.3E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.00008
				Iron	22800	mg/kg	6.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.4E-04	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.0006
				Manganese	1200	mg/kg	3.3E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.3E-05	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.02
				Thallium	0.664	mg/kg	1.8E-10	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Vanadium	38.5	mg/kg	1.1E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.5E-07	(mg/kg/day)	2.6E-04	(mg/kg/day)	0.003
				Trichloroethene	2.72	mg/kg	2.3E-09	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	1.0E-10	1.6E-07	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.0003
			Exp. Route Total								1.6E-07					0.04
		Exposure Point Total									4.5E-07					0.2
	Exposure Medium Total										4.5E-07					0.2
	Air	Site 43 including Background	Inhalation	Aluminum	1.1E-02	mg/m^3	2.1E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.5E-03	(mg/m^3)	5.0E-03	(mg/m^3)	0.3
				Arsenic	4.4E-06	mg/m^3	8.7E-09	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	3.7E-08	6.1E-07	(mg/m^3)	1.5E-05	(mg/m^3)	0.04
				Cadmium	6.7E-06	mg/m^3	1.3E-08	(mg/m^3)	1.8E-03	$(ug/m^3)^{-1}$	2.3E-08	9.1E-07	(mg/m^3)	1.0E-05	(mg/m^3)	0.09
				Chromium VI	1.7E-05	mg/m^3	3.4E-08	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	2.9E-06	2.4E-06	(mg/m^3)	3.0E-04	(mg/m^3)	0.008
				Cobalt	7.5E-06	mg/m^3	1.5E-08	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	1.3E-07	1.0E-06	(mg/m^3)	2.0E-05	(mg/m^3)	0.05
				Iron	1.4E-02	mg/m^3	2.8E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.9E-03	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	7.4E-04	mg/m^3	1.4E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.0E-04	(mg/m^3)	5.0E-05	(mg/m^3)	2.0
				Thallium	4.1E-07	mg/m^3	8.0E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.6E-08	(mg/m^3)	NA	(mg/m^3)	--
				Vanadium	2.4E-05	mg/m^3	4.7E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.3E-06	(mg/m^3)	NA	(mg/m^3)	--
				Trichloroethene	5.5E-03	mg/m^3	1.1E-05	(mg/m^3)	4.1E-06	$(ug/m^3)^{-1}$	4.4E-08	7.6E-04	(mg/m^3)	2.0E-03	(mg/m^3)	0.4
			Exp. Route Total								3.1E-06					2.9
		Exposure Point Total									3.1E-06					2.9
	Exposure Medium Total										3.1E-06					2.9
Medium Total											3.5E-06					3.1
Subsurface Soil	Subsurface Soil	Site 43 including Background	Ingestion	Aluminum	8950	mg/kg	1.2E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.7E-03	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.009
				Arsenic	2.38	mg/kg	2.0E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	3.0E-08	1.4E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.005
				Chromium VI	15.4	mg/kg	2.1E-07	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	1.1E-07	1.5E-05	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.003
				Cobalt	4.9	mg/kg	6.8E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.7E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.002
				Iron	13000	mg/kg	1.8E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-02	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.02
				Manganese	92.3	mg/kg	1.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.9E-05	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.004
				Trichloroethene	1.37	mg/kg	1.9E-08	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	8.7E-10	1.3E-06	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.003
			Exp. Route Total								1.4E-07					0.04
			Dermal	Aluminum	8950	mg/kg	2.5E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.7E-04	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.0002
				Arsenic	2.38	mg/kg	2.0E-09	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	3.0E-09	1.4E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0005
				Chromium VI	15.4	mg/kg	4.3E-09	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	8.5E-08	3.0E-07	(mg/kg/day)	1.3E-04	(mg/kg/day)	0.002
				Cobalt	4.9	mg/kg	1.4E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.5E-08	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.00003
				Iron	13000	mg/kg	3.6E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.5E-04	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.0004
				Manganese	92.3	mg/kg	2.6E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.8E-06	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.002
				Trichloroethene	1.37	mg/kg	1.1E-09	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	5.2E-11	8.0E-08	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.0002
			Exp. Route Total								8.8E-08					0.005
		Exposure Point Total									2.3E-07					0.05
	Exposure Medium Total										2.3E-07					0.05

TABLE 7.6.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Subsurface Soil	Air	Site 43 including Background	Inhalation	Aluminum	5.5E-03	mg/m^3	1.1E-05	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	7.6E-04	(mg/m^3)	5.0E-03	(mg/m^3)	0.2
				Arsenic	1.5E-06	mg/m^3	2.9E-09	(mg/m^3)	4.3E-03	(ug/m^3)$^{-1}$	1.2E-08	2.0E-07	(mg/m^3)	1.5E-05	(mg/m^3)	0.01
				Chromium VI	9.5E-06	mg/m^3	1.9E-08	(mg/m^3)	8.4E-02	(ug/m^3)$^{-1}$	1.6E-06	1.3E-06	(mg/m^3)	3.0E-04	(mg/m^3)	0.004
				Cobalt	3.0E-06	mg/m^3	5.9E-09	(mg/m^3)	9.0E-03	(ug/m^3)$^{-1}$	5.3E-08	4.1E-07	(mg/m^3)	2.0E-05	(mg/m^3)	0.02
				Iron	8.0E-03	mg/m^3	1.6E-05	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	1.1E-03	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	5.7E-05	mg/m^3	1.1E-07	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	7.8E-06	(mg/m^3)	5.0E-05	(mg/m^3)	0.2
				Trichloroethene	2.8E-03	mg/m^3	5.5E-06	(mg/m^3)	4.1E-06	(ug/m^3)$^{-1}$	2.2E-08	3.8E-04	(mg/m^3)	2.0E-03	(mg/m^3)	0.2
			Exp. Route Total								1.7E-06					0.5
		Exposure Point Total									1.7E-06					0.5
	Exposure Medium Total										1.7E-06					0.5
Medium Total											1.9E-06					0.6
Groundwater	Groundwater	Site 43 including Background	Ingestion	1,3-Dinitrobenzene	0.212	ug/L	3.6E-11	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.5E-09	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.000005
				2,6-Dinitrotoluene	0.504	ug/L	8.5E-11	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	1.3E-10	5.9E-09	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.000001
				3-Nitrotoluene	0.378	ug/L	6.3E-11	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	4.4E-09	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.000004
				Arsenic	2.8	ug/L	4.7E-10	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	7.0E-10	3.3E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0001
				Barium	138	ug/L	2.3E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.6E-06	(mg/kg/day)	2.0E-01	(mg/kg/day)	0.000008
				Beryllium	0.82	ug/L	1.4E-10	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	9.6E-09	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.000002
				Cadmium	0.422	ug/L	7.1E-11	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	5.0E-09	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.000005
				Chromium VI	1.5	ug/L	2.5E-10	(mg/kg/day)	5.0E-01	(mg/kg/day)$^{-1}$	1.3E-10	1.8E-08	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.000004
				Cobalt	48.9	ug/L	8.2E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	5.7E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0002
				Iron	24800	ug/L	4.2E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.9E-04	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.0004
				Manganese	481	ug/L	8.1E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	5.6E-06	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.0002
				Nickel	32.8	ug/L	5.5E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.9E-07	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.00002
				Thallium	0.803	ug/L	1.3E-10	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	9.4E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Vanadium	2.5	ug/L	4.2E-10	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.9E-08	(mg/kg/day)	1.0E-02	(mg/kg/day)	0.000003
				1,1-Dichloroethane	4.7	ug/L	7.9E-10	(mg/kg/day)	5.7E-03	(mg/kg/day)$^{-1}$	4.5E-12	5.5E-08	(mg/kg/day)	2.0E+00	(mg/kg/day)	2.8E-8
				1,1-Dichloroethene	4.4	ug/L	7.4E-10	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	5.2E-08	(mg/kg/day)	9.0E-03	(mg/kg/day)	0.000006
				1,2-Dichloroethane	0.36	ug/L	6.0E-11	(mg/kg/day)	9.1E-02	(mg/kg/day)$^{-1}$	5.5E-12	4.2E-09	(mg/kg/day)	2.0E-02	(mg/kg/day)	2.1E-7
				Cis-1,2-Dichloroethene	58	ug/L	9.7E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	6.8E-07	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.00003
				Trichloroethene	2680	ug/L	4.5E-07	(mg/kg/day)	4.6E-02	(mg/kg/day)$^{-1}$	2.1E-08	3.1E-05	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.06
				Vinyl Chloride	8	ug/L	1.3E-09	(mg/kg/day)	7.2E-01	(mg/kg/day)$^{-1}$	9.7E-10	9.4E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0003
			Exp. Route Total								2.3E-08					0.06
			Dermal	1,3-Dinitrobenzene	0.212	ug/L	7.7E-11	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	5.4E-09	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.00001
				2,6-Dinitrotoluene	0.504	ug/L	2.4E-10	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	3.6E-10	1.7E-08	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.000004
				3-Nitrotoluene	0.378	ug/L	7.5E-10	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	5.2E-08	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.00005
				Arsenic	2.8	ug/L	3.1E-10	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	4.6E-10	2.2E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.00007
				Barium	138	ug/L	1.5E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.1E-06	(mg/kg/day)	1.4E-02	(mg/kg/day)	0.00008
				Beryllium	0.82	ug/L	9.1E-11	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	6.4E-09	(mg/kg/day)	3.5E-05	(mg/kg/day)	0.0002
				Cadmium	0.422	ug/L	4.7E-11	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.3E-09	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.0001
				Chromium VI	1.5	ug/L	3.3E-10	(mg/kg/day)	2.0E+01	(mg/kg/day)$^{-1}$	6.6E-09	2.3E-08	(mg/kg/day)	1.3E-04	(mg/kg/day)	0.0002
				Cobalt	48.9	ug/L	2.2E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.5E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.00005
				Iron	24800	ug/L	2.7E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.9E-04	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.0003
				Manganese	481	ug/L	5.3E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.7E-06	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.004
				Nickel	32.8	ug/L	7.3E-10	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	5.1E-08	(mg/kg/day)	8.0E-04	(mg/kg/day)	0.00006
				Thallium	0.803	ug/L	8.9E-11	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	6.2E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Vanadium	2.5	ug/L	2.8E-10	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.9E-08	(mg/kg/day)	2.6E-04	(mg/kg/day)	0.00007
				1,1-Dichloroethane	4.7	ug/L	4.8E-09	(mg/kg/day)	5.7E-03	(mg/kg/day)$^{-1}$	2.7E-11	3.4E-07	(mg/kg/day)	2.0E+00	(mg/kg/day)	1.7E-7
				1,1-Dichloroethene	4.4	ug/L	7.6E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	5.4E-07	(mg/kg/day)	9.0E-03	(mg/kg/day)	0.00006
				1,2-Dichloroethane	0.36	ug/L	2.3E-10	(mg/kg/day)	9.1E-02	(mg/kg/day)$^{-1}$	2.1E-11	1.6E-08	(mg/kg/day)	2.0E-02	(mg/kg/day)	8.0E-7
				Cis-1,2-Dichloroethene	58	ug/L	9.4E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	6.6E-06	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0003
				Trichloroethene	2680	ug/L	5.4E-06	(mg/kg/day)	4.6E-02	(mg/kg/day)$^{-1}$	2.5E-07	3.8E-04	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.8
				Vinyl Chloride	8	ug/L	6.1E-09	(mg/kg/day)	7.2E-01	(mg/kg/day)$^{-1}$	4.4E-09	4.3E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.001
			Exp. Route Total								2.6E-07					0.8
		Exposure Point Total									2.8E-07					0.8
	Exposure Medium Total										2.8E-07					0.8

TABLE 7.6.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Air	Site 43 including Background	Inhalation	1,3-Dinitrobenzene	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				2,6-Dinitrotoluene	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				3-Nitrotoluene	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Arsenic	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	4.3E-03	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	1.5E-05	(mg/m^3)	--
				Barium	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	5.0E-03	(mg/m^3)	--
				Beryllium	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	2.4E-03	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	2.0E-05	(mg/m^3)	--
				Cadmium	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	1.8E-03	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	1.0E-05	(mg/m^3)	--
				Chromium VI	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	8.4E-02	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	3.0E-04	(mg/m^3)	--
				Cobalt	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	9.0E-03	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	2.0E-05	(mg/m^3)	--
				Iron	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	5.0E-05	(mg/m^3)	--
				Nickel	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	2.6E-04	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	2.0E-04	(mg/m^3)	--
				Thallium	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Vanadium	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				1,1-Dichloroethane	1.7E-04	mg/m^3	1.7E-08	(mg/m^3)	1.6E-06	(ug/m^3)$^{-1}$	2.7E-11	1.2E-06	(mg/m^3)	NA	(mg/m^3)	--
				1,1-Dichloroethene	1.7E-04	mg/m^3	1.6E-08	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	1.1E-06	(mg/m^3)	7.9E-02	(mg/m^3)	0.00001
				1,2-Dichloroethane	1.3E-05	mg/m^3	1.3E-09	(mg/m^3)	2.6E-05	(ug/m^3)$^{-1}$	3.3E-11	8.8E-08	(mg/m^3)	7.0E-02	(mg/m^3)	0.000001
				Cis-1,2-Dichloroethene	2.2E-03	mg/m^3	2.1E-07	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	1.5E-05	(mg/m^3)	NA	(mg/m^3)	--
				Trichloroethene	8.6E-02	mg/m^3	8.4E-06	(mg/m^3)	4.1E-06	(ug/m^3)$^{-1}$	3.5E-08	5.9E-04	(mg/m^3)	2.0E-03	(mg/m^3)	0.3
				Vinyl Chloride	3.7E-04	mg/m^3	3.7E-08	(mg/m^3)	4.4E-06	(ug/m^3)$^{-1}$	1.6E-10	2.6E-06	(mg/m^3)	7.7E-02	(mg/m^3)	0.00003
			Exp. Route Total								3.5E-08					0.3
		Exposure Point Total									3.5E-08					0.3
	Exposure Medium Total										3.5E-08					0.3
Medium Total											3.2E-07					1.1
Surface Water	Surface Water	Site 43	Ingestion	Arsenic	1.21	ug/L	3.5E-10	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	5.3E-10	2.5E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.00008
				Cobalt	25.9	ug/L	7.5E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	5.3E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0002
				Cis-1,2-Dichloroethene	195	ug/L	5.7E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	4.0E-06	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0002
				Trichloroethene	240	ug/L	7.0E-08	(mg/kg/day)	4.6E-02	(mg/kg/day)$^{-1}$	3.2E-09	4.9E-06	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.010
				Vinyl Chloride	1.26	ug/L	3.7E-10	(mg/kg/day)	7.2E-01	(mg/kg/day)$^{-1}$	2.6E-10	2.6E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.00009
			Exp. Route Total								4.0E-09					0.01
			Dermal	Arsenic	1.21	ug/L	1.2E-10	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	1.7E-10	8.1E-09	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.00003
				Cobalt	25.9	ug/L	9.9E-10	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	7.0E-08	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.00002
				Cis-1,2-Dichloroethene	195	ug/L	2.7E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.9E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0010
				Trichloroethene	240	ug/L	4.2E-07	(mg/kg/day)	4.6E-02	(mg/kg/day)$^{-1}$	1.9E-08	2.9E-05	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.06
				Vinyl Chloride	1.26	ug/L	8.3E-10	(mg/kg/day)	7.2E-01	(mg/kg/day)$^{-1}$	6.0E-10	5.8E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0002
			Exp. Route Total								2.0E-08					0.06
		Exposure Point Total									2.4E-08					0.07
	Exposure Medium Total										2.4E-08					0.07
Medium Total											2.4E-08					0.07
										Total of Receptor Risks Across All Media	5.8E-06				Total of Receptor Hazards Across All Media	4.8

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.7.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Maintenance Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Site 43	Ingestion	Aluminum	17600	mg/kg	5.3E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.1E-04	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.0004
				Arsenic	7.2	mg/kg	1.3E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.0E-08	1.0E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0003
				Cadmium	10.8	mg/kg	3.3E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.5E-07	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.0003
				Chromium VI	28.1	mg/kg	8.5E-08	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	4.2E-08	6.6E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0002
				Cobalt	12.1	mg/kg	3.7E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.8E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0009
				Iron	22800	mg/kg	6.9E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.4E-04	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.0008
				Manganese	1200	mg/kg	3.6E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.8E-05	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.001
				Thallium	0.664	mg/kg	2.0E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.6E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Vanadium	38.5	mg/kg	1.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.0E-07	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.0002
				Trichloroethene	2.72	mg/kg	8.2E-09	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	3.8E-10	6.4E-08	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.0001
			Exp. Route Total								6.2E-08					0.004
			Dermal	Aluminum	17600	mg/kg	7.0E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.5E-06	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.000005
				Arsenic	7.2	mg/kg	8.6E-10	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.3E-09	6.7E-09	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.00002
				Cadmium	10.8	mg/kg	4.3E-11	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.3E-10	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.00001
				Chromium VI	28.1	mg/kg	1.1E-09	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	2.2E-08	8.7E-09	(mg/kg/day)	7.5E-05	(mg/kg/day)	0.0001
				Cobalt	12.1	mg/kg	4.8E-10	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.8E-09	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.00001
				Iron	22800	mg/kg	9.1E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.1E-06	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.00001
				Manganese	1200	mg/kg	4.8E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.7E-07	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.0004
				Thallium	0.664	mg/kg	2.6E-11	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.1E-10	(mg/kg/day)	NA	(mg/kg/day)	--
				Vanadium	38.5	mg/kg	1.5E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-08	(mg/kg/day)	1.3E-04	(mg/kg/day)	0.00009
				Trichloroethene	2.72	mg/kg	3.3E-10	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	1.5E-11	2.5E-09	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.000005
			Exp. Route Total								2.4E-08					0.0007
		Exposure Point Total									8.6E-08					0.005
	Exposure Medium Total										8.6E-08					0.005
	Air	Site 43	Inhalation	Aluminum	5.4E-06	mg/m^3	7.7E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	6.0E-08	(mg/m^3)	5.0E-03	(mg/m^3)	0.00001
				Arsenic	2.2E-09	mg/m^3	3.1E-12	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	1.4E-11	2.4E-11	(mg/m^3)	1.5E-05	(mg/m^3)	0.000002
				Cadmium	3.3E-09	mg/m^3	4.7E-12	(mg/m^3)	1.8E-03	$(ug/m^3)^{-1}$	8.5E-12	3.7E-11	(mg/m^3)	1.0E-05	(mg/m^3)	0.000004
				Chromium VI	8.7E-09	mg/m^3	1.2E-11	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	1.0E-09	9.5E-11	(mg/m^3)	1.0E-04	(mg/m^3)	9.5E-7
				Cobalt	3.7E-09	mg/m^3	5.3E-12	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	4.8E-11	4.1E-11	(mg/m^3)	6.0E-06	(mg/m^3)	0.000007
				Iron	7.1E-06	mg/m^3	9.9E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	7.7E-08	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	3.7E-07	mg/m^3	5.2E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.1E-09	(mg/m^3)	5.0E-05	(mg/m^3)	0.00008
				Thallium	2.1E-10	mg/m^3	2.9E-13	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.3E-12	(mg/m^3)	NA	(mg/m^3)	--
				Vanadium	1.2E-08	mg/m^3	1.7E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.3E-10	(mg/m^3)	1.0E-04	(mg/m^3)	0.000001
				Trichloroethene	8.9E-04	mg/m^3	1.3E-06	(mg/m^3)	4.1E-06	$(ug/m^3)^{-1}$	5.2E-09	9.8E-06	(mg/m^3)	2.0E-03	(mg/m^3)	0.005
			Exp. Route Total								6.3E-09					0.005
		Exposure Point Total									6.3E-09					0.005
	Exposure Medium Total										6.3E-09					0.005
Medium Total											9.2E-08					0.01

TABLE 7.7.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Maintenance Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Subsurface Soil	Subsurface Soil	Site 43	Ingestion	Aluminum	8950	mg/kg	2.7E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.1E-04	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.0002
				Arsenic	2.38	mg/kg	4.3E-09	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	6.5E-09	3.4E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0001
				Chromium VI	15.4	mg/kg	4.6E-08	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	2.3E-08	3.6E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0001
				Cobalt	4.9	mg/kg	1.5E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0004
				Iron	13000	mg/kg	3.9E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.1E-04	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.0004
				Manganese	92.3	mg/kg	2.8E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.2E-06	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.00009
				Trichloroethene	1.37	mg/kg	4.1E-09	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	1.9E-10	3.2E-08	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.00006
			Exp. Route Total								3.0E-08					0.001
			Dermal	Aluminum	8950	mg/kg	3.6E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.8E-06	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.000003
				Arsenic	2.38	mg/kg	2.8E-10	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	4.3E-10	2.2E-09	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.000007
				Chromium VI	15.4	mg/kg	6.1E-10	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	1.2E-08	4.8E-09	(mg/kg/day)	7.5E-05	(mg/kg/day)	0.00006
				Cobalt	4.9	mg/kg	2.0E-10	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.5E-09	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.000005
				Iron	13000	mg/kg	5.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.0E-06	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.000006
				Manganese	92.3	mg/kg	3.7E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.9E-08	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.00003
				Trichloroethene	1.37	mg/kg	1.6E-10	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	7.5E-12	1.3E-09	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.000003
			Exp. Route Total								1.3E-08					0.0001
		Exposure Point Total									4.3E-08					0.002
	Exposure Medium Total										4.3E-08					0.002
	Air	Site 43	Inhalation	Aluminum	2.8E-06	mg/m^3	3.9E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.0E-08	(mg/m^3)	5.0E-03	(mg/m^3)	0.000006
				Arsenic	7.4E-10	mg/m^3	1.0E-12	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	4.5E-12	8.1E-12	(mg/m^3)	1.5E-05	(mg/m^3)	5.4E-7
				Chromium VI	4.8E-09	mg/m^3	6.7E-12	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	5.6E-10	5.2E-11	(mg/m^3)	1.0E-04	(mg/m^3)	5.2E-7
				Cobalt	1.5E-09	mg/m^3	2.1E-12	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	1.9E-11	1.7E-11	(mg/m^3)	6.0E-06	(mg/m^3)	0.000003
				Iron	4.0E-06	mg/m^3	5.7E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.4E-08	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	2.9E-08	mg/m^3	4.0E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.1E-10	(mg/m^3)	5.0E-05	(mg/m^3)	0.000006
				Trichloroethene	4.5E-04	mg/m^3	6.3E-07	(mg/m^3)	4.1E-06	$(ug/m^3)^{-1}$	2.6E-09	4.9E-06	(mg/m^3)	2.0E-03	(mg/m^3)	0.002
			Exp. Route Total								3.2E-09					0.002
		Exposure Point Total									3.2E-09					0.002
	Exposure Medium Total										3.2E-09					0.002
Medium Total											4.6E-08					0.004
Surface Water	Surface Water	Site 43	Ingestion	Arsenic	1.21	ug/L	1.5E-09	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.2E-09	1.1E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.00004
				Cobalt	25.9	ug/L	3.1E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.4E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0008
				Cis-1,2-Dichloroethene	195	ug/L	2.4E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.8E-06	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.0009
				Trichloroethene	240	ug/L	2.9E-07	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	1.3E-08	2.3E-06	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.005
				Vinyl Chloride	1.26	ug/L	1.5E-09	(mg/kg/day)	7.2E-01	$(mg/kg/day)^{-1}$	1.1E-09	1.2E-08	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.000004
			Exp. Route Total								1.7E-08					0.006
			Dermal	Arsenic	1.21	ug/L	4.8E-10	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	7.2E-10	3.8E-09	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.00001
				Cobalt	25.9	ug/L	4.1E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.2E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0001
				Cis-1,2-Dichloroethene	195	ug/L	1.1E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.8E-06	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.004
				Trichloroethene	240	ug/L	1.7E-06	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	8.0E-08	1.4E-05	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.03
				Vinyl Chloride	1.26	ug/L	3.4E-09	(mg/kg/day)	7.2E-01	$(mg/kg/day)^{-1}$	2.5E-09	2.7E-08	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.000009
			Exp. Route Total								8.3E-08					0.03
		Exposure Point Total									1.0E-07					0.04
	Exposure Medium Total										1.0E-07					0.04
Medium Total											1.0E-07					0.04
										Total of Receptor Risks Across All Media	2.4E-07				Total of Receptor Hazards Across All Media	0.05

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.8.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Site 43	Ingestion	Aluminum	17600	mg/kg	9.7E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.5E-03	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.008
				Arsenic	7.2	mg/kg	2.4E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	3.6E-07	1.9E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.006
				Cadmium	10.8	mg/kg	6.0E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.6E-06	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.005
				Chromium VI	28.1	mg/kg	1.5E-06	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	7.7E-07	1.2E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.004
				Cobalt	12.1	mg/kg	6.7E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.2E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.02
				Iron	22800	mg/kg	1.3E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.8E-03	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.01
				Manganese	1200	mg/kg	6.6E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.1E-04	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.02
				Thallium	0.664	mg/kg	3.7E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Vanadium	38.5	mg/kg	2.1E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.7E-05	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.003
				Trichloroethene	2.72	mg/kg	1.5E-07	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	6.9E-09	1.2E-06	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.002
			Exp. Route Total								1.1E-06					0.08
			Dermal	Aluminum	17600	mg/kg	1.3E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.0E-04	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.00010
				Arsenic	7.2	mg/kg	1.6E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.4E-08	1.2E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0004
				Cadmium	10.8	mg/kg	7.9E-10	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.1E-09	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.0002
				Chromium VI	28.1	mg/kg	2.0E-08	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	4.1E-07	1.6E-07	(mg/kg/day)	7.5E-05	(mg/kg/day)	0.002
				Cobalt	12.1	mg/kg	8.8E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.8E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0002
				Iron	22800	mg/kg	1.7E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-04	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.0002
				Manganese	1200	mg/kg	8.7E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.8E-06	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.007
				Thallium	0.664	mg/kg	4.8E-10	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.8E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Vanadium	38.5	mg/kg	2.8E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.2E-07	(mg/kg/day)	1.3E-04	(mg/kg/day)	0.002
				Trichloroethene	2.72	mg/kg	5.9E-09	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	2.7E-10	4.6E-08	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.00009
			Exp. Route Total								4.3E-07					0.01
		Exposure Point Total									1.6E-06					0.09
	Exposure Medium Total										1.6E-06					0.09
	Air	Site 43	Inhalation	Aluminum	5.4E-06	mg/m^3	1.4E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.1E-06	(mg/m^3)	5.0E-03	(mg/m^3)	0.0002
				Arsenic	2.2E-09	mg/m^3	5.7E-11	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	2.5E-10	4.5E-10	(mg/m^3)	1.5E-05	(mg/m^3)	0.00003
				Cadmium	3.3E-09	mg/m^3	8.6E-11	(mg/m^3)	1.8E-03	$(ug/m^3)^{-1}$	1.5E-10	6.7E-10	(mg/m^3)	1.0E-05	(mg/m^3)	0.00007
				Chromium VI	8.7E-09	mg/m^3	2.2E-10	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	1.9E-08	1.7E-09	(mg/m^3)	1.0E-04	(mg/m^3)	0.00002
				Cobalt	3.7E-09	mg/m^3	9.6E-11	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	8.7E-10	7.5E-10	(mg/m^3)	6.0E-06	(mg/m^3)	0.0001
				Iron	7.1E-06	mg/m^3	1.8E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.4E-06	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	3.7E-07	mg/m^3	9.6E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	7.4E-08	(mg/m^3)	5.0E-05	(mg/m^3)	0.001
				Thallium	2.1E-10	mg/m^3	5.3E-12	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Vanadium	1.2E-08	mg/m^3	3.1E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.4E-09	(mg/m^3)	1.0E-04	(mg/m^3)	0.00002
				Trichloroethene	8.9E-04	mg/m^3	2.3E-05	(mg/m^3)	4.1E-06	$(ug/m^3)^{-1}$	9.4E-08	1.8E-04	(mg/m^3)	2.0E-03	(mg/m^3)	0.09
			Exp. Route Total								1.1E-07					0.09
		Exposure Point Total									1.1E-07					0.09
	Exposure Medium Total										1.1E-07					0.09
Medium Total											1.7E-06					0.2

TABLE 7.8.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Subsurface Soil	Subsurface Soil	Site 43	Ingestion	Aluminum	8950	mg/kg	4.9E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.8E-03	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.004
				Arsenic	2.38	mg/kg	7.9E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.2E-07	6.1E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.002
				Chromium VI	15.4	mg/kg	8.5E-07	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	4.2E-07	6.6E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.002
				Cobalt	4.9	mg/kg	2.7E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.1E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.007
				Iron	13000	mg/kg	7.2E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.6E-03	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.008
				Manganese	92.3	mg/kg	5.1E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.0E-05	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.002
				Trichloroethene	1.37	mg/kg	7.5E-08	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	3.5E-09	5.9E-07	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.001
			Exp. Route Total								5.5E-07					0.03
			Dermal	Aluminum	8950	mg/kg	6.5E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.1E-05	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.00005
				Arsenic	2.38	mg/kg	5.2E-09	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	7.8E-09	4.0E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0001
				Chromium VI	15.4	mg/kg	1.1E-08	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	2.2E-07	8.7E-08	(mg/kg/day)	7.5E-05	(mg/kg/day)	0.001
				Cobalt	4.9	mg/kg	3.6E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.8E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.00009
				Iron	13000	mg/kg	9.5E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.4E-05	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.0001
				Manganese	92.3	mg/kg	6.7E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.2E-07	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.0005
				Trichloroethene	1.37	mg/kg	3.0E-09	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	1.4E-10	2.3E-08	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.00005
			Exp. Route Total								2.3E-07					0.002
		Exposure Point Total									7.8E-07					0.03
	Exposure Medium Total										7.8E-07					0.03
	Air	Site 43	Inhalation	Aluminum	2.8E-06	mg/m^3	7.1E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.5E-07	(mg/m^3)	5.0E-03	(mg/m^3)	0.0001
				Arsenic	7.4E-10	mg/m^3	1.9E-11	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	8.1E-11	1.5E-10	(mg/m^3)	1.5E-05	(mg/m^3)	0.000010
				Chromium VI	4.8E-09	mg/m^3	1.2E-10	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	1.0E-08	9.5E-10	(mg/m^3)	1.0E-04	(mg/m^3)	0.000010
				Cobalt	1.5E-09	mg/m^3	3.9E-11	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	3.5E-10	3.0E-10	(mg/m^3)	6.0E-06	(mg/m^3)	0.00005
				Iron	4.0E-06	mg/m^3	1.0E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	8.0E-07	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	2.9E-08	mg/m^3	7.3E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.7E-09	(mg/m^3)	5.0E-05	(mg/m^3)	0.0001
				Trichloroethene	4.5E-04	mg/m^3	1.2E-05	(mg/m^3)	4.1E-06	$(ug/m^3)^{-1}$	4.8E-08	9.0E-05	(mg/m^3)	2.0E-03	(mg/m^3)	0.05
			Exp. Route Total								5.8E-08					0.05
		Exposure Point Total									5.8E-08					0.05
	Exposure Medium Total										5.8E-08					0.05
Medium Total											8.4E-07					0.07

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.9.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Site 43	Ingestion	Aluminum	17600	mg/kg	2.1E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.5E-02	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.08
				Arsenic	7.2	mg/kg	5.3E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	7.9E-07	1.8E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.06
				Cadmium	10.8	mg/kg	1.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.6E-05	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.05
				Chromium VI	28.1	mg/kg	2.2E-05	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	1.1E-05	1.2E-04	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.04
				Cobalt	12.1	mg/kg	1.5E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.2E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.2
				Iron	22800	mg/kg	2.8E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.7E-02	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.1
				Manganese	1200	mg/kg	1.5E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.1E-03	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.2
				Thallium	0.664	mg/kg	8.1E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.8E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Vanadium	38.5	mg/kg	4.7E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.6E-04	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.03
				Trichloroethene (Mutagenic)	2.72	mg/kg	2.2E-06	(mg/kg/day)	9.3E-03	$(mg/kg/day)^{-1}$	2.0E-08	1.2E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	2.72	mg/kg	3.3E-07	(mg/kg/day)	3.7E-02	$(mg/kg/day)^{-1}$	1.2E-08	1.2E-05	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.02
			Exp. Route Total								1.2E-05					0.8
			Dermal	Aluminum	17600	mg/kg	2.4E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.4E-04	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.0008
				Arsenic	7.2	mg/kg	3.0E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	4.4E-08	1.0E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.003
				Cadmium	10.8	mg/kg	1.5E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.2E-08	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.002
				Chromium VI	28.1	mg/kg	2.5E-07	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	5.0E-06	1.3E-06	(mg/kg/day)	7.5E-05	(mg/kg/day)	0.02
				Cobalt	12.1	mg/kg	1.7E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.8E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.002
				Iron	22800	mg/kg	3.1E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-03	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.002
				Manganese	1200	mg/kg	1.6E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.7E-05	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.06
				Thallium	0.664	mg/kg	9.1E-10	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.2E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Vanadium	38.5	mg/kg	5.3E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.8E-06	(mg/kg/day)	1.3E-04	(mg/kg/day)	0.01
				Trichloroethene (Mutagenic)	2.72	mg/kg	7.3E-08	(mg/kg/day)	9.3E-03	$(mg/kg/day)^{-1}$	6.7E-10	3.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	2.72	mg/kg	1.1E-08	(mg/kg/day)	3.7E-02	$(mg/kg/day)^{-1}$	4.1E-10	3.9E-07	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.0008
			Exp. Route Total								5.0E-06					0.1
		Exposure Point Total									1.7E-05					0.9
	Exposure Medium Total										1.7E-05					0.9
	Air	Site 43	Inhalation	Aluminum	5.4E-06	mg/m^3	1.0E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.5E-06	(mg/m^3)	5.0E-03	(mg/m^3)	0.0007
				Arsenic	2.2E-09	mg/m^3	4.1E-11	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	1.8E-10	1.4E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.00010
				Cadmium	3.3E-09	mg/m^3	6.1E-11	(mg/m^3)	1.8E-03	$(ug/m^3)^{-1}$	1.1E-10	2.1E-09	(mg/m^3)	1.0E-05	(mg/m^3)	0.0002
				Chromium VI	8.7E-09	mg/m^3	1.0E-09	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	8.7E-08	5.6E-09	(mg/m^3)	1.0E-04	(mg/m^3)	0.00006
				Cobalt	3.7E-09	mg/m^3	6.9E-11	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	6.2E-10	2.4E-09	(mg/m^3)	6.0E-06	(mg/m^3)	0.0004
				Iron	7.1E-06	mg/m^3	1.3E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.5E-06	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	3.7E-07	mg/m^3	6.8E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.4E-07	(mg/m^3)	5.0E-05	(mg/m^3)	0.005
				Thallium	2.1E-10	mg/m^3	3.8E-12	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.3E-10	(mg/m^3)	NA	(mg/m^3)	--
				Vanadium	1.2E-08	mg/m^3	2.2E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	7.6E-09	(mg/m^3)	1.0E-04	(mg/m^3)	0.00008
				Trichloroethene (Mutagenic)	8.9E-04	mg/m^3	1.1E-04	(mg/m^3)	1.0E-06	$(ug/m^3)^{-1}$	1.1E-07	5.7E-04	(mg/m^3)	NA	(mg/m^3)	--
				Trichloroethene (Nonmutagenic)	8.9E-04	mg/m^3	1.6E-05	(mg/m^3)	3.1E-06	$(ug/m^3)^{-1}$	5.1E-08	5.7E-04	(mg/m^3)	2.0E-03	(mg/m^3)	0.3
			Exp. Route Total								2.5E-07					0.3
		Exposure Point Total									2.5E-07					0.3
	Exposure Medium Total										2.5E-07					0.3
Medium Total											1.7E-05					1.2
Subsurface Soil	Subsurface Soil	Site 43	Ingestion	Aluminum	8950	mg/kg	1.1E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.8E-02	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.04
				Arsenic	2.38	mg/kg	1.7E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.6E-07	6.1E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.02
				Chromium VI	15.4	mg/kg	1.2E-05	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	6.1E-06	6.6E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.02
				Cobalt	4.9	mg/kg	6.0E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.1E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.07
				Iron	13000	mg/kg	1.6E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.6E-02	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.08
				Manganese	92.3	mg/kg	1.1E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.9E-04	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.02
				Trichloroethene (Mutagenic)	1.37	mg/kg	1.1E-06	(mg/kg/day)	9.3E-03	$(mg/kg/day)^{-1}$	1.0E-08	5.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	1.37	mg/kg	1.7E-07	(mg/kg/day)	3.7E-02	$(mg/kg/day)^{-1}$	6.1E-09	5.9E-06	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.01
			Exp. Route Total								6.4E-06					0.3
			Dermal	Aluminum	8950	mg/kg	1.2E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.3E-04	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.0004
				Arsenic	2.38	mg/kg	9.8E-09	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.5E-08	3.4E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.001
				Chromium VI	15.4	mg/kg	1.4E-07	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	2.7E-06	7.4E-07	(mg/kg/day)	7.5E-05	(mg/kg/day)	0.010
				Cobalt	4.9	mg/kg	6.7E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.3E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0008
				Iron	13000	mg/kg	1.8E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.2E-04	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.0009
				Manganese	92.3	mg/kg	1.3E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.4E-06	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.005
				Trichloroethene (Mutagenic)	1.37	mg/kg	3.7E-08	(mg/kg/day)	9.3E-03	$(mg/kg/day)^{-1}$	3.4E-10	2.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	1.37	mg/kg	5.6E-09	(mg/kg/day)	3.7E-02	$(mg/kg/day)^{-1}$	2.1E-10	2.0E-07	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.0004
			Exp. Route Total								2.8E-06					0.02
		Exposure Point Total									9.1E-06					0.3
	Exposure Medium Total										9.1E-06					0.3

TABLE 7.9.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Subsurface Soil	Air	Site 43	Inhalation	Aluminum	2.8E-06	mg/m^3	5.1E-08	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	1.8E-06	(mg/m^3)	5.0E-03	(mg/m^3)	0.0004
				Arsenic	7.4E-10	mg/m^3	1.3E-11	(mg/m^3)	4.3E-03	(ug/m^3)$^{-1}$	5.8E-11	4.7E-10	(mg/m^3)	1.5E-05	(mg/m^3)	0.00003
				Chromium VI	4.8E-09	mg/m^3	5.7E-10	(mg/m^3)	8.4E-02	(ug/m^3)$^{-1}$	4.8E-08	3.1E-09	(mg/m^3)	1.0E-04	(mg/m^3)	0.00003
				Cobalt	1.5E-09	mg/m^3	2.8E-11	(mg/m^3)	9.0E-03	(ug/m^3)$^{-1}$	2.5E-10	9.7E-10	(mg/m^3)	6.0E-06	(mg/m^3)	0.0002
				Iron	4.0E-06	mg/m^3	7.4E-08	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	2.6E-06	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	2.9E-08	mg/m^3	5.2E-10	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	1.8E-08	(mg/m^3)	5.0E-05	(mg/m^3)	0.0004
				Trichloroethene (Mutagenic)	4.5E-04	mg/m^3	5.4E-05	(mg/m^3)	1.0E-06	(ug/m^3)$^{-1}$	5.4E-08	2.9E-04	(mg/m^3)	NA	(mg/m^3)	--
				Trichloroethene (Nonmutagenic)	4.5E-04	mg/m^3	8.3E-06	(mg/m^3)	3.1E-06	(ug/m^3)$^{-1}$	2.6E-08	2.9E-04	(mg/m^3)	2.0E-03	(mg/m^3)	0.1
			Exp. Route Total								1.3E-07					0.1
		Exposure Point Total									1.3E-07					0.1
	Exposure Medium Total										1.3E-07					0.1
Medium Total											9.3E-06					0.4
Groundwater	Groundwater	Site 43	Ingestion	1,3-Dinitrobenzene	0.212	ug/L	2.6E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	8.9E-06	(mg/kg/day)	1.0E-04	(mg/kg/day)	0.09
				2,6-Dinitrotoluene	0.504	ug/L	6.1E-07	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	9.1E-07	2.1E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.07
				3-Nitrotoluene	0.378	ug/L	4.6E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.6E-05	(mg/kg/day)	1.0E-04	(mg/kg/day)	0.2
				Arsenic	2.8	ug/L	3.4E-06	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	5.1E-06	1.2E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.4
				Barium	138	ug/L	1.7E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	5.8E-03	(mg/kg/day)	2.0E-01	(mg/kg/day)	0.03
				Beryllium	0.82	ug/L	9.9E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.5E-05	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.02
				Cadmium	0.422	ug/L	5.1E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.8E-05	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.02
				Chromium VI	1.5	ug/L	1.2E-05	(mg/kg/day)	5.0E-01	(mg/kg/day)$^{-1}$	5.9E-06	6.3E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.02
				Cobalt	48.9	ug/L	5.9E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.1E-03	(mg/kg/day)	3.0E-04	(mg/kg/day)	6.9
				Iron	24800	ug/L	3.0E-02	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.0E+00	(mg/kg/day)	7.0E-01	(mg/kg/day)	1.5
				Manganese	481	ug/L	5.8E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.0E-02	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.8
				Nickel	32.8	ug/L	4.0E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.4E-03	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.07
				Thallium	0.803	ug/L	9.7E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.4E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Vanadium	2.5	ug/L	3.0E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.1E-04	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.02
				1,1-Dichloroethane	4.7	ug/L	5.7E-06	(mg/kg/day)	5.7E-03	(mg/kg/day)$^{-1}$	3.2E-08	2.0E-04	(mg/kg/day)	2.0E-01	(mg/kg/day)	0.0010
				1,1-Dichloroethene	4.4	ug/L	5.3E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.9E-04	(mg/kg/day)	5.0E-02	(mg/kg/day)	0.004
				1,2-Dichloroethane	0.36	ug/L	4.3E-07	(mg/kg/day)	9.1E-02	(mg/kg/day)$^{-1}$	3.9E-08	1.5E-05	(mg/kg/day)	6.0E-03	(mg/kg/day)	0.003
				Cis-1,2-Dichloroethene	58	ug/L	7.0E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.4E-03	(mg/kg/day)	2.0E-03	(mg/kg/day)	1.2
				Trichloroethene (Mutagenic)	2680	ug/L	2.1E-02	(mg/kg/day)	9.3E-03	(mg/kg/day)$^{-1}$	2.0E-04	1.1E-01	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	2680	ug/L	3.2E-03	(mg/kg/day)	3.7E-02	(mg/kg/day)$^{-1}$	1.2E-04	1.1E-01	(mg/kg/day)	5.0E-04	(mg/kg/day)	226
				Vinyl Chloride	8	ug/L	3.6E-04	(mg/kg/day)	7.2E-01	(mg/kg/day)$^{-1}$	2.6E-04	3.4E-04	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.1
			Exp. Route Total								5.9E-04					238
			Dermal	1,3-Dinitrobenzene	0.212	ug/L	6.8E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.4E-07	(mg/kg/day)	1.0E-04	(mg/kg/day)	0.002
				2,6-Dinitrotoluene	0.504	ug/L	2.1E-08	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	3.2E-08	7.4E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.002
				3-Nitrotoluene	0.378	ug/L	6.4E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.2E-06	(mg/kg/day)	1.0E-04	(mg/kg/day)	0.02
				Arsenic	2.8	ug/L	1.1E-08	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	1.7E-08	3.9E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.001
				Barium	138	ug/L	5.5E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.9E-05	(mg/kg/day)	1.4E-02	(mg/kg/day)	0.001
				Beryllium	0.82	ug/L	3.3E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.1E-07	(mg/kg/day)	1.4E-05	(mg/kg/day)	0.008
				Cadmium	0.422	ug/L	1.7E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	5.9E-08	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.002
				Chromium VI	1.5	ug/L	7.8E-08	(mg/kg/day)	2.0E+01	(mg/kg/day)$^{-1}$	1.6E-06	4.2E-07	(mg/kg/day)	7.5E-05	(mg/kg/day)	0.006
				Cobalt	48.9	ug/L	7.8E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.7E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.009
				Iron	24800	ug/L	9.9E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.5E-03	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.005
				Manganese	481	ug/L	1.9E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	6.7E-05	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.07
				Nickel	32.8	ug/L	2.6E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	9.1E-07	(mg/kg/day)	8.0E-04	(mg/kg/day)	0.001
				Thallium	0.803	ug/L	3.2E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Vanadium	2.5	ug/L	9.9E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.5E-07	(mg/kg/day)	1.3E-04	(mg/kg/day)	0.003
				1,1-Dichloroethane	4.7	ug/L	3.8E-07	(mg/kg/day)	5.7E-03	(mg/kg/day)$^{-1}$	2.1E-09	1.3E-05	(mg/kg/day)	2.0E-01	(mg/kg/day)	0.00007
				1,1-Dichloroethene	4.4	ug/L	6.0E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.1E-05	(mg/kg/day)	5.0E-02	(mg/kg/day)	0.0004
				1,2-Dichloroethane	0.36	ug/L	1.8E-08	(mg/kg/day)	9.1E-02	(mg/kg/day)$^{-1}$	1.6E-09	6.3E-07	(mg/kg/day)	6.0E-03	(mg/kg/day)	0.0001
				Cis-1,2-Dichloroethene	58	ug/L	7.3E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.6E-04	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.1
				Trichloroethene (Mutagenic)	2680	ug/L	3.0E-03	(mg/kg/day)	9.3E-03	(mg/kg/day)$^{-1}$	2.8E-05	1.6E-02	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	2680	ug/L	4.6E-04	(mg/kg/day)	3.7E-02	(mg/kg/day)$^{-1}$	1.7E-05	1.6E-02	(mg/kg/day)	5.0E-04	(mg/kg/day)	32
				Vinyl Chloride	8	ug/L	1.6E-05	(mg/kg/day)	7.2E-01	(mg/kg/day)$^{-1}$	1.1E-05	1.5E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.005
			Exp. Route Total								5.7E-05					32
		Exposure Point Total									6.4E-04					270
	Exposure Medium Total										6.4E-04					270
Medium Total											6.4E-04					270

TABLE 7.9.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Surface Water	Site 43	Ingestion	Arsenic	1.21	ug/L	3.3E-09	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	4.9E-09	1.1E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0004
				Cobalt	25.9	ug/L	7.0E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.5E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.008
				Cis-1,2-Dichloroethene	195	ug/L	5.3E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.9E-05	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.009
				Trichloroethene (Mutagenic)	240	ug/L	4.2E-06	(mg/kg/day)	9.3E-03	$(mg/kg/day)^{-1}$	3.9E-08	2.3E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	240	ug/L	6.5E-07	(mg/kg/day)	3.7E-02	$(mg/kg/day)^{-1}$	2.4E-08	2.3E-05	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.05
				Vinyl Chloride	1.26	ug/L	1.7E-06	(mg/kg/day)	7.2E-01	$(mg/kg/day)^{-1}$	1.2E-06	1.2E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.00004
			Exp. Route Total								1.3E-06					0.06
			Dermal	Arsenic	1.21	ug/L	9.2E-10	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.4E-09	3.2E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0001
				Cobalt	25.9	ug/L	7.9E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.8E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0009
				Cis-1,2-Dichloroethene	195	ug/L	2.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.6E-05	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.04
				Trichloroethene (Mutagenic)	240	ug/L	2.2E-05	(mg/kg/day)	9.3E-03	$(mg/kg/day)^{-1}$	2.0E-07	1.2E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	240	ug/L	3.3E-06	(mg/kg/day)	3.7E-02	$(mg/kg/day)^{-1}$	1.2E-07	1.2E-04	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.2
				Vinyl Chloride	1.26	ug/L	3.2E-06	(mg/kg/day)	7.2E-01	$(mg/kg/day)^{-1}$	2.3E-06	2.3E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.00008
			Exp. Route Total								2.7E-06					0.3
		Exposure Point Total									3.9E-06					0.3
	Exposure Medium Total										3.9E-06					0.3
Medium Total											3.9E-06					0.3
										Total of Receptor Risks Across All Media	6.7E-04				Total of Receptor Hazards Across All Media	272

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.10.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Site 43	Ingestion	Aluminum	17600	mg/kg	8.1E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	8.1E-03	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.008
				Arsenic	7.2	mg/kg	2.0E-07	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	3.0E-07	2.0E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.007
				Cadmium	10.8	mg/kg	4.9E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	4.9E-06	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.005
				Chromium VI	28.1	mg/kg	2.0E-06	(mg/kg/day)	5.0E-01	(mg/kg/day)$^{-1}$	1.0E-06	1.3E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.004
				Cobalt	12.1	mg/kg	5.5E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	5.5E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.02
				Iron	22800	mg/kg	1.0E-03	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.0E-02	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.01
				Manganese	1200	mg/kg	5.5E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	5.5E-04	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.02
				Thallium	0.664	mg/kg	3.0E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Vanadium	38.5	mg/kg	1.8E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.8E-05	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.003
				Trichloroethene (Mutagenic)	2.72	mg/kg	2.0E-07	(mg/kg/day)	9.3E-03	(mg/kg/day)$^{-1}$	1.8E-09	1.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	2.72	mg/kg	1.2E-07	(mg/kg/day)	3.7E-02	(mg/kg/day)$^{-1}$	4.6E-09	1.2E-06	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.002
			Exp. Route Total								1.3E-06					0.09
			Dermal	Aluminum	17600	mg/kg	9.2E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	9.2E-05	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.00009
				Arsenic	7.2	mg/kg	1.1E-08	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	1.7E-08	1.1E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0004
				Cadmium	10.8	mg/kg	5.6E-10	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	5.6E-09	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.0002
				Chromium VI	28.1	mg/kg	2.3E-08	(mg/kg/day)	2.0E+01	(mg/kg/day)$^{-1}$	4.6E-07	1.5E-07	(mg/kg/day)	7.5E-05	(mg/kg/day)	0.002
				Cobalt	12.1	mg/kg	6.3E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	6.3E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0002
				Iron	22800	mg/kg	1.2E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.2E-04	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.0002
				Manganese	1200	mg/kg	6.3E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	6.3E-06	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.007
				Thallium	0.664	mg/kg	3.5E-10	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.5E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Vanadium	38.5	mg/kg	2.0E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.0E-07	(mg/kg/day)	1.3E-04	(mg/kg/day)	0.002
				Trichloroethene (Mutagenic)	2.72	mg/kg	6.7E-09	(mg/kg/day)	9.3E-03	(mg/kg/day)$^{-1}$	6.2E-11	4.3E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	2.72	mg/kg	4.3E-09	(mg/kg/day)	3.7E-02	(mg/kg/day)$^{-1}$	1.6E-10	4.3E-08	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.00009
			Exp. Route Total								4.8E-07					0.01
		Exposure Point Total									1.8E-06					0.10
	Exposure Medium Total										1.8E-06					0.10
	Air	Site 43	Inhalation	Aluminum	5.4E-06	mg/m^3	3.5E-07	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	3.5E-06	(mg/m^3)	5.0E-03	(mg/m^3)	0.0007
				Arsenic	2.2E-09	mg/m^3	1.4E-10	(mg/m^3)	4.3E-03	(ug/m^3)$^{-1}$	6.1E-10	1.4E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.00010
				Cadmium	3.3E-09	mg/m^3	2.1E-10	(mg/m^3)	1.8E-03	(ug/m^3)$^{-1}$	3.9E-10	2.1E-09	(mg/m^3)	1.0E-05	(mg/m^3)	0.0002
				Chromium VI	8.7E-09	mg/m^3	8.8E-10	(mg/m^3)	8.4E-02	(ug/m^3)$^{-1}$	7.4E-08	5.6E-09	(mg/m^3)	1.0E-04	(mg/m^3)	0.00006
				Cobalt	3.7E-09	mg/m^3	2.4E-10	(mg/m^3)	9.0E-03	(ug/m^3)$^{-1}$	2.2E-09	2.4E-09	(mg/m^3)	6.0E-06	(mg/m^3)	0.0004
				Iron	7.1E-06	mg/m^3	4.5E-07	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	4.5E-06	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	3.7E-07	mg/m^3	2.4E-08	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	2.4E-07	(mg/m^3)	5.0E-05	(mg/m^3)	0.005
				Thallium	2.1E-10	mg/m^3	1.3E-11	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	1.3E-10	(mg/m^3)	NA	(mg/m^3)	--
				Vanadium	1.2E-08	mg/m^3	7.6E-10	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	7.6E-09	(mg/m^3)	1.0E-04	(mg/m^3)	0.00008
				Trichloroethene (Mutagenic)	8.9E-04	mg/m^3	9.0E-05	(mg/m^3)	1.0E-06	(ug/m^3)$^{-1}$	9.0E-08	5.7E-04	(mg/m^3)	NA	(mg/m^3)	--
				Trichloroethene (Nonmutagenic)	8.9E-04	mg/m^3	5.7E-05	(mg/m^3)	3.1E-06	(ug/m^3)$^{-1}$	1.8E-07	5.7E-04	(mg/m^3)	2.0E-03	(mg/m^3)	0.3
			Exp. Route Total								3.4E-07					0.3
		Exposure Point Total									3.4E-07					0.3
	Exposure Medium Total										3.4E-07					0.3
Medium Total											2.1E-06					0.4
Subsurface Soil	Subsurface Soil	Site 43	Ingestion	Aluminum	8950	mg/kg	4.1E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	4.1E-03	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.004
				Arsenic	2.38	mg/kg	6.5E-08	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	9.8E-08	6.5E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.002
				Chromium VI	15.4	mg/kg	1.1E-06	(mg/kg/day)	5.0E-01	(mg/kg/day)$^{-1}$	5.5E-07	7.1E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.002
				Cobalt	4.9	mg/kg	2.2E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.2E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.007
				Iron	13000	mg/kg	6.0E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	6.0E-03	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.009
				Manganese	92.3	mg/kg	4.2E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	4.2E-05	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.002
				Trichloroethene (Mutagenic)	1.37	mg/kg	9.9E-08	(mg/kg/day)	9.3E-03	(mg/kg/day)$^{-1}$	9.2E-10	6.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	1.37	mg/kg	6.3E-08	(mg/kg/day)	3.7E-02	(mg/kg/day)$^{-1}$	2.3E-09	6.3E-07	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.001
			Exp. Route Total								6.6E-07					0.03
			Dermal	Aluminum	8950	mg/kg	4.7E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	4.7E-05	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.00005
				Arsenic	2.38	mg/kg	3.7E-09	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	5.6E-09	3.7E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0001
				Chromium VI	15.4	mg/kg	1.3E-08	(mg/kg/day)	2.0E+01	(mg/kg/day)$^{-1}$	2.5E-07	8.0E-08	(mg/kg/day)	7.5E-05	(mg/kg/day)	0.001
				Cobalt	4.9	mg/kg	2.6E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.6E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.00009
				Iron	13000	mg/kg	6.8E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	6.8E-05	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.00010
				Manganese	92.3	mg/kg	4.8E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	4.8E-07	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.0005
				Trichloroethene (Mutagenic)	1.37	mg/kg	3.4E-09	(mg/kg/day)	9.3E-03	(mg/kg/day)$^{-1}$	3.1E-11	2.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	1.37	mg/kg	2.1E-09	(mg/kg/day)	3.7E-02	(mg/kg/day)$^{-1}$	7.9E-11	2.1E-08	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.00004
			Exp. Route Total								2.6E-07					0.002
		Exposure Point Total									9.1E-07					0.03
	Exposure Medium Total										9.1E-07					0.03

TABLE 7.10.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
							Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Subsurface Soil	Air	Site 43	Inhalation	Aluminum	2.8E-06	mg/m^3	1.8E-07	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	1.8E-06	(mg/m^3)	5.0E-03	(mg/m^3)	0.0004
				Arsenic	7.4E-10	mg/m^3	4.7E-11	(mg/m^3)	4.3E-03	(ug/m^3)$^{-1}$	2.0E-10	4.7E-10	(mg/m^3)	1.5E-05	(mg/m^3)	0.00003
				Chromium VI	4.8E-09	mg/m^3	4.8E-10	(mg/m^3)	8.4E-02	(ug/m^3)$^{-1}$	4.0E-08	3.1E-09	(mg/m^3)	1.0E-04	(mg/m^3)	0.00003
				Cobalt	1.5E-09	mg/m^3	9.7E-11	(mg/m^3)	9.0E-03	(ug/m^3)$^{-1}$	8.8E-10	9.7E-10	(mg/m^3)	6.0E-06	(mg/m^3)	0.0002
				Iron	4.0E-06	mg/m^3	2.6E-07	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	2.6E-06	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	2.9E-08	mg/m^3	1.8E-09	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	1.8E-08	(mg/m^3)	5.0E-05	(mg/m^3)	0.0004
				Trichloroethene (Mutagenic)	4.5E-04	mg/m^3	4.5E-05	(mg/m^3)	1.0E-06	(ug/m^3)$^{-1}$	4.5E-08	2.9E-04	(mg/m^3)	NA	(mg/m^3)	--
				Trichloroethene (Nonmutagenic)	4.5E-04	mg/m^3	2.9E-05	(mg/m^3)	3.1E-06	(ug/m^3)$^{-1}$	9.0E-08	2.9E-04	(mg/m^3)	2.0E-03	(mg/m^3)	0.1
			Exp. Route Total								1.8E-07					0.1
		Exposure Point Total									1.8E-07					0.1
	Exposure Medium Total										1.8E-07					0.1
Medium Total											1.1E-06					0.2
Groundwater	Groundwater	Site 43	Ingestion	1,3-Dinitrobenzene	0.212	ug/L	4.1E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	4.1E-06	(mg/kg/day)	1.0E-04	(mg/kg/day)	0.04
				2,6-Dinitrotoluene	0.504	ug/L	9.7E-07	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	1.4E-06	9.7E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.03
				3-Nitrotoluene	0.378	ug/L	7.2E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	7.2E-06	(mg/kg/day)	1.0E-04	(mg/kg/day)	0.07
				Arsenic	2.8	ug/L	5.4E-06	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	8.1E-06	5.4E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.2
				Barium	138	ug/L	2.6E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.6E-03	(mg/kg/day)	2.0E-01	(mg/kg/day)	0.01
				Beryllium	0.82	ug/L	1.6E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.6E-05	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.008
				Cadmium	0.422	ug/L	8.1E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	8.1E-06	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.008
				Chromium VI	1.5	ug/L	4.5E-06	(mg/kg/day)	5.0E-01	(mg/kg/day)$^{-1}$	2.3E-06	2.9E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.010
				Cobalt	48.9	ug/L	9.4E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	9.4E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	3.1
				Iron	24800	ug/L	4.8E-02	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	4.8E-01	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.7
				Manganese	481	ug/L	9.2E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	9.2E-03	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.4
				Nickel	32.8	ug/L	6.3E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	6.3E-04	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.03
				Thallium	0.803	ug/L	1.5E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.5E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Vanadium	2.5	ug/L	4.8E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	4.8E-05	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.010
				1,1-Dichloroethane	4.7	ug/L	9.0E-06	(mg/kg/day)	5.7E-03	(mg/kg/day)$^{-1}$	5.1E-08	9.0E-05	(mg/kg/day)	2.0E-01	(mg/kg/day)	0.0005
				1,1-Dichloroethene	4.4	ug/L	8.4E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	8.4E-05	(mg/kg/day)	5.0E-02	(mg/kg/day)	0.002
				1,2-Dichloroethane	0.36	ug/L	6.9E-07	(mg/kg/day)	9.1E-02	(mg/kg/day)$^{-1}$	6.3E-08	6.9E-06	(mg/kg/day)	6.0E-03	(mg/kg/day)	0.001
				Cis-1,2-Dichloroethene	58	ug/L	1.1E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.1E-03	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.6
				Trichloroethene (Mutagenic)	2680	ug/L	8.1E-03	(mg/kg/day)	9.3E-03	(mg/kg/day)$^{-1}$	7.5E-05	5.1E-02	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	2680	ug/L	5.1E-03	(mg/kg/day)	3.7E-02	(mg/kg/day)$^{-1}$	1.9E-04	5.1E-02	(mg/kg/day)	5.0E-04	(mg/kg/day)	103
				Vinyl Chloride	8	ug/L	1.5E-05	(mg/kg/day)	7.2E-01	(mg/kg/day)$^{-1}$	1.1E-05	1.5E-04	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.05
			Exp. Route Total								2.9E-04					108
			Dermal	1,3-Dinitrobenzene	0.212	ug/L	1.2E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.2E-07	(mg/kg/day)	1.0E-04	(mg/kg/day)	0.001
				2,6-Dinitrotoluene	0.504	ug/L	3.8E-08	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	5.6E-08	3.8E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.001
				3-Nitrotoluene	0.378	ug/L	1.1E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.1E-06	(mg/kg/day)	1.0E-04	(mg/kg/day)	0.01
				Arsenic	2.8	ug/L	1.7E-08	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	2.6E-08	1.7E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0006
				Barium	138	ug/L	8.5E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	8.5E-06	(mg/kg/day)	1.4E-02	(mg/kg/day)	0.0006
				Beryllium	0.82	ug/L	5.1E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	5.1E-08	(mg/kg/day)	1.4E-05	(mg/kg/day)	0.004
				Cadmium	0.422	ug/L	2.6E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.6E-08	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.001
				Chromium VI	1.5	ug/L	2.9E-08	(mg/kg/day)	2.0E+01	(mg/kg/day)$^{-1}$	5.8E-07	1.8E-07	(mg/kg/day)	7.5E-05	(mg/kg/day)	0.002
				Cobalt	48.9	ug/L	1.2E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.2E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.004
				Iron	24800	ug/L	1.5E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.5E-03	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.002
				Manganese	481	ug/L	3.0E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.0E-05	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.03
				Nickel	32.8	ug/L	4.0E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	4.0E-07	(mg/kg/day)	8.0E-04	(mg/kg/day)	0.0005
				Thallium	0.803	ug/L	5.0E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	5.0E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Vanadium	2.5	ug/L	1.5E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.5E-07	(mg/kg/day)	1.3E-04	(mg/kg/day)	0.001
				1,1-Dichloroethane	4.7	ug/L	6.7E-07	(mg/kg/day)	5.7E-03	(mg/kg/day)$^{-1}$	3.8E-09	6.7E-06	(mg/kg/day)	2.0E-01	(mg/kg/day)	0.00003
				1,1-Dichloroethene	4.4	ug/L	1.1E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.1E-05	(mg/kg/day)	5.0E-02	(mg/kg/day)	0.0002
				1,2-Dichloroethane	0.36	ug/L	3.2E-08	(mg/kg/day)	9.1E-02	(mg/kg/day)$^{-1}$	2.9E-09	3.2E-07	(mg/kg/day)	6.0E-03	(mg/kg/day)	0.00005
				Cis-1,2-Dichloroethene	58	ug/L	1.3E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.3E-04	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.07
				Trichloroethene (Mutagenic)	2680	ug/L	1.3E-03	(mg/kg/day)	9.3E-03	(mg/kg/day)$^{-1}$	1.2E-05	8.1E-03	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	2680	ug/L	8.1E-04	(mg/kg/day)	3.7E-02	(mg/kg/day)$^{-1}$	3.0E-05	8.1E-03	(mg/kg/day)	5.0E-04	(mg/kg/day)	16
				Vinyl Chloride	8	ug/L	7.5E-07	(mg/kg/day)	7.2E-01	(mg/kg/day)$^{-1}$	5.4E-07	7.5E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.002
			Exp. Route Total								4.3E-05					16
		Exposure Point Total									3.3E-04					124
	Exposure Medium Total										3.3E-04					124

TABLE 7.10.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
							Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Air	Site 43	Inhalation	1,3-Dinitrobenzene	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				2,6-Dinitrotoluene	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				3-Nitrotoluene	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Arsenic	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	4.3E-03	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	1.5E-05	(mg/m^3)	--
				Barium	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	5.0E-04	(mg/m^3)	--
				Beryllium	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	2.4E-03	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	2.0E-05	(mg/m^3)	--
				Cadmium	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	1.8E-03	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	1.0E-05	(mg/m^3)	--
				Chromium VI	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	8.4E-02	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	1.0E-04	(mg/m^3)	--
				Cobalt	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	9.0E-03	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	6.0E-06	(mg/m^3)	--
				Iron	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	5.0E-05	(mg/m^3)	--
				Nickel	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	2.6E-04	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	9.0E-05	(mg/m^3)	--
				Thallium	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Vanadium	0.0E+00	mg/m^3	0.0E+00	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	1.0E-04	(mg/m^3)	--
				1,1-Dichloroethane	1.7E-04	mg/m^3	1.7E-05	(mg/m^3)	1.6E-06	(ug/m^3)$^{-1}$	2.7E-08	1.7E-04	(mg/m^3)	NA	(mg/m^3)	--
				1,1-Dichloroethene	1.7E-04	mg/m^3	1.6E-05	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	1.6E-04	(mg/m^3)	2.0E-01	(mg/m^3)	0.0008
				1,2-Dichloroethane	1.3E-05	mg/m^3	1.2E-06	(mg/m^3)	2.6E-05	(ug/m^3)$^{-1}$	3.2E-08	1.2E-05	(mg/m^3)	7.0E-03	(mg/m^3)	0.002
				Cis-1,2-Dichloroethene	2.2E-03	mg/m^3	2.1E-04	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	2.1E-03	(mg/m^3)	NA	(mg/m^3)	--
				Trichloroethene (Mutagenic)	8.6E-02	mg/m^3	1.3E-02	(mg/m^3)	1.0E-06	(ug/m^3)$^{-1}$	1.3E-05	8.3E-02	(mg/m^3)	NA	(mg/m^3)	--
				Trichloroethene (Nonmutagenic)	8.6E-02	mg/m^3	8.3E-03	(mg/m^3)	3.1E-06	(ug/m^3)$^{-1}$	2.6E-05	8.3E-02	(mg/m^3)	2.0E-03	(mg/m^3)	41
				Vinyl Chloride	3.7E-04	mg/m^3	3.6E-05	(mg/m^3)	4.4E-06	(ug/m^3)$^{-1}$	1.6E-07	3.6E-04	(mg/m^3)	1.0E-01	(mg/m^3)	0.004
			Exp. Route Total								3.9E-05					41
		Exposure Point Total									3.9E-05					41
	Exposure Medium Total										3.9E-05					41
Medium Total											3.7E-04					166
Surface Water	Surface Water	Site 43	Ingestion	Arsenic	1.21	ug/L	2.5E-09	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	3.7E-09	2.5E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.00008
				Cobalt	25.9	ug/L	5.3E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	5.3E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.002
				Cis-1,2-Dichloroethene	195	ug/L	4.0E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	4.0E-06	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.002
				Trichloroethene (Mutagenic)	240	ug/L	7.7E-07	(mg/kg/day)	9.3E-03	(mg/kg/day)$^{-1}$	7.1E-09	4.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	240	ug/L	4.9E-07	(mg/kg/day)	3.7E-02	(mg/kg/day)$^{-1}$	1.8E-08	4.9E-06	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.010
				Vinyl Chloride	1.26	ug/L	2.6E-09	(mg/kg/day)	7.2E-01	(mg/kg/day)$^{-1}$	1.8E-09	2.6E-08	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.000009
			Exp. Route Total								3.1E-08					0.01
			Dermal	Arsenic	1.21	ug/L	1.4E-09	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	2.1E-09	1.4E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.00005
				Cobalt	25.9	ug/L	1.2E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.2E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0004
				Cis-1,2-Dichloroethene	195	ug/L	3.3E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.3E-05	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.02
				Trichloroethene (Mutagenic)	240	ug/L	8.0E-06	(mg/kg/day)	9.3E-03	(mg/kg/day)$^{-1}$	7.4E-08	5.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Trichloroethene (Nonmutagenic)	240	ug/L	5.1E-06	(mg/kg/day)	3.7E-02	(mg/kg/day)$^{-1}$	1.9E-07	5.1E-05	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.1
				Vinyl Chloride	1.26	ug/L	1.0E-08	(mg/kg/day)	7.2E-01	(mg/kg/day)$^{-1}$	7.2E-09	1.0E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.00003
			Exp. Route Total								2.7E-07					0.1
		Exposure Point Total									3.0E-07					0.1
	Exposure Medium Total										3.0E-07					0.1
Medium Total											3.0E-07					0.1
										Total of Receptor Risks Across All Media	3.7E-04				Total of Receptor Hazards Across All Media	166

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Q.7 RAGS PART D TABLE 9s

Summary of Receptor Risks and Hazards for COPCs

LIST OF TABLES

RAGS PART D TABLE 9

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

Table No.	
	Reasonable Maximum Exposures
9.1.RME	Construction Workers
9.2.RME	Maintenace Workers
9.3.RME	Industrial Workers
9.4.RME	Child Residents
9.5.RME	Adult Residents
9.6.RME	Lifelong Residents
9.7.RME	Construction Workers Including Background Chemicals
9.8.RME	Maintenace Workers Including Background Chemicals
9.9.RME	Industrial Workers Including Background Chemicals
9.10.RME	Child Residents Including Background Chemicals
9.11.RME	Adult Residents Including Background Chemicals
9.12.RME	Lifelong Residents Including Background Chemicals
	Central Tendency Exposures
9.1.CTE	Construction Workers
9.2.CTE	Maintenace Workers
9.3.CTE	Industrial Workers
9.4.CTE	Child Residents
9.5.CTE	Adult Residents
9.6.CTE	Lifelong Residents
9.7.CTE	Construction Workers Including Background Chemicals
9.8.CTE	Maintenace Workers Including Background Chemicals
9.9.CTE	Industrial Workers Including Background Chemicals
9.10.CTE	Child Residents Including Background Chemicals
9.11.CTE	Adult Residents Including Background Chemicals
9.12.CTE	Lifelong Residents Including Background Chemicals

TABLE 9.1.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Site 43	Aluminum	- -	--	- -	--	- -	CNS	0.03	--	0.001	0.04
			Cadmium	- -	--	- -	--	- -	Kidney	0.02	--	0.003	0.02
			Chromium VI	4E-07	--	5E-07	--	9E-07	None Specified	0.01	--	0.01	0.02
			Trichloroethene	3E-09	--	3E-10	--	4E-09	Liver, Kidney	0.01	--	0.0009	0.01
			Chemical Total	4E-07	--	5E-07	--	9E-07		0.08	--	0.02	0.09
		Exposure Point Total						9E-07					0.09
	Exposure Medium Total							9E-07					0.09
	Air	Site 43	Aluminum	--	- -	--	--	- -	CNS	--	0.3	--	0.3
			Cadmium	--	2E-08	--	--	2E-08	Kidney, Respiratory	--	0.09	--	0.09
			Chromium VI	--	3E-06	--	--	3E-06	Respiratory	--	0.008	--	0.008
			Trichloroethene	--	4E-08	--	--	4E-08	Liver, Kidney	--	0.4	--	0.4
			Chemical Total	--	3E-06	--	--	3E-06		- -	0.8	- -	0.8
		Exposure Point Total						3E-06					0.8
	Exposure Medium Total							3E-06					0.8
Medium Total								4E-06					0.9
Subsurface Soil	Subsurface Soil	Site 43	Manganese	- -	--	- -	--	- -	CNS	0.007	--	0.006	0.01
			Trichloroethene	2E-09	--	2E-10	--	2E-09	Liver, Kidney	0.005	--	0.0005	0.006
			Chemical Total	2E-09	--	2E-10	--	2E-09		0.01	--	0.006	0.02
		Exposure Point Total						2E-09					0.02
	Exposure Medium Total							2E-09					0.02
	Air	Site 43	Manganese	--	- -	--	--	- -	CNS	--	0.2	--	0.2
			Trichloroethene	--	2E-08	--	--	2E-08	Liver, Kidney	--	0.2	--	0.2
			Chemical Total	--	2E-08	--	--	2E-08		- -	0.3	- -	0.3
		Exposure Point Total						2E-08					0.3
	Exposure Medium Total							2E-08					0.3
Medium Total								2E-08					0.4
Groundwater	Groundwater	Site 43	1,3-Dinitrobenzene	- -	--	- -	--	- -	Spleen	0.00001	--	0.00005	0.00006
			2,6-Dinitrotoluene	4E-10	--	2E-09	--	2E-09	CNS, Blood, Liver	0.000004	--	0.00002	0.00002
			3-Nitrotoluene	- -	--	- -	--	- -	NA	0.00001	--	0.0003	0.0003
			Arsenic	2E-09	--	3E-09	--	5E-09	Skin, CVS	0.0003	--	0.0004	0.0008
			Barium	- -	--	- -	--	- -	Kidney	0.00002	--	0.0005	0.0005
			Beryllium	- -	--	- -	--	- -	GS	0.000006	--	0.001	0.001
			Cobalt	- -	--	- -	--	- -	Thyroid	0.0006	--	0.0003	0.0009
			Iron	- -	--	- -	--	- -	GS	0.001	--	0.002	0.003
			Manganese	- -	--	- -	--	- -	CNS	0.0007	--	0.02	0.02
			Nickel	- -	--	- -	--	- -	Body Weight	0.00006	--	0.0004	0.0004
			Thallium	- -	--	- -	--	- -	Skin	--	--	--	--
			1,1-Dichloroethane	1E-11	--	1E-10	--	2E-10	Kidney	8E-8	--	0.0000009	0.0000009
			1,1-Dichloroethene	- -	--	- -	--	- -	Liver	0.00002	--	0.0003	0.0003
			1,2-Dichloroethane	2E-11	--	1E-10	--	1E-10	Kidney	0.0000006	--	0.000004	0.000005
			Cis-1,2-Dichloroethene	- -	--	- -	--	- -	Kidney	0.0001	--	0.002	0.002
			Trichloroethene	6E-08	--	1E-06	--	1E-06	Liver, Kidney	0.2	--	4	4
			Vinyl Chloride	3E-09	--	2E-08	--	3E-08	Liver	0.0009	--	0.008	0.009
			Chemical Total	7E-08	--	1E-06	--	1E-06		0.2	--	4	4
		Exposure Point Total						1E-06					4
	Exposure Medium Total							1E-06					4

TABLE 9.1.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Air	Site 43	1,3-Dinitrobenzene	--	- -	--	--	- -	NA	--	--	--	--
			2,6-Dinitrotoluene	--	- -	--	--	- -	NA	--	--	--	--
			3-Nitrotoluene	--	- -	--	--	- -	NA	--	--	--	--
			Arsenic	--	- -	--	--	- -	NA	--	--	--	--
			Barium	--	- -	--	--	- -	Fetotoxicity	--	--	--	--
			Beryllium	--	- -	--	--	- -	Respiratory	--	--	--	--
			Cobalt	--	- -	--	--	- -	Respiratory	--	--	--	--
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	--	--	--
			Nickel	--	- -	--	--	- -	Respiratory	--	--	--	--
			Thallium	--	- -	--	--	- -	NA	--	--	--	--
			1,1-Dichloroethane	--	2E-10	--	--	2E-10	NA	--	--	--	--
			1,1-Dichloroethene	--	- -	--	--	- -	Liver	--	0.00009	--	0.00009
			1,2-Dichloroethane	--	2E-10	--	--	2E-10	NA	--	0.000008	--	0.000008
			Cis-1,2-Dichloroethene	--	- -	--	--	- -	NA	--	--	--	--
			Trichloroethene	--	2E-07	--	--	2E-07	Liver, Kidney	--	2	--	2
			Vinyl Chloride	--	1E-09	--	--	1E-09	Liver	--	0.0002	--	0.0002
			Chemical Total	--	2E-07	--	--	2E-07		- -	2	- -	2
		Exposure Point Total						2E-07					2
	Exposure Medium Total							2E-07					2
Medium Total								2E-06					6
Surface Water	Surface Water	Site 43	Arsenic	2E-09	--	7E-10	--	3E-09	Skin, CVS	0.0003	--	0.0001	0.0004
			Cobalt	- -	--	- -	--	- -	Thyroid	0.0007	--	0.00009	0.0008
			Cis-1,2-Dichloroethene	- -	--	- -	--	- -	Kidney	0.0008	--	0.003	0.004
			Trichloroethene	1E-08	--	6E-08	--	7E-08	Liver, Kidney	0.04	--	0.2	0.2
			Vinyl Chloride	1E-09	--	2E-09	--	3E-09	Liver	0.0003	--	0.0007	0.001
			Chemical Total	2E-08	--	6E-08	--	8E-08		0.04	--	0.2	0.2
		Exposure Point Total						8E-08					0.2
	Exposure Medium Total							8E-08					0.2
Medium Total								8E-08					0.2
Receptor Total							Receptor Risk Total	5E-06				Receptor HI Total	7

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Blood HI	0.00002
Total Body Weight HI	0.0004
Total CNS HI	0.5
Total CVS HI	0.001
Total GS HI	0.004
Total Kidney HI	7
Total Liver HI	6
Total Respiratory HI	0.10
Total None Specified HI	0.02
Total Skin HI	0.001
Total Thyroid HI	0.002
Total Spleen HI	0.00006

TABLE 9.2.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Maintenance Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Site 43	Aluminum	- -	--	- -	--	- -	CNS	0.002	--	0.0001	0.002
			Cadmium	- -	--	- -	--	- -	Kidney	0.001	--	0.0003	0.001
			Chromium VI	5E-07	--	1E-06	--	2E-06	None Specified	0.0009	--	0.002	0.003
			Trichloroethene	4E-09	--	8E-10	--	5E-09	Immune System, Developmental	0.0005	--	0.0001	0.0006
			Chemical Total	5E-07	--	1E-06	--	2E-06		0.004	--	0.003	0.007
		Exposure Point Total						2E-06					0.007
	Exposure Medium Total							2E-06					0.007
	Air	Site 43	Aluminum	--	- -	--	--	- -	CNS	--	0.00002	--	0.00002
			Cadmium	--	5E-11	--	--	5E-11	Kidney, Respiratory	--	0.000007	--	0.000007
			Chromium VI	--	6E-09	--	--	6E-09	Respiratory	--	0.000002	--	0.000002
			Trichloroethene	--	3E-08	--	--	3E-08	Liver, Kidney	--	0.010	--	0.010
			Chemical Total	--	3E-08	--	--	3E-08		- -	0.010	- -	0.010
		Exposure Point Total						3E-08					0.010
	Exposure Medium Total							3E-08					0.010
Medium Total								2E-06					0.02
Subsurface Soil	Subsurface Soil	Site 43	Manganese	- -	--	- -	--	- -	CNS	0.0004	--	0.0006	0.0010
			Trichloroethene	2E-09	--	4E-10	--	3E-09	Immune System, Developmental	0.0003	--	0.00005	0.0003
			Chemical Total	2E-09	--	4E-10	--	3E-09		0.0006	--	0.0006	0.001
		Exposure Point Total						3E-09					0.001
	Exposure Medium Total							3E-09					0.001
	Air	Site 43	Manganese	--	- -	--	--	- -	CNS	--	0.00001	--	0.00001
			Trichloroethene	--	1E-08	--	--	1E-08	Liver, Kidney	--	0.005	--	0.005
			Chemical Total	--	1E-08	--	--	1E-08		- -	0.005	- -	0.005
		Exposure Point Total						1E-08					0.005
	Exposure Medium Total							1E-08					0.005
Medium Total								2E-08					0.006
Surface Water	Surface Water	Site 43	Arsenic	2E-08	--	8E-09	--	3E-08	Skin, CVS	0.0002	--	0.00005	0.0002
			Cobalt	- -	--	- -	--	- -	Thyroid	0.003	--	0.0004	0.004
			Cis-1,2-Dichloroethene	- -	--	- -	--	- -	Kidney	0.004	--	0.02	0.02
			Trichloroethene	1E-07	--	7E-07	--	9E-07	Immune System, Developmental	0.02	--	0.09	0.1
			Vinyl Chloride	1E-08	--	2E-08	--	4E-08	Liver	0.00002	--	0.00003	0.00005
			Chemical Total	2E-07	--	7E-07	--	9E-07		0.03	--	0.1	0.1
		Exposure Point Total						9E-07					0.1
	Exposure Medium Total							9E-07					0.1
Medium Total								9E-07					0.1
Receptor Total							Receptor Risk Total	3E-06				Receptor HI Total	0.2

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.3.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Site 43	Aluminum	- -	--	- -	--	- -	CNS	0.02	--	0.001	0.02
			Cadmium	- -	--	- -	--	- -	Kidney	0.01	--	0.003	0.01
			Chromium VI	5E-06	--	1E-05	--	2E-05	None Specified	0.009	--	0.02	0.03
			Trichloroethene	4E-08	--	9E-09	--	5E-08	Immune System, Developmental	0.005	--	0.001	0.006
			Chemical Total	5E-06	--	1E-05	--	2E-05		0.04	--	0.03	0.07
		Exposure Point Total						2E-05					0.07
	Exposure Medium Total							2E-05					0.07
	Air	Site 43	Aluminum	--	- -	--	--	- -	CNS	--	0.0002	--	0.0002
			Cadmium	--	5E-10	--	--	5E-10	Kidney, Respiratory	--	0.00008	--	0.00008
			Chromium VI	--	6E-08	--	--	6E-08	Respiratory	--	0.00002	--	0.00002
			Trichloroethene	--	3E-07	--	--	3E-07	Liver, Kidney	--	0.1	--	0.1
			Chemical Total	--	4E-07	--	--	4E-07		- -	0.1	- -	0.1
		Exposure Point Total						4E-07					0.1
	Exposure Medium Total							4E-07					0.1
Medium Total								2E-05					0.2
Subsurface Soil	Subsurface Soil	Site 43	Manganese	- -	--	- -	--	- -	CNS	0.004	--	0.006	0.010
			Trichloroethene	2E-08	--	4E-09	--	3E-08	Immune System, Developmental	0.003	--	0.0005	0.003
			Chemical Total	2E-08	--	4E-09	--	3E-08		0.006	--	0.007	0.01
		Exposure Point Total						3E-08					0.01
	Exposure Medium Total							3E-08					0.01
	Air	Site 43	Manganese	--	- -	--	--	- -	CNS	--	0.0001	--	0.0001
			Trichloroethene	--	2E-07	--	--	2E-07	Liver, Kidney	--	0.05	--	0.05
			Chemical Total	--	2E-07	--	--	2E-07		- -	0.05	- -	0.05
		Exposure Point Total						2E-07					0.05
	Exposure Medium Total							2E-07					0.05
Medium Total								2E-07					0.06

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.4.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Site 43	Aluminum	- -	--	- -	--	- -	CNS	0.2	--	0.006	0.2
			Cadmium	- -	--	- -	--	- -	Kidney	0.1	--	0.02	0.2
			Chromium VI	8E-05	--	9E-05	--	2E-04	None Specified	0.1	--	0.1	0.3
			Trichloroethene (Mutagenic)	1E-07	--	1E-08	--	2E-07	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	1E-07	--	9E-09	--	1E-07	Immune System, Developmental	0.07	--	0.006	0.08
			Chemical Total	8E-05	--	9E-05	--	2E-04		0.6	--	0.2	0.7
		Exposure Point Total						2E-04					0.7
	Exposure Medium Total							2E-04					0.7
	Air	Site 43	Aluminum	--	- -	--	--	- -	CNS	--	0.001	--	0.001
			Cadmium	--	5E-10	--	--	5E-10	Kidney, Respiratory	--	0.0003	--	0.0003
			Chromium VI	--	3E-07	--	--	3E-07	Respiratory	--	0.00008	--	0.00008
			Trichloroethene (Mutagenic)	--	4E-07	--	--	4E-07	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	--	2E-07	--	--	2E-07	Liver, Kidney	--	0.4	--	0.4
			Chemical Total	--	9E-07	--	--	9E-07		- -	0.4	- -	0.4
		Exposure Point Total						9E-07					0.4
	Exposure Medium Total							9E-07					0.4
Medium Total								2E-04					1
Subsurface Soil	Subsurface Soil	Site 43	Manganese	- -	--	- -	--	- -	CNS	0.05	--	0.03	0.08
			Trichloroethene (Mutagenic)	7E-08	--	6E-09	--	8E-08	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	6E-08	--	5E-09	--	6E-08	Immune System, Developmental	0.04	--	0.003	0.04
			Chemical Total	1E-07	--	1E-08	--	1E-07		0.08	--	0.04	0.1
		Exposure Point Total						1E-07					0.1
	Exposure Medium Total							1E-07					0.1
	Air	Site 43	Manganese	--	- -	--	--	- -	CNS	--	0.0005	--	0.0005
			Trichloroethene (Mutagenic)	--	2E-07	--	--	2E-07	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	--	1E-07	--	--	1E-07	Liver, Kidney	--	0.2	--	0.2
			Chemical Total	--	3E-07	--	--	3E-07		- -	0.2	- -	0.2
		Exposure Point Total						3E-07					0.2
	Exposure Medium Total							3E-07					0.2
Medium Total								5E-07					0.3
Groundwater	Groundwater	Site 43	1,3-Dinitrobenzene	- -	--	- -	--	- -	Spleen	0.1	--	0.001	0.1
			2,6-Dinitrotoluene	4E-06	--	5E-08	--	4E-06	CNS, Blood, Liver	0.1	--	0.001	0.1
			3-Nitrotoluene	- -	--	- -	--	- -	NA	0.2	--	0.01	0.3
			Arsenic	2E-05	--	2E-08	--	2E-05	Skin, CVS	0.6	--	0.0004	0.6
			Barium	- -	--	- -	--	- -	Kidney	0.04	--	0.0004	0.04
			Beryllium	- -	--	- -	--	- -	GS	0.03	--	0.002	0.03
			Cobalt	- -	--	- -	--	- -	Thyroid	10	--	0.003	10
			Iron	- -	--	- -	--	- -	GS	2	--	0.001	2
			Manganese	- -	--	- -	--	- -	CNS	1	--	0.02	1
			Nickel	- -	--	- -	--	- -	Body Weight	0.1	--	0.0003	0.1
			Thallium	- -	--	- -	--	- -	Skin	--	--	--	--
			1,1-Dichloroethane	1E-07	--	4E-09	--	2E-07	Kidney	0.002	--	0.00004	0.002
			1,1-Dichloroethene	- -	--	- -	--	- -	Liver	0.006	--	0.0002	0.006
			1,2-Dichloroethane	2E-07	--	3E-09	--	2E-07	Kidney	0.004	--	0.00006	0.004
			Cis-1,2-Dichloroethene	- -	--	- -	--	- -	Kidney	2	--	0.07	2
			Trichloroethene (Mutagenic)	7E-04	--	4E-05	--	8E-04	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	5E-04	--	3E-05	--	6E-04	Immune System, Developmental	343	--	18	360
			Vinyl Chloride	4E-04	--	7E-06	--	4E-04	Liver	0.2	--	0.003	0.2
			Chemical Total	2E-03	--	7E-05	--	2E-03		360	--	18	378
		Exposure Point Total						2E-03					378
	Exposure Medium Total							2E-03					378
Medium Total								2E-03					378

TABLE 9.4.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Water	Surface Water	Site 43	Arsenic	6E-08	--	2E-08	--	8E-08	Skin, CVS	0.002	--	0.0004	0.002
			Cobalt	- -	--	- -	--	- -	Thyroid	0.03	--	0.004	0.04
			Cis-1,2-Dichloroethene	- -	--	- -	--	- -	Kidney	0.04	--	0.1	0.2
			Trichloroethene (Mutagenic)	4E-07	--	2E-06	--	2E-06	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	3E-07	--	1E-06	--	1E-06	Immune System, Developmental	0.2	--	0.7	0.9
			Vinyl Chloride	2E-06	--	4E-06	--	7E-06	Liver	0.0002	--	0.0003	0.0004
			Chemical Total	3E-06	--	7E-06	--	1E-05		0.3	--	0.9	1
		Exposure Point Total						1E-05					1
	Exposure Medium Total							1E-05					1
Medium Total								1E-05					1
Receptor Total							Receptor Risk Total	2E-03				Receptor HI Total	380

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Blood HI	0.1
Total Body Weight HI	0.1
Total CNS HI	2
Total CVS HI	0.6
Total Developmental HI	361
Total GS HI	2
Total Kidney HI	3
Total Liver HI	0.9
Total Respiratory HI	0.0004
Total None Specified HI	0.3
Total Skin HI	0.6
Total Thyroid HI	10
Total Spleen HI	0.1

TABLE 9.5.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Site 43	Aluminum	- -	--	- -	--	- -	CNS	0.02	--	0.0010	0.03
			Cadmium	- -	--	- -	--	- -	Kidney	0.01	--	0.002	0.02
			Chromium VI	1E-05	--	2E-05	--	3E-05	None Specified	0.01	--	0.02	0.03
			Trichloroethene (Mutagenic)	2E-08	--	3E-09	--	2E-08	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	5E-08	--	6E-09	--	5E-08	Immune System, Developmental	0.007	--	0.0009	0.008
			Chemical Total	1E-05	--	2E-05	--	3E-05		0.06	--	0.02	0.08
		Exposure Point Total						3E-05					0.08
	Exposure Medium Total							3E-05					0.08
	Air	Site 43	Aluminum	--	- -	--	--	- -	CNS	--	0.001	--	0.001
			Cadmium	--	2E-09	--	--	2E-09	Kidney, Respiratory	--	0.0003	--	0.0003
			Chromium VI	--	4E-07	--	--	4E-07	Respiratory	--	0.00008	--	0.00008
			Trichloroethene (Mutagenic)	--	5E-07	--	--	5E-07	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	--	9E-07	--	--	9E-07	Liver, Kidney	--	0.4	--	0.4
			Chemical Total	--	2E-06	--	--	2E-06		- -	0.4	- -	0.4
		Exposure Point Total						2E-06					0.4
	Exposure Medium Total							2E-06					0.4
Medium Total								3E-05					0.5
Subsurface Soil	Subsurface Soil	Site 43	Manganese	- -	--	- -	--	- -	CNS	0.005	--	0.005	0.01
			Trichloroethene (Mutagenic)	1E-08	--	1E-09	--	1E-08	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	2E-08	--	3E-09	--	3E-08	Immune System, Developmental	0.004	--	0.0004	0.004
			Chemical Total	3E-08	--	4E-09	--	4E-08		0.009	--	0.006	0.01
		Exposure Point Total						4E-08					0.01
	Exposure Medium Total							4E-08					0.01
	Air	Site 43	Manganese	--	- -	--	--	- -	CNS	--	0.0005	--	0.0005
			Trichloroethene (Mutagenic)	--	3E-07	--	--	3E-07	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	--	5E-07	--	--	5E-07	Liver, Kidney	--	0.2	--	0.2
			Chemical Total	--	7E-07	--	--	7E-07		- -	0.2	- -	0.2
		Exposure Point Total						7E-07					0.2
	Exposure Medium Total							7E-07					0.2
Medium Total								8E-07					0.2
Groundwater	Groundwater	Site 43	1,3-Dinitrobenzene	- -	--	- -	--	- -	Spleen	0.06	--	0.002	0.06
			2,6-Dinitrotoluene	7E-06	--	3E-07	--	7E-06	CNS, Blood, Liver	0.05	--	0.002	0.05
			3-Nitrotoluene	- -	--	- -	--	- -	NA	0.1	--	0.02	0.1
			Arsenic	4E-05	--	2E-07	--	4E-05	Skin, CVS	0.3	--	0.001	0.3
			Barium	- -	--	- -	--	- -	Kidney	0.02	--	0.001	0.02
			Beryllium	- -	--	- -	--	- -	GS	0.01	--	0.008	0.02
			Cobalt	- -	--	- -	--	- -	Thyroid	4	--	0.009	4
			Iron	- -	--	- -	--	- -	GS	1.0	--	0.005	1.0
			Manganese	- -	--	- -	--	- -	CNS	0.5	--	0.07	0.6
			Nickel	- -	--	- -	--	- -	Body Weight	0.04	--	0.001	0.05
			Thallium	- -	--	- -	--	- -	Skin	--	--	--	--
			1,1-Dichloroethane	3E-07	--	2E-08	--	3E-07	Kidney	0.0006	--	0.00005	0.0007
			1,1-Dichloroethene	- -	--	- -	--	- -	Liver	0.002	--	0.0003	0.003
			1,2-Dichloroethane	3E-07	--	2E-08	--	3E-07	Kidney	0.002	--	0.00008	0.002
			Cis-1,2-Dichloroethene	- -	--	- -	--	- -	Kidney	0.8	--	0.10	0.9
			Trichloroethene (Mutagenic)	4E-04	--	7E-05	--	5E-04	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	9E-04	--	2E-04	--	1E-03	Immune System, Developmental	147	--	25	172
			Vinyl Chloride	5E-05	--	3E-06	--	6E-05	Liver	0.07	--	0.004	0.08
			Chemical Total	1E-03	--	2E-04	--	2E-03		154	--	25	179
		Exposure Point Total						2E-03					179
	Exposure Medium Total							2E-03					179

TABLE 9.5.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Air	Site 43	1,3-Dinitrobenzene	--	- -	--	--	- -	NA	--	--	--	--
			2,6-Dinitrotoluene	--	- -	--	--	- -	NA	--	--	--	--
			3-Nitrotoluene	--	- -	--	--	- -	NA	--	--	--	--
			Arsenic	--	- -	--	--	- -	NA	--	--	--	--
			Barium	--	- -	--	--	- -	CVS	--	--	--	--
			Beryllium	--	- -	--	--	- -	Respiratory	--	--	--	--
			Cobalt	--	- -	--	--	- -	Respiratory	--	--	--	--
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	--	--	--
			Nickel	--	- -	--	--	- -	Respiratory	--	--	--	--
			Thallium	--	- -	--	--	- -	NA	--	--	--	--
			1,1-Dichloroethane	--	2E-07	--	--	2E-07	NA	--	--	--	--
			1,1-Dichloroethene	--	- -	--	--	- -	Liver	--	0.002	--	0.002
			1,2-Dichloroethane	--	2E-07	--	--	2E-07	NA	--	0.003	--	0.003
			Cis-1,2-Dichloroethene	--	- -	--	--	- -	NA	--	--	--	--
			Trichloroethene (Mutagenic)	--	1E-04	--	--	1E-04	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	--	2E-04	--	--	2E-04	Liver, Kidney	--	83	--	83
			Vinyl Chloride	--	1E-06	--	--	1E-06	Liver	--	0.007	--	0.007
			Chemical Total	--	3E-04	--	--	3E-04		- -	83	- -	83
		Exposure Point Total						3E-04					83
	Exposure Medium Total							3E-04					83
Medium Total								2E-03					263
Surface Water	Surface Water	Site 43	Arsenic	5E-08	--	3E-08	--	8E-08	Skin, CVS	0.0003	--	0.0002	0.0005
			Cobalt	- -	--	- -	--	- -	Thyroid	0.007	--	0.002	0.009
			Cis-1,2-Dichloroethene	- -	--	- -	--	- -	Kidney	0.008	--	0.06	0.06
			Trichloroethene (Mutagenic)	1E-07	--	1E-06	--	1E-06	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	2E-07	--	2E-06	--	2E-06	Immune System, Developmental	0.04	--	0.3	0.4
			Vinyl Chloride	3E-08	--	9E-08	--	1E-07	Liver	0.00003	--	0.0001	0.0002
			Chemical Total	4E-07	--	3E-06	--	4E-06		0.05	--	0.4	0.4
		Exposure Point Total						4E-06					0.4
	Exposure Medium Total							4E-06					0.4
Medium Total								4E-06					0.4
Receptor Total							Receptor Risk Total	2E-03				Receptor HI Total	264

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Blood HI	0.05
Total Body Weight HI	0.05
Total CNS HI	0.7
Total CVS HI	0.3
Total Developmental HI	172
Total GS HI	1.0
Total Kidney HI	85
Total Liver HI	84
Total Respiratory HI	0.0004
Total None Specified HI	0.03
Total Skin HI	0.3
Total Thyroid HI	4
Total Spleen HI	0.06

TABLE 9.6.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Lifelong (Child and Adult)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Site 43	Aluminum	- -	--	- -	--	- -					
			Cadmium	- -	--	- -	--	- -					
			Chromium VI	9E-05	--	1E-04	--	2E-04					
			Trichloroethene (Mutagenic)	2E-07	--	2E-08	--	2E-07					
			Trichloroethene (Nonmutagenic)	2E-07	--	1E-08	--	2E-07					
			Chemical Total	9E-05	--	1E-04	--	2E-04					
		Exposure Point Total						2E-04					
	Exposure Medium Total							2E-04					
	Air	Site 43	Aluminum	--	- -	--	--	- -					
			Cadmium	--	2E-09	--	--	2E-09					
			Chromium VI	--	8E-07	--	--	8E-07					
			Trichloroethene (Mutagenic)	--	9E-07	--	--	9E-07					
			Trichloroethene (Nonmutagenic)	--	1E-06	--	--	1E-06					
			Chemical Total	--	3E-06	--	--	3E-06					
		Exposure Point Total						3E-06					
	Exposure Medium Total							3E-06					
Medium Total								2E-04					
Subsurface Soil	Subsurface Soil	Site 43	Manganese	- -	--	- -	--	- -					
			Trichloroethene (Mutagenic)	9E-08	--	8E-09	--	9E-08					
			Trichloroethene (Nonmutagenic)	8E-08	--	7E-09	--	9E-08					
			Chemical Total	2E-07	--	2E-08	--	2E-07					
		Exposure Point Total						2E-07					
	Exposure Medium Total							2E-07					
	Air	Site 43	Manganese	--	- -	--	--	- -					
			Trichloroethene (Mutagenic)	--	5E-07	--	--	5E-07					
			Trichloroethene (Nonmutagenic)	--	6E-07	--	--	6E-07					
			Chemical Total	--	1E-06	--	--	1E-06					
		Exposure Point Total						1E-06					
	Exposure Medium Total							1E-06					
Medium Total								1E-06					
Groundwater	Groundwater	Site 43	1,3-Dinitrobenzene	- -	--	- -	--	- -					
			2,6-Dinitrotoluene	1E-05	--	3E-07	--	1E-05					
			3-Nitrotoluene	- -	--	- -	--	- -					
			Arsenic	6E-05	--	2E-07	--	6E-05					
			Barium	- -	--	- -	--	- -					
			Beryllium	- -	--	- -	--	- -					
			Cobalt	- -	--	- -	--	- -					
			Iron	- -	--	- -	--	- -					
			Manganese	- -	--	- -	--	- -					
			Nickel	- -	--	- -	--	- -					
			Thallium	- -	--	- -	--	- -					
			1,1-Dichloroethane	4E-07	--	2E-08	--	4E-07					
			1,1-Dichloroethene	- -	--	- -	--	- -					
			1,2-Dichloroethane	5E-07	--	2E-08	--	5E-07					
			Cis-1,2-Dichloroethene	- -	--	- -	--	- -					
			Trichloroethene (Mutagenic)	1E-03	--	1E-04	--	1E-03					
			Trichloroethene (Nonmutagenic)	1E-03	--	2E-04	--	2E-03					
			Vinyl Chloride	5E-04	--	9E-06	--	5E-04					
			Chemical Total	3E-03	--	3E-04	--	3E-03					
		Exposure Point Total						3E-03					
	Exposure Medium Total							3E-03					

TABLE 9.6.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Lifelong (Child and Adult)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Air	Site 43	1,3-Dinitrobenzene	--	- -	--	--	- -					
			2,6-Dinitrotoluene	--	- -	--	--	- -					
			3-Nitrotoluene	--	- -	--	--	- -					
			Arsenic	--	- -	--	--	- -					
			Barium	--	- -	--	--	- -					
			Beryllium	--	- -	--	--	- -					
			Cobalt	--	- -	--	--	- -					
			Iron	--	- -	--	--	- -					
			Manganese	--	- -	--	--	- -					
			Nickel	--	- -	--	--	- -					
			Thallium	--	- -	--	--	- -					
			1,1-Dichloroethane	--	2E-07	--	--	2E-07					
			1,1-Dichloroethene	--	- -	--	--	- -					
			1,2-Dichloroethane	--	2E-07	--	--	2E-07					
			Cis-1,2-Dichloroethene	--	- -	--	--	- -					
			Trichloroethene (Mutagenic)	--	1E-04	--	--	1E-04					
			Trichloroethene (Nonmutagenic)	--	2E-04	--	--	2E-04					
			Vinyl Chloride	--	1E-06	--	--	1E-06					
			Chemical Total	--	3E-04	--	--	3E-04					
		Exposure Point Total						3E-04					
	Exposure Medium Total							3E-04					
Medium Total								4E-03					
Surface Water	Surface Water	Site 43	Arsenic	5E-08	--	3E-08	--	8E-08					
			Cobalt	- -	--	- -	--	- -					
			Cis-1,2-Dichloroethene	- -	--	- -	--	- -					
			Trichloroethene (Mutagenic)	1E-07	--	1E-06	--	1E-06					
			Trichloroethene (Nonmutagenic)	2E-07	--	2E-06	--	2E-06					
			Vinyl Chloride	1E-05	--	9E-08	--	1E-05					
			Chemical Total	1E-05	--	3E-06	--	1E-05					
		Exposure Point Total						1E-05					
	Exposure Medium Total							1E-05					
Medium Total								1E-05					
Receptor Total							Receptor Risk Total	4E-03					

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.7.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Site 43 including Background	Aluminum	- -	--	- -	--	- -	CNS	0.03	--	0.001	0.04
			Arsenic	2E-07	--	3E-08	--	2E-07	Skin, CVS	0.03	--	0.004	0.03
			Cadmium	- -	--	- -	--	- -	Kidney	0.02	--	0.003	0.02
			Chromium VI	4E-07	--	5E-07	--	9E-07	None Specified	0.01	--	0.01	0.02
			Cobalt	- -	--	- -	--	- -	Thyroid	0.008	--	0.0002	0.008
			Iron	- -	--	- -	--	- -	GS	0.06	--	0.002	0.06
			Manganese	- -	--	- -	--	- -	CNS	0.10	--	0.07	0.2
			Thallium	- -	--	- -	--	- -	Skin	--	--	--	--
			Vanadium	- -	--	- -	--	- -	Kidney	0.007	--	0.009	0.02
			Trichloroethene	3E-09	--	3E-10	--	4E-09	Liver, Kidney	0.01	--	0.0009	0.01
			Chemical Total	6E-07	--	5E-07	--	1E-06		0.3	--	0.1	0.4
		Exposure Point Total						1E-06					0.4
	Exposure Medium Total							1E-06					0.4
	Air	Site 43 including Background	Aluminum	--	- -	--	--	- -	CNS	--	0.3	--	0.3
			Arsenic	--	4E-08	--	--	4E-08	NA	--	0.04	--	0.04
			Cadmium	--	2E-08	--	--	2E-08	Kidney, Respiratory	--	0.09	--	0.09
			Chromium VI	--	3E-06	--	--	3E-06	Respiratory	--	0.008	--	0.008
			Cobalt	--	1E-07	--	--	1E-07	Respiratory	--	0.05	--	0.05
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	2	--	2
			Thallium	--	- -	--	--	- -	NA	--	--	--	--
			Vanadium	--	- -	--	--	- -	NA	--	--	--	--
			Trichloroethene	--	4E-08	--	--	4E-08	Liver, Kidney	--	0.4	--	0.4
			Chemical Total	--	3E-06	--	--	3E-06		- -	3	- -	3
		Exposure Point Total						3E-06					3
	Exposure Medium Total							3E-06					3
Medium Total								4E-06					3
Subsurface Soil	Subsurface Soil	Site 43 including Background	Aluminum	- -	--	- -	--	- -	CNS	0.02	--	0.0005	0.02
			Arsenic	6E-08	--	9E-09	--	7E-08	Skin, CVS	0.009	--	0.001	0.01
			Chromium VI	2E-07	--	3E-07	--	5E-07	None Specified	0.006	--	0.007	0.01
			Cobalt	- -	--	- -	--	- -	Thyroid	0.003	--	0.00009	0.003
			Iron	- -	--	- -	--	- -	GS	0.04	--	0.001	0.04
			Manganese	- -	--	- -	--	- -	CNS	0.007	--	0.006	0.01
			Trichloroethene	2E-09	--	2E-10	--	2E-09	Liver, Kidney	0.005	--	0.0005	0.006
			Chemical Total	3E-07	--	3E-07	--	5E-07		0.08	--	0.02	0.1
		Exposure Point Total						5E-07					0.1
	Exposure Medium Total							5E-07					0.1
	Air	Site 43 including Background	Aluminum	--	- -	--	--	- -	CNS	--	0.2	--	0.2
			Arsenic	--	1E-08	--	--	1E-08	NA	--	0.01	--	0.01
			Chromium VI	--	2E-06	--	--	2E-06	Respiratory	--	0.004	--	0.004
			Cobalt	--	5E-08	--	--	5E-08	Respiratory	--	0.02	--	0.02
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	0.2	--	0.2
			Trichloroethene	--	2E-08	--	--	2E-08	Liver, Kidney	--	0.2	--	0.2
			Chemical Total	--	2E-06	--	--	2E-06		- -	0.5	- -	0.5
		Exposure Point Total						2E-06					0.5
	Exposure Medium Total							2E-06					0.5
Medium Total								2E-06					0.6

TABLE 9.7.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Site 43 including Background	1,3-Dinitrobenzene	- -	--	- -	--	- -	Spleen	0.00001	--	0.00005	0.00006
			2,6-Dinitrotoluene	4E-10	--	2E-09	--	2E-09	CNS, Blood, Liver	0.000004	--	0.00002	0.00002
			3-Nitrotoluene	- -	--	- -	--	- -	NA	0.00001	--	0.0003	0.0003
			Arsenic	2E-09	--	3E-09	--	5E-09	Skin, CVS	0.0003	--	0.0004	0.0008
			Barium	- -	--	- -	--	- -	Kidney	0.00002	--	0.0005	0.0005
			Beryllium	- -	--	- -	--	- -	GS	0.000006	--	0.001	0.001
			Cadmium	- -	--	- -	--	- -	Kidney	0.00001	--	0.0008	0.0008
			Chromium VI	4E-10	--	4E-08	--	4E-08	None Specified	0.00001	--	0.001	0.001
			Cobalt	- -	--	- -	--	- -	Thyroid	0.0006	--	0.0003	0.0009
			Iron	- -	--	- -	--	- -	GS	0.001	--	0.002	0.003
			Manganese	- -	--	- -	--	- -	CNS	0.0007	--	0.02	0.02
			Nickel	- -	--	- -	--	- -	Body Weight	0.00006	--	0.0004	0.0004
			Thallium	- -	--	- -	--	- -	Skin	--	--	--	--
			Vanadium	- -	--	- -	--	- -	Kidney	0.000009	--	0.0004	0.0005
			1,1-Dichloroethane	1E-11	--	1E-10	--	2E-10	Kidney	8E-8	--	0.0000009	0.0000009
			1,1-Dichloroethene	- -	--	- -	--	- -	Liver	0.00002	--	0.0003	0.0003
			1,2-Dichloroethane	2E-11	--	1E-10	--	1E-10	Kidney	0.0000006	--	0.000004	0.000005
			Cis-1,2-Dichloroethene	- -	--	- -	--	- -	Kidney	0.0001	--	0.002	0.002
			Trichloroethene	6E-08	--	1E-06	--	1E-06	Liver, Kidney	0.2	--	4	4
			Vinyl Chloride	3E-09	--	2E-08	--	3E-08	Liver	0.0009	--	0.008	0.009
			Chemical Total	7E-08	--	1E-06	--	1E-06		0.2	--	4	4
		Exposure Point Total						1E-06					4
	Exposure Medium Total							1E-06					4
	Air	Site 43 including Background	1,3-Dinitrobenzene	--	- -	--	--	- -	NA	--	--	--	--
			2,6-Dinitrotoluene	--	- -	--	--	- -	NA	--	--	--	--
			3-Nitrotoluene	--	- -	--	--	- -	NA	--	--	--	--
			Arsenic	--	- -	--	--	- -	NA	--	--	--	--
			Barium	--	- -	--	--	- -	Fetotoxicity	--	--	--	--
			Beryllium	--	- -	--	--	- -	Respiratory	--	--	--	--
			Cadmium	--	- -	--	--	- -	Kidney, Respiratory	--	--	--	--
			Chromium VI	--	- -	--	--	- -	Respiratory	--	--	--	--
			Cobalt	--	- -	--	--	- -	Respiratory	--	--	--	--
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	--	--	--
			Nickel	--	- -	--	--	- -	Respiratory	--	--	--	--
			Thallium	--	- -	--	--	- -	NA	--	--	--	--
			Vanadium	--	- -	--	--	- -	NA	--	--	--	--
			1,1-Dichloroethane	--	2E-10	--	--	2E-10	NA	--	--	--	--
			1,1-Dichloroethene	--	- -	--	--	- -	Liver	--	0.00009	--	0.00009
			1,2-Dichloroethane	--	2E-10	--	--	2E-10	NA	--	0.000008	--	0.000008
			Cis-1,2-Dichloroethene	--	- -	--	--	- -	NA	--	--	--	--
			Trichloroethene	--	2E-07	--	--	2E-07	Liver, Kidney	--	2	--	2
			Vinyl Chloride	--	1E-09	--	--	1E-09	Liver	--	0.0002	--	0.0002
			Chemical Total	--	2E-07	--	--	2E-07		- -	2	- -	2
		Exposure Point Total						2E-07					2
	Exposure Medium Total							2E-07					2
Medium Total								2E-06					6
Surface Water	Surface Water	Site 43	Arsenic	2E-09	--	7E-10	--	3E-09	Skin, CVS	0.0003	--	0.0001	0.0004
			Cobalt	- -	--	- -	--	- -	Thyroid	0.0007	--	0.00009	0.0008
			Cis-1,2-Dichloroethene	- -	--	- -	--	- -	Kidney	0.0008	--	0.003	0.004
			Trichloroethene	1E-08	--	6E-08	--	7E-08	Liver, Kidney	0.04	--	0.2	0.2
			Vinyl Chloride	1E-09	--	2E-09	--	3E-09	Liver	0.0003	--	0.0007	0.001
			Chemical Total	2E-08	--	6E-08	--	8E-08		0.04	--	0.2	0.2
		Exposure Point Total						8E-08					0.2
	Exposure Medium Total							8E-08					0.2
Medium Total								8E-08					0.2
Receptor Total							Receptor Risk Total	8E-06				Receptor HI Total	10

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Liver HI	6	Total Blood HI	0.00002
Total Respiratory HI	0.2	Total Body Weight HI	0.0004
Total None Specified HI	0.04	Total CNS HI	3
Total Skin HI	0.04	Total CVS HI	0.04
Total Thyroid HI	0.01	Total GS HI	0.1
Total Spleen HI	0.00006	Total Kidney HI	7

TABLE 9.8.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Maintenance Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Site 43	Aluminum	- -	--	- -	--	- -	CNS	0.002	--	0.0001	0.002
			Arsenic	2E-07	--	7E-08	--	3E-07	Skin, CVS	0.001	--	0.0004	0.002
			Cadmium	- -	--	- -	--	- -	Kidney	0.001	--	0.0003	0.001
			Chromium VI	5E-07	--	1E-06	--	2E-06	None Specified	0.0009	--	0.002	0.003
			Cobalt	- -	--	- -	--	- -	Thyroid	0.004	--	0.0003	0.004
			Iron	- -	--	- -	--	- -	GS	0.003	--	0.0002	0.003
			Manganese	- -	--	- -	--	- -	CNS	0.005	--	0.008	0.01
			Thallium	- -	--	- -	--	- -	Skin	--	--	--	--
			Vanadium	- -	--	- -	--	- -	Kidney	0.0007	--	0.002	0.003
			Trichloroethene	4E-09	--	8E-10	--	5E-09	Immune System, Developmental	0.0005	--	0.0001	0.0006
			Chemical Total	7E-07	--	1E-06	--	2E-06		0.02	--	0.01	0.03
		Exposure Point Total						2E-06					0.03
	Exposure Medium Total							2E-06					0.03
	Air	Site 43	Aluminum	--	- -	--	--	- -	CNS	--	0.00002	--	0.00002
			Arsenic	--	8E-11	--	--	8E-11	NA	--	0.000003	--	0.000003
			Cadmium	--	5E-11	--	--	5E-11	Kidney, Respiratory	--	0.000007	--	0.000007
			Chromium VI	--	6E-09	--	--	6E-09	Respiratory	--	0.000002	--	0.000002
			Cobalt	--	3E-10	--	--	3E-10	Respiratory	--	0.00001	--	0.00001
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	0.0002	--	0.0002
			Thallium	--	- -	--	--	- -	NA	--	--	--	--
			Vanadium	--	- -	--	--	- -	NA	--	0.000003	--	0.000003
			Trichloroethene	--	3E-08	--	--	3E-08	Liver, Kidney	--	0.010	--	0.010
			Chemical Total	--	3E-08	--	--	3E-08		- -	0.01	- -	0.01
		Exposure Point Total						3E-08					0.01
	Exposure Medium Total							3E-08					0.01
Medium Total								2E-06					0.04
Subsurface Soil	Subsurface Soil	Site 43	Aluminum	- -	--	- -	--	- -	CNS	0.0008	--	0.00006	0.0009
			Arsenic	7E-08	--	2E-08	--	1E-07	Skin, CVS	0.0004	--	0.0001	0.0006
			Chromium VI	3E-07	--	7E-07	--	9E-07	None Specified	0.0005	--	0.001	0.002
			Cobalt	- -	--	- -	--	- -	Thyroid	0.002	--	0.0001	0.002
			Iron	- -	--	- -	--	- -	GS	0.002	--	0.0001	0.002
			Manganese	- -	--	- -	--	- -	CNS	0.0004	--	0.0006	0.0010
			Trichloroethene	2E-09	--	4E-10	--	3E-09	Immune System, Developmental	0.0003	--	0.00005	0.0003
			Chemical Total	3E-07	--	7E-07	--	1E-06		0.006	--	0.002	0.008
		Exposure Point Total						1E-06					0.008
	Exposure Medium Total							1E-06					0.008
	Air	Site 43	Aluminum	--	- -	--	--	- -	CNS	--	0.00001	--	0.00001
			Arsenic	--	2E-11	--	--	2E-11	NA	--	0.000001	--	0.000001
			Chromium VI	--	3E-09	--	--	3E-09	Respiratory	--	0.000001	--	0.000001
			Cobalt	--	1E-10	--	--	1E-10	Respiratory	--	0.000006	--	0.000006
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	0.00001	--	0.00001
			Trichloroethene	--	1E-08	--	--	1E-08	Liver, Kidney	--	0.005	--	0.005
			Chemical Total	--	2E-08	--	--	2E-08		- -	0.005	- -	0.005
		Exposure Point Total						2E-08					0.005
	Exposure Medium Total							2E-08					0.005
Medium Total								1E-06					0.01
Surface Water	Surface Water	Site 43	Arsenic	2E-08	--	8E-09	--	3E-08	Skin, CVS	0.0002	--	0.00005	0.0002
			Cobalt	- -	--	- -	--	- -	Thyroid	0.003	--	0.0004	0.004
			Cis-1,2-Dichloroethene	- -	--	- -	--	- -	Kidney	0.004	--	0.02	0.02
			Trichloroethene	1E-07	--	7E-07	--	9E-07	Immune System, Developmental	0.02	--	0.09	0.1
			Vinyl Chloride	1E-08	--	2E-08	--	4E-08	Liver	0.00002	--	0.00003	0.00005
			Chemical Total	2E-07	--	7E-07	--	9E-07		0.03	--	0.1	0.1
		Exposure Point Total						9E-07					0.1
	Exposure Medium Total							9E-07					0.1
Medium Total								9E-07					0.1
Receptor Total							Receptor Risk Total	4E-06				Receptor HI Total	0.2

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.9.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Site 43	Aluminum	- -	--	- -	--	- -	CNS	0.02	--	0.001	0.02
			Arsenic	2E-06	--	7E-07	--	3E-06	Skin, CVS	0.01	--	0.005	0.02
			Cadmium	- -	--	- -	--	- -	Kidney	0.01	--	0.003	0.01
			Chromium VI	5E-06	--	1E-05	--	2E-05	None Specified	0.009	--	0.02	0.03
			Cobalt	- -	--	- -	--	- -	Thyroid	0.04	--	0.003	0.04
			Iron	- -	--	- -	--	- -	GS	0.03	--	0.002	0.03
			Manganese	- -	--	- -	--	- -	CNS	0.05	--	0.08	0.1
			Thallium	- -	--	- -	--	- -	Skin	--	--	--	--
			Vanadium	- -	--	- -	--	- -	Kidney	0.007	--	0.02	0.03
			Trichloroethene	4E-08	--	9E-09	--	5E-08	Immune System, Developmental	0.005	--	0.001	0.006
			Chemical Total	7E-06	--	1E-05	--	2E-05		0.2	--	0.1	0.3
		Exposure Point Total						2E-05					0.3
	Exposure Medium Total							2E-05					0.3
	Air	Site 43	Aluminum	--	- -	--	--	- -	CNS	--	0.0002	--	0.0002
			Arsenic	--	8E-10	--	--	8E-10	NA	--	0.00003	--	0.00003
			Cadmium	--	5E-10	--	--	5E-10	Kidney, Respiratory	--	0.00008	--	0.00008
			Chromium VI	--	6E-08	--	--	6E-08	Respiratory	--	0.00002	--	0.00002
			Cobalt	--	3E-09	--	--	3E-09	Respiratory	--	0.0001	--	0.0001
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	0.002	--	0.002
			Thallium	--	- -	--	--	- -	NA	--	--	--	--
			Vanadium	--	- -	--	--	- -	NA	--	0.00003	--	0.00003
			Trichloroethene	--	3E-07	--	--	3E-07	Liver, Kidney	--	0.1	--	0.1
			Chemical Total	--	4E-07	--	--	4E-07		- -	0.1	- -	0.1
		Exposure Point Total						4E-07					0.1
	Exposure Medium Total							4E-07					0.1
Medium Total								2E-05					0.4
Subsurface Soil	Subsurface Soil	Site 43	Aluminum	- -	--	- -	--	- -	CNS	0.009	--	0.0006	0.009
			Arsenic	7E-07	--	2E-07	--	1E-06	Skin, CVS	0.005	--	0.002	0.006
			Chromium VI	3E-06	--	7E-06	--	1E-05	None Specified	0.005	--	0.01	0.02
			Cobalt	- -	--	- -	--	- -	Thyroid	0.02	--	0.001	0.02
			Iron	- -	--	- -	--	- -	GS	0.02	--	0.001	0.02
			Manganese	- -	--	- -	--	- -	CNS	0.004	--	0.006	0.010
			Trichloroethene	2E-08	--	4E-09	--	3E-08	Immune System, Developmental	0.003	--	0.0005	0.003
			Chemical Total	3E-06	--	7E-06	--	1E-05		0.06	--	0.02	0.08
		Exposure Point Total						1E-05					0.08
	Exposure Medium Total							1E-05					0.08
	Air	Site 43	Aluminum	--	- -	--	--	- -	CNS	--	0.0001	--	0.0001
			Arsenic	--	3E-10	--	--	3E-10	NA	--	0.00001	--	0.00001
			Chromium VI	--	3E-08	--	--	3E-08	Respiratory	--	0.00001	--	0.00001
			Cobalt	--	1E-09	--	--	1E-09	Respiratory	--	0.00006	--	0.00006
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	0.0001	--	0.0001
			Trichloroethene	--	2E-07	--	--	2E-07	Liver, Kidney	--	0.05	--	0.05
			Chemical Total	--	2E-07	--	--	2E-07		- -	0.05	- -	0.05
		Exposure Point Total						2E-07					0.05
	Exposure Medium Total							2E-07					0.05
Medium Total								1E-05					0.1

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.10.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Site 43	Aluminum	- -	--	- -	--	- -	CNS	0.2	--	0.006	0.2
			Arsenic	7E-06	--	1E-06	--	8E-06	Skin, CVS	0.2	--	0.03	0.2
			Cadmium	- -	--	- -	--	- -	Kidney	0.1	--	0.02	0.2
			Chromium VI	8E-05	--	9E-05	--	2E-04	None Specified	0.1	--	0.1	0.3
			Cobalt	- -	--	- -	--	- -	Thyroid	0.5	--	0.01	0.5
			Iron	- -	--	- -	--	- -	GS	0.4	--	0.01	0.4
			Manganese	- -	--	- -	--	- -	CNS	0.6	--	0.4	1
			Thallium	- -	--	- -	--	- -	Skin	--	--	--	--
			Vanadium	- -	--	- -	--	- -	Kidney	0.10	--	0.1	0.2
			Trichloroethene (Mutagenic)	1E-07	--	1E-08	--	2E-07	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	1E-07	--	9E-09	--	1E-07	Immune System, Developmental	0.07	--	0.006	0.08
			Chemical Total	9E-05	--	9E-05	--	2E-04		2	--	0.8	3
		Exposure Point Total						2E-04					3
	Exposure Medium Total							2E-04					3
	Air	Site 43	Aluminum	--	- -	--	--	- -	CNS	--	0.001	--	0.001
			Arsenic	--	8E-10	--	--	8E-10	NA	--	0.0001	--	0.0001
			Cadmium	--	5E-10	--	--	5E-10	Kidney, Respiratory	--	0.0003	--	0.0003
			Chromium VI	--	3E-07	--	--	3E-07	Respiratory	--	0.00008	--	0.00008
			Cobalt	--	3E-09	--	--	3E-09	Respiratory	--	0.0006	--	0.0006
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	0.007	--	0.007
			Thallium	--	- -	--	--	- -	NA	--	--	--	--
			Vanadium	--	- -	--	--	- -	NA	--	0.0001	--	0.0001
			Trichloroethene (Mutagenic)	--	4E-07	--	--	4E-07	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	--	2E-07	--	--	2E-07	Liver, Kidney	--	0.4	--	0.4
			Chemical Total	--	9E-07	--	--	9E-07		- -	0.4	- -	0.4
		Exposure Point Total						9E-07					0.4
	Exposure Medium Total							9E-07					0.4
Medium Total								2E-04					4
Subsurface Soil	Subsurface Soil	Site 43	Aluminum	- -	--	- -	--	- -	CNS	0.1	--	0.003	0.1
			Arsenic	2E-06	--	3E-07	--	3E-06	Skin, CVS	0.06	--	0.009	0.07
			Chromium VI	5E-05	--	5E-05	--	1E-04	None Specified	0.07	--	0.07	0.1
			Cobalt	- -	--	- -	--	- -	Thyroid	0.2	--	0.006	0.2
			Iron	- -	--	- -	--	- -	GS	0.2	--	0.007	0.2
			Manganese	- -	--	- -	--	- -	CNS	0.05	--	0.03	0.08
			Trichloroethene (Mutagenic)	7E-08	--	6E-09	--	8E-08	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	6E-08	--	5E-09	--	6E-08	Immune System, Developmental	0.04	--	0.003	0.04
			Chemical Total	5E-05	--	5E-05	--	1E-04		0.8	--	0.1	0.9
		Exposure Point Total						1E-04					0.9
	Exposure Medium Total							1E-04					0.9
	Air	Site 43	Aluminum	--	- -	--	--	- -	CNS	--	0.0005	--	0.0005
			Arsenic	--	3E-10	--	--	3E-10	NA	--	0.00005	--	0.00005
			Chromium VI	--	2E-07	--	--	2E-07	Respiratory	--	0.00005	--	0.00005
			Cobalt	--	1E-09	--	--	1E-09	Respiratory	--	0.0002	--	0.0002
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	0.0005	--	0.0005
			Trichloroethene (Mutagenic)	--	2E-07	--	--	2E-07	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	--	1E-07	--	--	1E-07	Liver, Kidney	--	0.2	--	0.2
			Chemical Total	--	5E-07	--	--	5E-07		- -	0.2	- -	0.2
		Exposure Point Total						5E-07					0.2
	Exposure Medium Total							5E-07					0.2
Medium Total								1E-04					1

TABLE 9.10.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Site 43	1,3-Dinitrobenzene	- -	--	- -	--	- -	Spleen	0.1	--	0.001	0.1
			2,6-Dinitrotoluene	4E-06	--	5E-08	--	4E-06	CNS, Blood, Liver	0.1	--	0.001	0.1
			3-Nitrotoluene	- -	--	- -	--	- -	NA	0.2	--	0.01	0.3
			Arsenic	2E-05	--	2E-08	--	2E-05	Skin, CVS	0.6	--	0.0004	0.6
			Barium	- -	--	- -	--	- -	Kidney	0.04	--	0.0004	0.04
			Beryllium	- -	--	- -	--	- -	GS	0.03	--	0.002	0.03
			Cadmium	- -	--	- -	--	- -	Kidney	0.03	--	0.0007	0.03
			Chromium VI	2E-05	--	1E-06	--	2E-05	None Specified	0.03	--	0.002	0.03
			Cobalt	- -	--	- -	--	- -	Thyroid	10	--	0.003	10
			Iron	- -	--	- -	--	- -	GS	2	--	0.001	2
			Manganese	- -	--	- -	--	- -	CNS	1	--	0.02	1
			Nickel	- -	--	- -	--	- -	Body Weight	0.1	--	0.0003	0.1
			Thallium	- -	--	- -	--	- -	Skin	--	--	--	--
			Vanadium	- -	--	- -	--	- -	Kidney	0.03	--	0.0008	0.03
			1,1-Dichloroethane	1E-07	--	4E-09	--	2E-07	Kidney	0.002	--	0.00004	0.002
			1,1-Dichloroethene	- -	--	- -	--	- -	Liver	0.006	--	0.0002	0.006
			1,2-Dichloroethane	2E-07	--	3E-09	--	2E-07	Kidney	0.004	--	0.00006	0.004
			Cis-1,2-Dichloroethene	- -	--	- -	--	- -	Kidney	2	--	0.07	2
			Trichloroethene (Mutagenic)	7E-04	--	4E-05	--	8E-04	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	5E-04	--	3E-05	--	6E-04	Immune System, Developmental	343	--	18	360
			Vinyl Chloride	4E-04	--	7E-06	--	4E-04	Liver	0.2	--	0.003	0.2
			Chemical Total	2E-03	--	7E-05	--	2E-03		360	--	18	378
		Exposure Point Total						2E-03					378
	Exposure Medium Total							2E-03					378
Medium Total								2E-03					378
Surface Water	Surface Water	Site 43	Arsenic	6E-08	--	2E-08	--	8E-08	Skin, CVS	0.002	--	0.0004	0.002
			Cobalt	- -	--	- -	--	- -	Thyroid	0.03	--	0.004	0.04
			Cis-1,2-Dichloroethene	- -	--	- -	--	- -	Kidney	0.04	--	0.1	0.2
			Trichloroethene (Mutagenic)	4E-07	--	2E-06	--	2E-06	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	3E-07	--	1E-06	--	1E-06	Immune System, Developmental	0.2	--	0.7	0.9
			Vinyl Chloride	2E-06	--	4E-06	--	7E-06	Liver	0.0002	--	0.0003	0.0004
			Chemical Total	3E-06	--	7E-06	--	1E-05		0.3	--	0.9	1
		Exposure Point Total						1E-05					1
	Exposure Medium Total							1E-05					1
Medium Total								1E-05					1
Receptor Total							Receptor Risk Total	2E-03				Receptor HI Total	384

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Blood HI	0.1
Total Body Weight HI	0.1
Total CNS HI	3
Total CVS HI	0.9
Total Developmental HI	361
Total GS HI	3
Total Kidney HI	3
Total Liver HI	0.9
Total Respiratory HI	0.001
Total None Specified HI	0.4
Total Skin HI	0.9
Total Thyroid HI	11
Total Spleen HI	0.1

TABLE 9.11.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Site 43	Aluminum	- -	--	- -	--	- -	CNS	0.02	--	0.0010	0.03
			Arsenic	3E-06	--	6E-07	--	4E-06	Skin, CVS	0.02	--	0.004	0.02
			Cadmium	- -	--	- -	--	- -	Kidney	0.01	--	0.002	0.02
			Chromium VI	1E-05	--	2E-05	--	3E-05	None Specified	0.01	--	0.02	0.03
			Cobalt	- -	--	- -	--	- -	Thyroid	0.06	--	0.002	0.06
			Iron	- -	--	- -	--	- -	GS	0.04	--	0.002	0.05
			Manganese	- -	--	- -	--	- -	CNS	0.07	--	0.07	0.1
			Thallium	- -	--	- -	--	- -	Skin	--	--	--	--
			Vanadium	- -	--	- -	--	- -	Kidney	0.01	--	0.02	0.03
			Trichloroethene (Mutagenic)	2E-08	--	3E-09	--	2E-08	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	5E-08	--	6E-09	--	5E-08	Immune System, Developmental	0.007	--	0.0009	0.008
			Chemical Total	2E-05	--	2E-05	--	4E-05		0.3	--	0.1	0.4
		Exposure Point Total						4E-05					0.4
	Exposure Medium Total							4E-05					0.4
	Air	Site 43	Aluminum	--	- -	--	--	- -	CNS	--	0.001	--	0.001
			Arsenic	--	3E-09	--	--	3E-09	NA	--	0.0001	--	0.0001
			Cadmium	--	2E-09	--	--	2E-09	Kidney, Respiratory	--	0.0003	--	0.0003
			Chromium VI	--	4E-07	--	--	4E-07	Respiratory	--	0.00008	--	0.00008
			Cobalt	--	1E-08	--	--	1E-08	Respiratory	--	0.0006	--	0.0006
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	0.007	--	0.007
			Thallium	--	- -	--	--	- -	NA	--	--	--	--
			Vanadium	--	- -	--	--	- -	NA	--	0.0001	--	0.0001
			Trichloroethene (Mutagenic)	--	5E-07	--	--	5E-07	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	--	9E-07	--	--	9E-07	Liver, Kidney	--	0.4	--	0.4
			Chemical Total	--	2E-06	--	--	2E-06		- -	0.4	- -	0.4
		Exposure Point Total						2E-06					0.4
	Exposure Medium Total							2E-06					0.4
Medium Total								4E-05					0.8
Subsurface Soil	Subsurface Soil	Site 43	Aluminum	- -	--	- -	--	- -	CNS	0.01	--	0.0005	0.01
			Arsenic	1E-06	--	2E-07	--	1E-06	Skin, CVS	0.007	--	0.001	0.008
			Chromium VI	7E-06	--	1E-05	--	2E-05	None Specified	0.007	--	0.01	0.02
			Cobalt	- -	--	- -	--	- -	Thyroid	0.02	--	0.0009	0.02
			Iron	- -	--	- -	--	- -	GS	0.03	--	0.001	0.03
			Manganese	- -	--	- -	--	- -	CNS	0.005	--	0.005	0.01
			Trichloroethene (Mutagenic)	1E-08	--	1E-09	--	1E-08	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	2E-08	--	3E-09	--	3E-08	Immune System, Developmental	0.004	--	0.0004	0.004
			Chemical Total	8E-06	--	1E-05	--	2E-05		0.08	--	0.02	0.1
		Exposure Point Total						2E-05					0.1
	Exposure Medium Total							2E-05					0.1
	Air	Site 43	Aluminum	--	- -	--	--	- -	CNS	--	0.0005	--	0.0005
			Arsenic	--	1E-09	--	--	1E-09	NA	--	0.00005	--	0.00005
			Chromium VI	--	2E-07	--	--	2E-07	Respiratory	--	0.00005	--	0.00005
			Cobalt	--	4E-09	--	--	4E-09	Respiratory	--	0.0002	--	0.0002
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	0.0005	--	0.0005
			Trichloroethene (Mutagenic)	--	3E-07	--	--	3E-07	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	--	5E-07	--	--	5E-07	Liver, Kidney	--	0.2	--	0.2
			Chemical Total	--	1E-06	--	--	1E-06		- -	0.2	- -	0.2
		Exposure Point Total						1E-06					0.2
	Exposure Medium Total							1E-06					0.2
Medium Total								2E-05					0.3

TABLE 9.11.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Site 43	1,3-Dinitrobenzene	- -	--	- -	--	- -	Spleen	0.06	--	0.002	0.06
			2,6-Dinitrotoluene	7E-06	--	3E-07	--	7E-06	CNS, Blood, Liver	0.05	--	0.002	0.05
			3-Nitrotoluene	- -	--	- -	--	- -	NA	0.1	--	0.02	0.1
			Arsenic	4E-05	--	2E-07	--	4E-05	Skin, CVS	0.3	--	0.001	0.3
			Barium	- -	--	- -	--	- -	Kidney	0.02	--	0.001	0.02
			Beryllium	- -	--	- -	--	- -	GS	0.01	--	0.008	0.02
			Cadmium	- -	--	- -	--	- -	Kidney	0.01	--	0.002	0.01
			Chromium VI	1E-05	--	5E-06	--	2E-05	None Specified	0.01	--	0.006	0.02
			Cobalt	- -	--	- -	--	- -	Thyroid	4	--	0.009	4
			Iron	- -	--	- -	--	- -	GS	1.0	--	0.005	1.0
			Manganese	- -	--	- -	--	- -	CNS	0.5	--	0.07	0.6
			Nickel	- -	--	- -	--	- -	Body Weight	0.04	--	0.001	0.05
			Thallium	- -	--	- -	--	- -	Skin	--	--	--	--
			Vanadium	- -	--	- -	--	- -	Kidney	0.01	--	0.003	0.02
			1,1-Dichloroethane	3E-07	--	2E-08	--	3E-07	Kidney	0.0006	--	0.00005	0.0007
			1,1-Dichloroethene	- -	--	- -	--	- -	Liver	0.002	--	0.0003	0.003
			1,2-Dichloroethane	3E-07	--	2E-08	--	3E-07	Kidney	0.002	--	0.00008	0.002
			Cis-1,2-Dichloroethene	- -	--	- -	--	- -	Kidney	0.8	--	0.10	0.9
			Trichloroethene (Mutagenic)	4E-04	--	7E-05	--	5E-04	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	9E-04	--	2E-04	--	1E-03	Immune System, Developmental	147	--	25	172
			Vinyl Chloride	5E-05	--	3E-06	--	6E-05	Liver	0.07	--	0.004	0.08
			Chemical Total	1E-03	--	2E-04	--	2E-03		154	--	25	179
		Exposure Point Total						2E-03					179
	Exposure Medium Total							2E-03					179
	Air	Site 43	1,3-Dinitrobenzene	--	- -	--	--	- -	NA	--	--	--	--
			2,6-Dinitrotoluene	--	- -	--	--	- -	NA	--	--	--	--
			3-Nitrotoluene	--	- -	--	--	- -	NA	--	--	--	--
			Arsenic	--	- -	--	--	- -	NA	--	--	--	--
			Barium	--	- -	--	--	- -	CVS	--	--	--	--
			Beryllium	--	- -	--	--	- -	Respiratory	--	--	--	--
			Cadmium	--	- -	--	--	- -	Kidney, Respiratory	--	--	--	--
			Chromium VI	--	- -	--	--	- -	Respiratory	--	--	--	--
			Cobalt	--	- -	--	--	- -	Respiratory	--	--	--	--
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	--	--	--
			Nickel	--	- -	--	--	- -	Respiratory	--	--	--	--
			Thallium	--	- -	--	--	- -	NA	--	--	--	--
			Vanadium	--	- -	--	--	- -	NA	--	--	--	--
			1,1-Dichloroethane	--	9E-08	--	--	9E-08	NA	--	--	--	--
			1,1-Dichloroethene	--	- -	--	--	- -	Liver	--	0.0008	--	0.0008
			1,2-Dichloroethane	--	1E-07	--	--	1E-07	NA	--	0.002	--	0.002
			Cis-1,2-Dichloroethene	--	- -	--	--	- -	NA	--	--	--	--
			Trichloroethene (Mutagenic)	--	5E-05	--	--	5E-05	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	--	9E-05	--	--	9E-05	Liver, Kidney	--	43	--	43
			Vinyl Chloride	--	5E-07	--	--	5E-07	Liver	--	0.004	--	0.004
			Chemical Total	--	1E-04	--	--	1E-04		- -	43	- -	43
		Exposure Point Total						1E-04					43
	Exposure Medium Total							1E-04					43
Medium Total								2E-03					222
Surface Water	Surface Water	Site 43	Arsenic	5E-08	--	3E-08	--	8E-08	Skin, CVS	0.0003	--	0.0002	0.0005
			Cobalt	- -	--	- -	--	- -	Thyroid	0.007	--	0.002	0.009
			Cis-1,2-Dichloroethene	- -	--	- -	--	- -	Kidney	0.008	--	0.06	0.06
			Trichloroethene (Mutagenic)	1E-07	--	1E-06	--	1E-06	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	2E-07	--	2E-06	--	2E-06	Immune System, Developmental	0.04	--	0.3	0.4
			Vinyl Chloride	3E-08	--	9E-08	--	1E-07	Liver	0.00003	--	0.0001	0.0002
			Chemical Total	4E-07	--	3E-06	--	4E-06		0.05	--	0.4	0.4
		Exposure Point Total						4E-06					0.4
	Exposure Medium Total							4E-06					0.4
Medium Total								4E-06					0.4
Receptor Total							Receptor Risk Total	2E-03				Receptor HI Total	223

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Liver HI	43	Total Blood HI	0.05
Total Respiratory HI	0.001	Total Body Weight HI	0.05
Total None Specified HI	0.07	Total CNS HI	0.9
Total Skin HI	0.3	Total CVS HI	0.3
Total Thyroid HI	5	Total Developmental HI	172
Total Spleen HI	0.06	Total GS HI	1
		Total Kidney HI	44

TABLE 9.12.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Lifelong (Child and Adult)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Site 43	Aluminum	- -	--	- -	--	- -					
			Arsenic	1E-05	--	2E-06	--	1E-05					
			Cadmium	- -	--	- -	--	- -					
			Chromium VI	9E-05	--	1E-04	--	2E-04					
			Cobalt	- -	--	- -	--	- -					
			Iron	- -	--	- -	--	- -					
			Manganese	- -	--	- -	--	- -					
			Thallium	- -	--	- -	--	- -					
			Vanadium	- -	--	- -	--	- -					
			Trichloroethene (Mutagenic)	2E-07	--	2E-08	--	2E-07					
			Trichloroethene (Nonmutagenic)	2E-07	--	1E-08	--	2E-07					
			Chemical Total	1E-04	--	1E-04	--	2E-04					
		Exposure Point Total						2E-04					
	Exposure Medium Total							2E-04					
	Air	Site 43	Aluminum	--	- -	--	--	- -					
			Arsenic	--	4E-09	--	--	4E-09					
			Cadmium	--	2E-09	--	--	2E-09					
			Chromium VI	--	8E-07	--	--	8E-07					
			Cobalt	--	1E-08	--	--	1E-08					
			Iron	--	- -	--	--	- -					
			Manganese	--	- -	--	--	- -					
			Thallium	--	- -	--	--	- -					
			Vanadium	--	- -	--	--	- -					
			Trichloroethene (Mutagenic)	--	9E-07	--	--	9E-07					
			Trichloroethene (Nonmutagenic)	--	1E-06	--	--	1E-06					
			Chemical Total	--	3E-06	--	--	3E-06					
		Exposure Point Total						3E-06					
	Exposure Medium Total							3E-06					
Medium Total								2E-04					
Subsurface Soil	Subsurface Soil	Site 43	Aluminum	- -	--	- -	--	- -					
			Arsenic	3E-06	--	5E-07	--	4E-06					
			Chromium VI	5E-05	--	6E-05	--	1E-04					
			Cobalt	- -	--	- -	--	- -					
			Iron	- -	--	- -	--	- -					
			Manganese	- -	--	- -	--	- -					
			Trichloroethene (Mutagenic)	9E-08	--	8E-09	--	9E-08					
			Trichloroethene (Nonmutagenic)	8E-08	--	7E-09	--	9E-08					
			Chemical Total	6E-05	--	6E-05	--	1E-04					
		Exposure Point Total						1E-04					
	Exposure Medium Total							1E-04					
	Air	Site 43	Aluminum	--	- -	--	--	- -					
			Arsenic	--	1E-09	--	--	1E-09					
			Chromium VI	--	4E-07	--	--	4E-07					
			Cobalt	--	6E-09	--	--	6E-09					
			Iron	--	- -	--	--	- -					
			Manganese	--	- -	--	--	- -					
			Trichloroethene (Mutagenic)	--	5E-07	--	--	5E-07					
			Trichloroethene (Nonmutagenic)	--	6E-07	--	--	6E-07					
			Chemical Total	--	1E-06	--	--	1E-06					
		Exposure Point Total						1E-06					
	Exposure Medium Total							1E-06					
Medium Total								1E-04					

TABLE 9.12.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Lifelong (Child and Adult)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Site 43	1,3-Dinitrobenzene	- -	--	- -	--	- -					
			2,6-Dinitrotoluene	1E-05	--	3E-07	--	1E-05					
			3-Nitrotoluene	- -	--	- -	--	- -					
			Arsenic	6E-05	--	2E-07	--	6E-05					
			Barium	- -	--	- -	--	- -					
			Beryllium	- -	--	- -	--	- -					
			Cadmium	- -	--	- -	--	- -					
			Chromium VI	3E-05	--	7E-06	--	4E-05					
			Cobalt	- -	--	- -	--	- -					
			Iron	- -	--	- -	--	- -					
			Manganese	- -	--	- -	--	- -					
			Nickel	- -	--	- -	--	- -					
			Thallium	- -	--	- -	--	- -					
			Vanadium	- -	--	- -	--	- -					
			1,1-Dichloroethane	4E-07	--	2E-08	--	4E-07					
			1,1-Dichloroethene	- -	--	- -	--	- -					
			1,2-Dichloroethane	5E-07	--	2E-08	--	5E-07					
			Cis-1,2-Dichloroethene	- -	--	- -	--	- -					
			Trichloroethene (Mutagenic)	1E-03	--	1E-04	--	1E-03					
			Trichloroethene (Nonmutagenic)	1E-03	--	2E-04	--	2E-03					
			Vinyl Chloride	5E-04	--	9E-06	--	5E-04					
			Chemical Total	3E-03	--	3E-04	--	4E-03					
		Exposure Point Total						4E-03					
	Exposure Medium Total							4E-03					
	Air	Site 43	1,3-Dinitrobenzene	--	- -	--	--	- -					
			2,6-Dinitrotoluene	--	- -	--	--	- -					
			3-Nitrotoluene	--	- -	--	--	- -					
			Arsenic	--	- -	--	--	- -					
			Barium	--	- -	--	--	- -					
			Beryllium	--	- -	--	--	- -					
			Cadmium	--	- -	--	--	- -					
			Chromium VI	--	- -	--	--	- -					
			Cobalt	--	- -	--	--	- -					
			Iron	--	- -	--	--	- -					
			Manganese	--	- -	--	--	- -					
			Nickel	--	- -	--	--	- -					
			Thallium	--	- -	--	--	- -					
			Vanadium	--	- -	--	--	- -					
			1,1-Dichloroethane	--	9E-08	--	--	9E-08					
			1,1-Dichloroethene	--	- -	--	--	- -					
			1,2-Dichloroethane	--	1E-07	--	--	1E-07					
			Cis-1,2-Dichloroethene	--	- -	--	--	- -					
			Trichloroethene (Mutagenic)	--	5E-05	--	--	5E-05					
			Trichloroethene (Nonmutagenic)	--	9E-05	--	--	9E-05					
			Vinyl Chloride	--	5E-07	--	--	5E-07					
			Chemical Total	--	1E-04	--	--	1E-04					
		Exposure Point Total						1E-04					
	Exposure Medium Total							1E-04					
Medium Total								4E-03					
Surface Water	Surface Water	Site 43	Arsenic	5E-08	--	3E-08	--	8E-08					
			Cobalt	- -	--	- -	--	- -					
			Cis-1,2-Dichloroethene	1E-05	--	- -	--	1E-05					
			Trichloroethene (Mutagenic)	1E-07	--	1E-06	--	1E-06					
			Trichloroethene (Nonmutagenic)	2E-07	--	2E-06	--	2E-06					
			Vinyl Chloride	3E-08	--	9E-08	--	1E-07					
			Chemical Total	1E-05	--	3E-06	--	1E-05					
		Exposure Point Total						1E-05					
	Exposure Medium Total							1E-05					
Medium Total								1E-05					
Receptor Total							Receptor Risk Total	4E-03					

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.1.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Site 43	Aluminum	- -	--	- -	--	- -	CNS	0.02	--	0.0003	0.02
			Cadmium	- -	--	- -	--	- -	Kidney	0.01	--	0.0008	0.01
			Chromium VI	2E-07	--	2E-07	--	3E-07	None Specified	0.005	--	0.004	0.010
			Trichloroethene	2E-09	--	1E-10	--	2E-09	Liver, Kidney	0.005	--	0.0003	0.006
			Chemical Total	2E-07	--	2E-07	--	4E-07		0.04	--	0.006	0.04
		Exposure Point Total						4E-07					0.04
	Exposure Medium Total							4E-07					0.04
	Air	Site 43	Aluminum	--	- -	--	--	- -	CNS	--	0.3	--	0.3
			Cadmium	--	2E-08	--	--	2E-08	Kidney, Respiratory	--	0.09	--	0.09
			Chromium VI	--	3E-06	--	--	3E-06	Respiratory	--	0.008	--	0.008
			Trichloroethene	--	4E-08	--	--	4E-08	Liver, Kidney	--	0.4	--	0.4
			Chemical Total	--	3E-06	--	--	3E-06		- -	0.8	- -	0.8
		Exposure Point Total						3E-06					0.8
	Exposure Medium Total							3E-06					0.8
Medium Total								3E-06					0.8
Subsurface Soil	Subsurface Soil	Site 43	Manganese	- -	--	- -	--	- -	CNS	0.004	--	0.002	0.006
			Trichloroethene	9E-10	--	5E-11	--	9E-10	Liver, Kidney	0.003	--	0.0002	0.003
			Chemical Total	9E-10	--	5E-11	--	9E-10		0.006	--	0.002	0.008
		Exposure Point Total						9E-10					0.008
	Exposure Medium Total							9E-10					0.008
	Air	Site 43	Manganese	--	- -	--	--	- -	CNS	--	0.2	--	0.2
			Trichloroethene	--	2E-08	--	--	2E-08	Liver, Kidney	--	0.2	--	0.2
			Chemical Total	--	2E-08	--	--	2E-08		- -	0.3	- -	0.3
		Exposure Point Total						2E-08					0.3
	Exposure Medium Total							2E-08					0.3
Medium Total								2E-08					0.4
Groundwater	Groundwater	Site 43	1,3-Dinitrobenzene	- -	--	- -	--	- -	Spleen	0.000005	--	0.00001	0.00002
			2,6-Dinitrotoluene	1E-10	--	4E-10	--	5E-10	CNS, Blood, Liver	0.000001	--	0.000004	0.000006
			3-Nitrotoluene	- -	--	- -	--	- -	NA	0.000004	--	0.00005	0.00006
			Arsenic	7E-10	--	5E-10	--	1E-09	Skin, CVS	0.0001	--	0.00007	0.0002
			Barium	- -	--	- -	--	- -	Kidney	0.000008	--	0.00008	0.00008
			Beryllium	- -	--	- -	--	- -	GS	0.000002	--	0.0002	0.0002
			Cobalt	- -	--	- -	--	- -	Thyroid	0.0002	--	0.00005	0.0002
			Iron	- -	--	- -	--	- -	GS	0.0004	--	0.0003	0.0007
			Manganese	- -	--	- -	--	- -	CNS	0.0002	--	0.004	0.004
			Nickel	- -	--	- -	--	- -	Body Weight	0.00002	--	0.00006	0.00008
			Thallium	- -	--	- -	--	- -	Skin	--	--	--	--
			1,1-Dichloroethane	4E-12	--	3E-11	--	3E-11	Kidney	3E-8	--	0.0000002	0.0000002
			1,1-Dichloroethene	- -	--	- -	--	- -	Liver	0.000006	--	0.00006	0.00007
			1,2-Dichloroethane	5E-12	--	2E-11	--	3E-11	Kidney	0.0000002	--	0.0000008	0.000001
			Cis-1,2-Dichloroethene	- -	--	- -	--	- -	Kidney	0.00003	--	0.0003	0.0004
			Trichloroethene	2E-08	--	2E-07	--	3E-07	Liver, Kidney	0.06	--	0.8	0.8
			Vinyl Chloride	1E-09	--	4E-09	--	5E-09	Liver	0.0003	--	0.001	0.002
			Chemical Total	2E-08	--	3E-07	--	3E-07		0.06	--	0.8	0.8
		Exposure Point Total						3E-07					0.8
	Exposure Medium Total							3E-07					0.8

TABLE 9.1.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Air	Site 43	1,3-Dinitrobenzene	--	- -	--	--	- -	NA	--	--	--	--
			2,6-Dinitrotoluene	--	- -	--	--	- -	NA	--	--	--	--
			3-Nitrotoluene	--	- -	--	--	- -	NA	--	--	--	--
			Arsenic	--	- -	--	--	- -	NA	--	--	--	--
			Barium	--	- -	--	--	- -	Fetotoxicity	--	--	--	--
			Beryllium	--	- -	--	--	- -	Respiratory	--	--	--	--
			Cobalt	--	- -	--	--	- -	Respiratory	--	--	--	--
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	--	--	--
			Nickel	--	- -	--	--	- -	Respiratory	--	--	--	--
			Thallium	--	- -	--	--	- -	NA	--	--	--	--
			1,1-Dichloroethane	--	3E-11	--	--	3E-11	NA	--	--	--	--
			1,1-Dichloroethene	--	- -	--	--	- -	Liver	--	0.00001	--	0.00001
			1,2-Dichloroethane	--	3E-11	--	--	3E-11	NA	--	0.000001	--	0.000001
			Cis-1,2-Dichloroethene	--	- -	--	--	- -	NA	--	--	--	--
			Trichloroethene	--	3E-08	--	--	3E-08	Liver, Kidney	--	0.3	--	0.3
			Vinyl Chloride	--	2E-10	--	--	2E-10	Liver	--	0.00003	--	0.00003
			Chemical Total	--	3E-08	--	--	3E-08		- -	0.3	- -	0.3
		Exposure Point Total						3E-08					0.3
	Exposure Medium Total							3E-08					0.3
Medium Total								3E-07					1
Surface Water	Surface Water	Site 43	Arsenic	5E-10	--	2E-10	--	7E-10	Skin, CVS	0.00008	--	0.00003	0.0001
			Cobalt	- -	--	- -	--	- -	Thyroid	0.0002	--	0.00002	0.0002
			Cis-1,2-Dichloroethene	- -	--	- -	--	- -	Kidney	0.0002	--	0.0010	0.001
			Trichloroethene	3E-09	--	2E-08	--	2E-08	Liver, Kidney	0.010	--	0.06	0.07
			Vinyl Chloride	3E-10	--	6E-10	--	9E-10	Liver	0.00009	--	0.0002	0.0003
			Chemical Total	4E-09	--	2E-08	--	2E-08		0.01	--	0.06	0.07
		Exposure Point Total						2E-08					0.07
	Exposure Medium Total							2E-08					0.07
Medium Total								2E-08					0.07
Receptor Total							Receptor Risk Total	4E-06				Receptor HI Total	2

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Blood HI	0.000006
Total Body Weight HI	0.00008
Total CNS HI	0.5
Total CVS HI	0.0003
Total GS HI	0.0009
Total Kidney HI	2
Total Liver HI	2
Total Respiratory HI	0.10
Total None Specified HI	0.010
Total Skin HI	0.0003
Total Thyroid HI	0.0004
Total Spleen HI	0.00002

TABLE 9.2.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Maintenance Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Site 43	Aluminum	- -	--	- -	--	- -	CNS	0.0004	--	0.000005	0.0004
			Cadmium	- -	--	- -	--	- -	Kidney	0.0003	--	0.00001	0.0003
			Chromium VI	4E-08	--	2E-08	--	6E-08	None Specified	0.0002	--	0.0001	0.0003
			Trichloroethene	4E-10	--	1E-11	--	4E-10	Immune System, Developmental	0.0001	--	0.000005	0.0001
			Chemical Total	4E-08	--	2E-08	--	7E-08		0.001	--	0.0001	0.001
		Exposure Point Total						7E-08					0.001
	Exposure Medium Total							7E-08					0.001
	Air	Site 43	Aluminum	--	- -	--	--	- -	CNS	--	0.00001	--	0.00001
			Cadmium	--	8E-12	--	--	8E-12	Kidney, Respiratory	--	0.000004	--	0.000004
			Chromium VI	--	1E-09	--	--	1E-09	Respiratory	--	0.0000010	--	0.0000010
			Trichloroethene	--	5E-09	--	--	5E-09	Liver, Kidney	--	0.005	--	0.005
			Chemical Total	--	6E-09	--	--	6E-09		- -	0.005	- -	0.005
		Exposure Point Total						6E-09					0.005
	Exposure Medium Total							6E-09					0.005
Medium Total								7E-08					0.006
Subsurface Soil	Subsurface Soil	Site 43	Manganese	- -	--	- -	--	- -	CNS	0.00009	--	0.00003	0.0001
			Trichloroethene	2E-10	--	8E-12	--	2E-10	Immune System, Developmental	0.00006	--	0.000003	0.00007
			Chemical Total	2E-10	--	8E-12	--	2E-10		0.0002	--	0.00003	0.0002
		Exposure Point Total						2E-10					0.0002
	Exposure Medium Total							2E-10					0.0002
	Air	Site 43	Manganese	--	- -	--	--	- -	CNS	--	0.000006	--	0.000006
			Trichloroethene	--	3E-09	--	--	3E-09	Liver, Kidney	--	0.002	--	0.002
			Chemical Total	--	3E-09	--	--	3E-09		- -	0.002	- -	0.002
		Exposure Point Total						3E-09					0.002
	Exposure Medium Total							3E-09					0.002
Medium Total								3E-09					0.003
Surface Water	Surface Water	Site 43	Arsenic	2E-09	--	7E-10	--	3E-09	Skin, CVS	0.00004	--	0.00001	0.00005
			Cobalt	- -	--	- -	--	- -	Thyroid	0.0008	--	0.0001	0.0009
			Cis-1,2-Dichloroethene	- -	--	- -	--	- -	Kidney	0.0009	--	0.004	0.005
			Trichloroethene	1E-08	--	8E-08	--	9E-08	Immune System, Developmental	0.005	--	0.03	0.03
			Vinyl Chloride	1E-09	--	2E-09	--	4E-09	Liver	0.000004	--	0.000009	0.00001
			Chemical Total	2E-08	--	8E-08	--	1E-07		0.006	--	0.03	0.04
		Exposure Point Total						1E-07					0.04
	Exposure Medium Total							1E-07					0.04
Medium Total								1E-07					0.04
Receptor Total							Receptor Risk Total	2E-07				Receptor HI Total	0.05

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.3.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Site 43	Aluminum	- -	--	- -	--	- -	CNS	0.008	--	0.00010	0.008
			Cadmium	- -	--	- -	--	- -	Kidney	0.005	--	0.0002	0.005
			Chromium VI	8E-07	--	4E-07	--	1E-06	None Specified	0.004	--	0.002	0.006
			Trichloroethene	7E-09	--	3E-10	--	7E-09	Immune System, Developmental	0.002	--	0.00009	0.002
			Chemical Total	8E-07	--	4E-07	--	1E-06		0.02	--	0.003	0.02
		Exposure Point Total						1E-06					0.02
	Exposure Medium Total							1E-06					0.02
	Air	Site 43	Aluminum	--	- -	--	--	- -	CNS	--	0.0002	--	0.0002
			Cadmium	--	2E-10	--	--	2E-10	Kidney, Respiratory	--	0.00007	--	0.00007
			Chromium VI	--	2E-08	--	--	2E-08	Respiratory	--	0.00002	--	0.00002
			Trichloroethene	--	9E-08	--	--	9E-08	Liver, Kidney	--	0.09	--	0.09
			Chemical Total	--	1E-07	--	--	1E-07		- -	0.09	- -	0.09
		Exposure Point Total						1E-07					0.09
	Exposure Medium Total							1E-07					0.09
Medium Total								1E-06					0.1
Subsurface Soil	Subsurface Soil	Site 43	Manganese	- -	--	- -	--	- -	CNS	0.002	--	0.0005	0.002
			Trichloroethene	3E-09	--	1E-10	--	4E-09	Immune System, Developmental	0.001	--	0.00005	0.001
			Chemical Total	3E-09	--	1E-10	--	4E-09		0.003	--	0.0006	0.003
		Exposure Point Total						4E-09					0.003
	Exposure Medium Total							4E-09					0.003
	Air	Site 43	Manganese	--	- -	--	--	- -	CNS	--	0.0001	--	0.0001
			Trichloroethene	--	5E-08	--	--	5E-08	Liver, Kidney	--	0.05	--	0.05
			Chemical Total	--	5E-08	--	--	5E-08		- -	0.05	- -	0.05
		Exposure Point Total						5E-08					0.05
	Exposure Medium Total							5E-08					0.05
Medium Total								5E-08					0.05

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.4.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Site 43	Aluminum	- -	--	- -	--	- -	CNS	0.08	--	0.0008	0.08
			Cadmium	- -	--	- -	--	- -	Kidney	0.05	--	0.002	0.05
			Chromium VI	1E-05	--	5E-06	--	2E-05	None Specified	0.04	--	0.02	0.06
			Trichloroethene (Mutagenic)	2E-08	--	7E-10	--	2E-08	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	1E-08	--	4E-10	--	1E-08	Immune System, Developmental	0.02	--	0.0008	0.02
			Chemical Total	1E-05	--	5E-06	--	2E-05		0.2	--	0.02	0.2
		Exposure Point Total						2E-05					0.2
	Exposure Medium Total							2E-05					0.2
	Air	Site 43	Aluminum	--	- -	--	--	- -	CNS	--	0.0007	--	0.0007
			Cadmium	--	1E-10	--	--	1E-10	Kidney, Respiratory	--	0.0002	--	0.0002
			Chromium VI	--	9E-08	--	--	9E-08	Respiratory	--	0.00006	--	0.00006
			Trichloroethene (Mutagenic)	--	1E-07	--	--	1E-07	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	--	5E-08	--	--	5E-08	Liver, Kidney	--	0.3	--	0.3
			Chemical Total	--	2E-07	--	--	2E-07		- -	0.3	- -	0.3
		Exposure Point Total						2E-07					0.3
	Exposure Medium Total							2E-07					0.3
Medium Total								2E-05					0.5
Subsurface Soil	Subsurface Soil	Site 43	Manganese	- -	--	- -	--	- -	CNS	0.02	--	0.005	0.02
			Trichloroethene (Mutagenic)	1E-08	--	3E-10	--	1E-08	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	6E-09	--	2E-10	--	6E-09	Immune System, Developmental	0.01	--	0.0004	0.01
			Chemical Total	2E-08	--	5E-10	--	2E-08		0.03	--	0.005	0.03
		Exposure Point Total						2E-08					0.03
	Exposure Medium Total							2E-08					0.03
	Air	Site 43	Manganese	--	- -	--	--	- -	CNS	--	0.0004	--	0.0004
			Trichloroethene (Mutagenic)	--	5E-08	--	--	5E-08	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	--	3E-08	--	--	3E-08	Liver, Kidney	--	0.1	--	0.1
			Chemical Total	--	8E-08	--	--	8E-08		- -	0.1	- -	0.1
		Exposure Point Total						8E-08					0.1
	Exposure Medium Total							8E-08					0.1
Medium Total								1E-07					0.2
Groundwater	Groundwater	Site 43	1,3-Dinitrobenzene	- -	--	- -	--	- -	Spleen	0.09	--	0.002	0.09
			2,6-Dinitrotoluene	9E-07	--	3E-08	--	9E-07	CNS, Blood, Liver	0.07	--	0.002	0.07
			3-Nitrotoluene	- -	--	- -	--	- -	NA	0.2	--	0.02	0.2
			Arsenic	5E-06	--	2E-08	--	5E-06	Skin, CVS	0.4	--	0.001	0.4
			Barium	- -	--	- -	--	- -	Kidney	0.03	--	0.001	0.03
			Beryllium	- -	--	- -	--	- -	GS	0.02	--	0.008	0.03
			Cobalt	- -	--	- -	--	- -	Thyroid	7	--	0.009	7
			Iron	- -	--	- -	--	- -	GS	1	--	0.005	1
			Manganese	- -	--	- -	--	- -	CNS	0.8	--	0.07	0.9
			Nickel	- -	--	- -	--	- -	Body Weight	0.07	--	0.001	0.07
			Thallium	- -	--	- -	--	- -	Skin	--	--	--	--
			1,1-Dichloroethane	3E-08	--	2E-09	--	3E-08	Kidney	0.0010	--	0.00007	0.001
			1,1-Dichloroethene	- -	--	- -	--	- -	Liver	0.004	--	0.0004	0.004
			1,2-Dichloroethane	4E-08	--	2E-09	--	4E-08	Kidney	0.003	--	0.0001	0.003
			Cis-1,2-Dichloroethene	- -	--	- -	--	- -	Kidney	1	--	0.1	1
			Trichloroethene (Mutagenic)	2E-04	--	3E-05	--	2E-04	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	1E-04	--	2E-05	--	1E-04	Immune System, Developmental	226	--	32	258
			Vinyl Chloride	3E-04	--	1E-05	--	3E-04	Liver	0.1	--	0.005	0.1
			Chemical Total	6E-04	--	6E-05	--	6E-04		238	--	32	270
		Exposure Point Total						6E-04					270
	Exposure Medium Total							6E-04					270
Medium Total								6E-04					270

TABLE 9.4.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Water	Surface Water	Site 43	Arsenic	5E-09	--	1E-09	--	6E-09	Skin, CVS	0.0004	--	0.0001	0.0005
			Cobalt	- -	--	- -	--	- -	Thyroid	0.008	--	0.0009	0.009
			Cis-1,2-Dichloroethene	- -	--	- -	--	- -	Kidney	0.009	--	0.04	0.05
			Trichloroethene (Mutagenic)	4E-08	--	2E-07	--	2E-07	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	2E-08	--	1E-07	--	1E-07	Immune System, Developmental	0.05	--	0.2	0.3
			Vinyl Chloride	1E-06	--	2E-06	--	4E-06	Liver	0.00004	--	0.00008	0.0001
			Chemical Total	1E-06	--	3E-06	--	4E-06		0.06	--	0.3	0.3
		Exposure Point Total						4E-06					0.3
	Exposure Medium Total							4E-06					0.3
Medium Total								4E-06					0.3
Receptor Total							Receptor Risk Total	7E-04				Receptor HI Total	271

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Blood HI	0.07
Total Body Weight HI	0.07
Total CNS HI	1
Total CVS HI	0.4
Total Developmental HI	258
Total GS HI	2
Total Kidney HI	2
Total Liver HI	0.6
Total Respiratory HI	0.0003
Total None Specified HI	0.06
Total Skin HI	0.4
Total Thyroid HI	7
Total Spleen HI	0.09

TABLE 9.5.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Site 43	Aluminum	- -	--	- -	--	- -	CNS	0.008	--	0.00009	0.008
			Cadmium	- -	--	- -	--	- -	Kidney	0.005	--	0.0002	0.005
			Chromium VI	1E-06	--	5E-07	--	1E-06	None Specified	0.004	--	0.002	0.006
			Trichloroethene (Mutagenic)	2E-09	--	6E-11	--	2E-09	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	5E-09	--	2E-10	--	5E-09	Immune System, Developmental	0.002	--	0.00009	0.003
			Chemical Total	1E-06	--	5E-07	--	1E-06		0.02	--	0.002	0.02
		Exposure Point Total						1E-06					0.02
	Exposure Medium Total							1E-06					0.02
	Air	Site 43	Aluminum	--	- -	--	--	- -	CNS	--	0.0007	--	0.0007
			Cadmium	--	4E-10	--	--	4E-10	Kidney, Respiratory	--	0.0002	--	0.0002
			Chromium VI	--	7E-08	--	--	7E-08	Respiratory	--	0.00006	--	0.00006
			Trichloroethene (Mutagenic)	--	9E-08	--	--	9E-08	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	--	2E-07	--	--	2E-07	Liver, Kidney	--	0.3	--	0.3
			Chemical Total	--	3E-07	--	--	3E-07		- -	0.3	- -	0.3
		Exposure Point Total						3E-07					0.3
	Exposure Medium Total							3E-07					0.3
Medium Total								2E-06					0.3
Subsurface Soil	Subsurface Soil	Site 43	Manganese	- -	--	- -	--	- -	CNS	0.002	--	0.0005	0.002
			Trichloroethene (Mutagenic)	9E-10	--	3E-11	--	9E-10	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	2E-09	--	8E-11	--	2E-09	Immune System, Developmental	0.001	--	0.00004	0.001
			Chemical Total	3E-09	--	1E-10	--	3E-09		0.003	--	0.0005	0.004
		Exposure Point Total						3E-09					0.004
	Exposure Medium Total							3E-09					0.004
	Air	Site 43	Manganese	--	- -	--	--	- -	CNS	--	0.0004	--	0.0004
			Trichloroethene (Mutagenic)	--	5E-08	--	--	5E-08	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	--	9E-08	--	--	9E-08	Liver, Kidney	--	0.1	--	0.1
			Chemical Total	--	1E-07	--	--	1E-07		- -	0.1	- -	0.1
		Exposure Point Total						1E-07					0.1
	Exposure Medium Total							1E-07					0.1
Medium Total								1E-07					0.1
Groundwater	Groundwater	Site 43	1,3-Dinitrobenzene	- -	--	- -	--	- -	Spleen	0.04	--	0.001	0.04
			2,6-Dinitrotoluene	1E-06	--	6E-08	--	2E-06	CNS, Blood, Liver	0.03	--	0.001	0.03
			3-Nitrotoluene	- -	--	- -	--	- -	NA	0.07	--	0.01	0.08
			Arsenic	8E-06	--	3E-08	--	8E-06	Skin, CVS	0.2	--	0.0006	0.2
			Barium	- -	--	- -	--	- -	Kidney	0.01	--	0.0006	0.01
			Beryllium	- -	--	- -	--	- -	GS	0.008	--	0.004	0.01
			Cobalt	- -	--	- -	--	- -	Thyroid	3	--	0.004	3
			Iron	- -	--	- -	--	- -	GS	0.7	--	0.002	0.7
			Manganese	- -	--	- -	--	- -	CNS	0.4	--	0.03	0.4
			Nickel	- -	--	- -	--	- -	Body Weight	0.03	--	0.0005	0.03
			Thallium	- -	--	- -	--	- -	Skin	--	--	--	--
			1,1-Dichloroethane	5E-08	--	4E-09	--	6E-08	Kidney	0.0005	--	0.00003	0.0005
			1,1-Dichloroethene	- -	--	- -	--	- -	Liver	0.002	--	0.0002	0.002
			1,2-Dichloroethane	6E-08	--	3E-09	--	7E-08	Kidney	0.001	--	0.00005	0.001
			Cis-1,2-Dichloroethene	- -	--	- -	--	- -	Kidney	0.6	--	0.07	0.6
			Trichloroethene (Mutagenic)	8E-05	--	1E-05	--	9E-05	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	2E-04	--	3E-05	--	2E-04	Immune System, Developmental	103	--	16	119
			Vinyl Chloride	1E-05	--	5E-07	--	1E-05	Liver	0.05	--	0.002	0.05
			Chemical Total	3E-04	--	4E-05	--	3E-04		108	--	16	124
		Exposure Point Total						3E-04					124
	Exposure Medium Total							3E-04					124

TABLE 9.5.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Air	Site 43	1,3-Dinitrobenzene	--	- -	--	--	- -	NA	--	--	--	--
			2,6-Dinitrotoluene	--	- -	--	--	- -	NA	--	--	--	--
			3-Nitrotoluene	--	- -	--	--	- -	NA	--	--	--	--
			Arsenic	--	- -	--	--	- -	NA	--	--	--	--
			Barium	--	- -	--	--	- -	CVS	--	--	--	--
			Beryllium	--	- -	--	--	- -	Respiratory	--	--	--	--
			Cobalt	--	- -	--	--	- -	Respiratory	--	--	--	--
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	--	--	--
			Nickel	--	- -	--	--	- -	Respiratory	--	--	--	--
			Thallium	--	- -	--	--	- -	NA	--	--	--	--
			1,1-Dichloroethane	--	5E-09	--	--	5E-09	NA	--	--	--	--
			1,1-Dichloroethene	--	- -	--	--	- -	Liver	--	0.0002	--	0.0002
			1,2-Dichloroethane	--	6E-09	--	--	6E-09	NA	--	0.0003	--	0.0003
			Cis-1,2-Dichloroethene	--	- -	--	--	- -	NA	--	--	--	--
			Trichloroethene (Mutagenic)	--	3E-06	--	--	3E-06	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	--	5E-06	--	--	5E-06	Liver, Kidney	--	8	--	8
			Vinyl Chloride	--	3E-08	--	--	3E-08	Liver	--	0.0007	--	0.0007
			Chemical Total	--	8E-06	--	--	8E-06		- -	8	- -	8
		Exposure Point Total						8E-06					8
	Exposure Medium Total							8E-06					8
Medium Total								3E-04					132
Surface Water	Surface Water	Site 43	Arsenic	4E-09	--	2E-09	--	6E-09	Skin, CVS	0.00008	--	0.00005	0.0001
			Cobalt	- -	--	- -	--	- -	Thyroid	0.002	--	0.0004	0.002
			Cis-1,2-Dichloroethene	- -	--	- -	--	- -	Kidney	0.002	--	0.02	0.02
			Trichloroethene (Mutagenic)	7E-09	--	7E-08	--	8E-08	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	2E-08	--	2E-07	--	2E-07	Immune System, Developmental	0.010	--	0.1	0.1
			Vinyl Chloride	2E-09	--	7E-09	--	9E-09	Liver	0.000009	--	0.00003	0.00004
			Chemical Total	3E-08	--	3E-07	--	3E-07		0.01	--	0.1	0.1
		Exposure Point Total						3E-07					0.1
	Exposure Medium Total							3E-07					0.1
Medium Total								3E-07					0.1
Receptor Total							Receptor Risk Total	3E-04				Receptor HI Total	133

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Blood HI	0.03
Total Body Weight HI	0.03
Total CNS HI	0.5
Total CVS HI	0.2
Total Developmental HI	119
Total GS HI	0.7
Total Kidney HI	9
Total Liver HI	9
Total Respiratory HI	0.0003
Total None Specified HI	0.006
Total Skin HI	0.2
Total Thyroid HI	3
Total Spleen HI	0.04

TABLE 9.6.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Lifelong (Child and Adult)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Site 43	Aluminum	- -	--	- -	--	- -					
			Cadmium	- -	--	- -	--	- -					
			Chromium VI	1E-05	--	5E-06	--	2E-05					
			Trichloroethene (Mutagenic)	2E-08	--	7E-10	--	2E-08					
			Trichloroethene (Nonmutagenic)	2E-08	--	6E-10	--	2E-08					
			Chemical Total	1E-05	--	5E-06	--	2E-05					
		Exposure Point Total						2E-05					
	Exposure Medium Total							2E-05					
	Air	Site 43	Aluminum	--	- -	--	--	- -					
			Cadmium	--	5E-10	--	--	5E-10					
			Chromium VI	--	2E-07	--	--	2E-07					
			Trichloroethene (Mutagenic)	--	2E-07	--	--	2E-07					
			Trichloroethene (Nonmutagenic)	--	2E-07	--	--	2E-07					
			Chemical Total	--	6E-07	--	--	6E-07					
		Exposure Point Total						6E-07					
	Exposure Medium Total							6E-07					
Medium Total								2E-05					
Subsurface Soil	Subsurface Soil	Site 43	Manganese	- -	--	- -	--	- -					
			Trichloroethene (Mutagenic)	1E-08	--	4E-10	--	1E-08					
			Trichloroethene (Nonmutagenic)	8E-09	--	3E-10	--	9E-09					
			Chemical Total	2E-08	--	7E-10	--	2E-08					
		Exposure Point Total						2E-08					
	Exposure Medium Total							2E-08					
	Air	Site 43	Manganese	--	- -	--	--	- -					
			Trichloroethene (Mutagenic)	--	1E-07	--	--	1E-07					
			Trichloroethene (Nonmutagenic)	--	1E-07	--	--	1E-07					
			Chemical Total	--	2E-07	--	--	2E-07					
		Exposure Point Total						2E-07					
	Exposure Medium Total							2E-07					
Medium Total								2E-07					
Groundwater	Groundwater	Site 43	1,3-Dinitrobenzene	- -	--	- -	--	- -					
			2,6-Dinitrotoluene	2E-06	--	9E-08	--	2E-06					
			3-Nitrotoluene	- -	--	- -	--	- -					
			Arsenic	1E-05	--	4E-08	--	1E-05					
			Barium	- -	--	- -	--	- -					
			Beryllium	- -	--	- -	--	- -					
			Cobalt	- -	--	- -	--	- -					
			Iron	- -	--	- -	--	- -					
			Manganese	- -	--	- -	--	- -					
			Nickel	- -	--	- -	--	- -					
			Thallium	- -	--	- -	--	- -					
			1,1-Dichloroethane	8E-08	--	6E-09	--	9E-08					
			1,1-Dichloroethene	- -	--	- -	--	- -					
			1,2-Dichloroethane	1E-07	--	5E-09	--	1E-07					
			Cis-1,2-Dichloroethene	- -	--	- -	--	- -					
			Trichloroethene (Mutagenic)	3E-04	--	4E-05	--	3E-04					
			Trichloroethene (Nonmutagenic)	3E-04	--	5E-05	--	4E-04					
			Vinyl Chloride	3E-04	--	1E-05	--	3E-04					
			Chemical Total	9E-04	--	1E-04	--	1E-03					
		Exposure Point Total						1E-03					
	Exposure Medium Total							1E-03					

TABLE 9.6.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Lifelong (Child and Adult)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Air	Site 43	1,3-Dinitrobenzene	--	- -	--	--	- -					
			2,6-Dinitrotoluene	--	- -	--	--	- -					
			3-Nitrotoluene	--	- -	--	--	- -					
			Arsenic	--	- -	--	--	- -					
			Barium	--	- -	--	--	- -					
			Beryllium	--	- -	--	--	- -					
			Cobalt	--	- -	--	--	- -					
			Iron	--	- -	--	--	- -					
			Manganese	--	- -	--	--	- -					
			Nickel	--	- -	--	--	- -					
			Thallium	--	- -	--	--	- -					
			1,1-Dichloroethane	--	5E-09	--	--	5E-09					
			1,1-Dichloroethene	--	- -	--	--	- -					
			1,2-Dichloroethane	--	6E-09	--	--	6E-09					
			Cis-1,2-Dichloroethene	--	- -	--	--	- -					
			Trichloroethene (Mutagenic)	--	3E-06	--	--	3E-06					
			Trichloroethene (Nonmutagenic)	--	5E-06	--	--	5E-06					
			Vinyl Chloride	--	3E-08	--	--	3E-08					
			Chemical Total	--	8E-06	--	--	8E-06					
		Exposure Point Total						8E-06					
	Exposure Medium Total							8E-06					
Medium Total								1E-03					
Surface Water	Surface Water	Site 43	Arsenic	4E-09	--	2E-09	--	6E-09					
			Cobalt	- -	--	- -	--	- -					
			Cis-1,2-Dichloroethene	- -	--	- -	--	- -					
			Trichloroethene (Mutagenic)	7E-09	--	7E-08	--	8E-08					
			Trichloroethene (Nonmutagenic)	2E-08	--	2E-07	--	2E-07					
			Vinyl Chloride	4E-06	--	7E-09	--	4E-06					
			Chemical Total	4E-06	--	3E-07	--	4E-06					
		Exposure Point Total						4E-06					
	Exposure Medium Total							4E-06					
Medium Total								4E-06					
Receptor Total							Receptor Risk Total	1E-03					

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.7.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Site 43 including Background	Aluminum	- -	--	- -	--	- -	CNS	0.02	--	0.0003	0.02
			Arsenic	9E-08	--	9E-09	--	1E-07	Skin, CVS	0.01	--	0.001	0.02
			Cadmium	- -	--	- -	--	- -	Kidney	0.01	--	0.0008	0.01
			Chromium VI	2E-07	--	2E-07	--	3E-07	None Specified	0.005	--	0.004	0.010
			Cobalt	- -	--	- -	--	- -	Thyroid	0.004	--	0.00008	0.004
			Iron	- -	--	- -	--	- -	GS	0.03	--	0.0006	0.03
			Manganese	- -	--	- -	--	- -	CNS	0.05	--	0.02	0.07
			Thallium	- -	--	- -	--	- -	Skin	--	--	--	--
			Vanadium	- -	--	- -	--	- -	Kidney	0.004	--	0.003	0.007
			Trichloroethene	2E-09	--	1E-10	--	2E-09	Liver, Kidney	0.005	--	0.0003	0.006
			Chemical Total	3E-07	--	2E-07	--	5E-07		0.1	--	0.04	0.2
		Exposure Point Total						5E-07					0.2
	Exposure Medium Total							5E-07					0.2
	Air	Site 43 including Background	Aluminum	--	- -	--	--	- -	CNS	--	0.3	--	0.3
			Arsenic	--	4E-08	--	--	4E-08	NA	--	0.04	--	0.04
			Cadmium	--	2E-08	--	--	2E-08	Kidney, Respiratory	--	0.09	--	0.09
			Chromium VI	--	3E-06	--	--	3E-06	Respiratory	--	0.008	--	0.008
			Cobalt	--	1E-07	--	--	1E-07	Respiratory	--	0.05	--	0.05
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	2	--	2
			Thallium	--	- -	--	--	- -	NA	--	--	--	--
			Vanadium	--	- -	--	--	- -	NA	--	--	--	--
			Trichloroethene	--	4E-08	--	--	4E-08	Liver, Kidney	--	0.4	--	0.4
			Chemical Total	--	3E-06	--	--	3E-06		- -	3	- -	3
		Exposure Point Total						3E-06					3
	Exposure Medium Total							3E-06					3
Medium Total								4E-06					3
Subsurface Soil	Subsurface Soil	Site 43 including Background	Aluminum	- -	--	- -	--	- -	CNS	0.009	--	0.0002	0.009
			Arsenic	3E-08	--	3E-09	--	3E-08	Skin, CVS	0.005	--	0.0005	0.005
			Chromium VI	1E-07	--	9E-08	--	2E-07	None Specified	0.003	--	0.002	0.005
			Cobalt	- -	--	- -	--	- -	Thyroid	0.002	--	0.00003	0.002
			Iron	- -	--	- -	--	- -	GS	0.02	--	0.0004	0.02
			Manganese	- -	--	- -	--	- -	CNS	0.004	--	0.002	0.006
			Trichloroethene	9E-10	--	5E-11	--	9E-10	Liver, Kidney	0.003	--	0.0002	0.003
			Chemical Total	1E-07	--	9E-08	--	2E-07		0.04	--	0.005	0.05
		Exposure Point Total						2E-07					0.05
	Exposure Medium Total							2E-07					0.05
	Air	Site 43 including Background	Aluminum	--	- -	--	--	- -	CNS	--	0.2	--	0.2
			Arsenic	--	1E-08	--	--	1E-08	NA	--	0.01	--	0.01
			Chromium VI	--	2E-06	--	--	2E-06	Respiratory	--	0.004	--	0.004
			Cobalt	--	5E-08	--	--	5E-08	Respiratory	--	0.02	--	0.02
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	0.2	--	0.2
			Trichloroethene	--	2E-08	--	--	2E-08	Liver, Kidney	--	0.2	--	0.2
			Chemical Total	--	2E-06	--	--	2E-06		- -	0.5	- -	0.5
		Exposure Point Total						2E-06					0.5
	Exposure Medium Total							2E-06					0.5
Medium Total								2E-06					0.6

TABLE 9.7.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Site 43 including Background	1,3-Dinitrobenzene	- -	--	- -	--	- -	Spleen	0.000005	--	0.00001	0.00002
			2,6-Dinitrotoluene	1E-10	--	4E-10	--	5E-10	CNS, Blood, Liver	0.000001	--	0.000004	0.000006
			3-Nitrotoluene	- -	--	- -	--	- -	NA	0.000004	--	0.00005	0.00006
			Arsenic	7E-10	--	5E-10	--	1E-09	Skin, CVS	0.0001	--	0.00007	0.0002
			Barium	- -	--	- -	--	- -	Kidney	0.000008	--	0.00008	0.00008
			Beryllium	- -	--	- -	--	- -	GS	0.000002	--	0.0002	0.0002
			Cadmium	- -	--	- -	--	- -	Kidney	0.000005	--	0.0001	0.0001
			Chromium VI	1E-10	--	7E-09	--	7E-09	None Specified	0.000004	--	0.0002	0.0002
			Cobalt	- -	--	- -	--	- -	Thyroid	0.0002	--	0.00005	0.0002
			Iron	- -	--	- -	--	- -	GS	0.0004	--	0.0003	0.0007
			Manganese	- -	--	- -	--	- -	CNS	0.0002	--	0.004	0.004
			Nickel	- -	--	- -	--	- -	Body Weight	0.00002	--	0.00006	0.00008
			Thallium	- -	--	- -	--	- -	Skin	--	--	--	--
			Vanadium	- -	--	- -	--	- -	Kidney	0.000003	--	0.00007	0.00008
			1,1-Dichloroethane	4E-12	--	3E-11	--	3E-11	Kidney	3E-8	--	0.0000002	0.0000002
			1,1-Dichloroethene	- -	--	- -	--	- -	Liver	0.000006	--	0.00006	0.00007
			1,2-Dichloroethane	5E-12	--	2E-11	--	3E-11	Kidney	0.0000002	--	0.0000008	0.000001
			Cis-1,2-Dichloroethene	- -	--	- -	--	- -	Kidney	0.00003	--	0.0003	0.0004
			Trichloroethene	2E-08	--	2E-07	--	3E-07	Liver, Kidney	0.06	--	0.8	0.8
			Vinyl Chloride	1E-09	--	4E-09	--	5E-09	Liver	0.0003	--	0.001	0.002
			Chemical Total	2E-08	--	3E-07	--	3E-07		0.06	--	0.8	0.8
		Exposure Point Total						3E-07					0.8
	Exposure Medium Total							3E-07					0.8
	Air	Site 43 including Background	1,3-Dinitrobenzene	--	- -	--	--	- -	NA	--	--	--	--
			2,6-Dinitrotoluene	--	- -	--	--	- -	NA	--	--	--	--
			3-Nitrotoluene	--	- -	--	--	- -	NA	--	--	--	--
			Arsenic	--	- -	--	--	- -	NA	--	--	--	--
			Barium	--	- -	--	--	- -	Fetotoxicity	--	--	--	--
			Beryllium	--	- -	--	--	- -	Respiratory	--	--	--	--
			Cadmium	--	- -	--	--	- -	Kidney, Respiratory	--	--	--	--
			Chromium VI	--	- -	--	--	- -	Respiratory	--	--	--	--
			Cobalt	--	- -	--	--	- -	Respiratory	--	--	--	--
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	--	--	--
			Nickel	--	- -	--	--	- -	Respiratory	--	--	--	--
			Thallium	--	- -	--	--	- -	NA	--	--	--	--
			Vanadium	--	- -	--	--	- -	NA	--	--	--	--
			1,1-Dichloroethane	--	3E-11	--	--	3E-11	NA	--	--	--	--
			1,1-Dichloroethene	--	- -	--	--	- -	Liver	--	0.00001	--	0.00001
			1,2-Dichloroethane	--	3E-11	--	--	3E-11	NA	--	0.000001	--	0.000001
			Cis-1,2-Dichloroethene	--	- -	--	--	- -	NA	--	--	--	--
			Trichloroethene	--	3E-08	--	--	3E-08	Liver, Kidney	--	0.3	--	0.3
			Vinyl Chloride	--	2E-10	--	--	2E-10	Liver	--	0.00003	--	0.00003
			Chemical Total	--	3E-08	--	--	3E-08		- -	0.3	- -	0.3
		Exposure Point Total						3E-08					0.3
	Exposure Medium Total							3E-08					0.3
Medium Total								3E-07					1
Surface Water	Surface Water	Site 43	Arsenic	5E-10	--	2E-10	--	7E-10	Skin, CVS	0.00008	--	0.00003	0.0001
			Cobalt	- -	--	- -	--	- -	Thyroid	0.0002	--	0.00002	0.0002
			Cis-1,2-Dichloroethene	- -	--	- -	--	- -	Kidney	0.0002	--	0.0010	0.001
			Trichloroethene	3E-09	--	2E-08	--	2E-08	Liver, Kidney	0.010	--	0.06	0.07
			Vinyl Chloride	3E-10	--	6E-10	--	9E-10	Liver	0.00009	--	0.0002	0.0003
			Chemical Total	4E-09	--	2E-08	--	2E-08		0.01	--	0.06	0.07
		Exposure Point Total						2E-08					0.07
	Exposure Medium Total							2E-08					0.07
Medium Total								2E-08					0.07
Receptor Total							Receptor Risk Total	6E-06				Receptor HI Total	5

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Liver HI	2	Total Blood HI	0.000006
Total Respiratory HI	0.2	Total Body Weight HI	0.00008
Total None Specified HI	0.02	Total CNS HI	3
Total Skin HI	0.02	Total CVS HI	0.02
Total Thyroid HI	0.006	Total GS HI	0.05
Total Spleen HI	0.00002	Total Kidney HI	2

TABLE 9.8.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Maintenance Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Site 43	Aluminum	- -	--	- -	--	- -	CNS	0.0004	--	0.000005	0.0004
			Arsenic	2E-08	--	1E-09	--	2E-08	Skin, CVS	0.0003	--	0.00002	0.0004
			Cadmium	- -	--	- -	--	- -	Kidney	0.0003	--	0.00001	0.0003
			Chromium VI	4E-08	--	2E-08	--	6E-08	None Specified	0.0002	--	0.0001	0.0003
			Cobalt	- -	--	- -	--	- -	Thyroid	0.0009	--	0.00001	0.0010
			Iron	- -	--	- -	--	- -	GS	0.0008	--	0.00001	0.0008
			Manganese	- -	--	- -	--	- -	CNS	0.001	--	0.0004	0.002
			Thallium	- -	--	- -	--	- -	Skin	--	--	--	--
			Vanadium	- -	--	- -	--	- -	Kidney	0.0002	--	0.00009	0.0003
			Trichloroethene	4E-10	--	1E-11	--	4E-10	Immune System, Developmental	0.0001	--	0.000005	0.0001
			Chemical Total	6E-08	--	2E-08	--	9E-08		0.004	--	0.0007	0.005
		Exposure Point Total						9E-08					0.005
	Exposure Medium Total							9E-08					0.005
	Air	Site 43	Aluminum	--	- -	--	--	- -	CNS	--	0.00001	--	0.00001
			Arsenic	--	1E-11	--	--	1E-11	NA	--	0.000002	--	0.000002
			Cadmium	--	8E-12	--	--	8E-12	Kidney, Respiratory	--	0.000004	--	0.000004
			Chromium VI	--	1E-09	--	--	1E-09	Respiratory	--	0.0000010	--	0.0000010
			Cobalt	--	5E-11	--	--	5E-11	Respiratory	--	0.000007	--	0.000007
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	0.00008	--	0.00008
			Thallium	--	- -	--	--	- -	NA	--	--	--	--
			Vanadium	--	- -	--	--	- -	NA	--	0.000001	--	0.000001
			Trichloroethene	--	5E-09	--	--	5E-09	Liver, Kidney	--	0.005	--	0.005
			Chemical Total	--	6E-09	--	--	6E-09		- -	0.005	- -	0.005
		Exposure Point Total						6E-09					0.005
	Exposure Medium Total							6E-09					0.005
Medium Total								9E-08					0.01
Subsurface Soil	Subsurface Soil	Site 43	Aluminum	- -	--	- -	--	- -	CNS	0.0002	--	0.000003	0.0002
			Arsenic	6E-09	--	4E-10	--	7E-09	Skin, CVS	0.0001	--	0.000007	0.0001
			Chromium VI	2E-08	--	1E-08	--	4E-08	None Specified	0.0001	--	0.00006	0.0002
			Cobalt	- -	--	- -	--	- -	Thyroid	0.0004	--	0.000005	0.0004
			Iron	- -	--	- -	--	- -	GS	0.0004	--	0.000006	0.0004
			Manganese	- -	--	- -	--	- -	CNS	0.00009	--	0.00003	0.0001
			Trichloroethene	2E-10	--	8E-12	--	2E-10	Immune System, Developmental	0.00006	--	0.000003	0.00007
			Chemical Total	3E-08	--	1E-08	--	4E-08		0.001	--	0.0001	0.002
		Exposure Point Total						4E-08					0.002
	Exposure Medium Total							4E-08					0.002
	Air	Site 43	Aluminum	--	- -	--	--	- -	CNS	--	0.000006	--	0.000006
			Arsenic	--	4E-12	--	--	4E-12	NA	--	0.0000005	--	0.0000005
			Chromium VI	--	6E-10	--	--	6E-10	Respiratory	--	0.0000005	--	0.0000005
			Cobalt	--	2E-11	--	--	2E-11	Respiratory	--	0.000003	--	0.000003
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	0.000006	--	0.000006
			Trichloroethene	--	3E-09	--	--	3E-09	Liver, Kidney	--	0.002	--	0.002
			Chemical Total	--	3E-09	--	--	3E-09		- -	0.002	- -	0.002
		Exposure Point Total						3E-09					0.002
	Exposure Medium Total							3E-09					0.002
Medium Total								5E-08					0.004
Surface Water	Surface Water	Site 43	Arsenic	2E-09	--	7E-10	--	3E-09	Skin, CVS	0.00004	--	0.00001	0.00005
			Cobalt	- -	--	- -	--	- -	Thyroid	0.0008	--	0.0001	0.0009
			Cis-1,2-Dichloroethene	- -	--	- -	--	- -	Kidney	0.0009	--	0.004	0.005
			Trichloroethene	1E-08	--	8E-08	--	9E-08	Immune System, Developmental	0.005	--	0.03	0.03
			Vinyl Chloride	1E-09	--	2E-09	--	4E-09	Liver	0.000004	--	0.000009	0.00001
			Chemical Total	2E-08	--	8E-08	--	1E-07		0.006	--	0.03	0.04
		Exposure Point Total						1E-07					0.04
	Exposure Medium Total							1E-07					0.04
Medium Total								1E-07					0.04
Receptor Total							Receptor Risk Total	2E-07				Receptor HI Total	0.05

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.9.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Site 43	Aluminum	- -	--	- -	--	- -	CNS	0.008	--	0.00010	0.008
			Arsenic	4E-07	--	2E-08	--	4E-07	Skin, CVS	0.006	--	0.0004	0.007
			Cadmium	- -	--	- -	--	- -	Kidney	0.005	--	0.0002	0.005
			Chromium VI	8E-07	--	4E-07	--	1E-06	None Specified	0.004	--	0.002	0.006
			Cobalt	- -	--	- -	--	- -	Thyroid	0.02	--	0.0002	0.02
			Iron	- -	--	- -	--	- -	GS	0.01	--	0.0002	0.01
			Manganese	- -	--	- -	--	- -	CNS	0.02	--	0.007	0.03
			Thallium	- -	--	- -	--	- -	Skin	--	--	--	--
			Vanadium	- -	--	- -	--	- -	Kidney	0.003	--	0.002	0.005
			Trichloroethene	7E-09	--	3E-10	--	7E-09	Immune System, Developmental	0.002	--	0.00009	0.002
			Chemical Total	1E-06	--	4E-07	--	2E-06		0.08	--	0.01	0.09
		Exposure Point Total						2E-06					0.09
	Exposure Medium Total							2E-06					0.09
	Air	Site 43	Aluminum	--	- -	--	--	- -	CNS	--	0.0002	--	0.0002
			Arsenic	--	2E-10	--	--	2E-10	NA	--	0.00003	--	0.00003
			Cadmium	--	2E-10	--	--	2E-10	Kidney, Respiratory	--	0.00007	--	0.00007
			Chromium VI	--	2E-08	--	--	2E-08	Respiratory	--	0.00002	--	0.00002
			Cobalt	--	9E-10	--	--	9E-10	Respiratory	--	0.0001	--	0.0001
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	0.001	--	0.001
			Thallium	--	- -	--	--	- -	NA	--	--	--	--
			Vanadium	--	- -	--	--	- -	NA	--	0.00002	--	0.00002
			Trichloroethene	--	9E-08	--	--	9E-08	Liver, Kidney	--	0.09	--	0.09
			Chemical Total	--	1E-07	--	--	1E-07		- -	0.09	- -	0.09
		Exposure Point Total						1E-07					0.09
	Exposure Medium Total							1E-07					0.09
Medium Total								2E-06					0.2
Subsurface Soil	Subsurface Soil	Site 43	Aluminum	- -	--	- -	--	- -	CNS	0.004	--	0.00005	0.004
			Arsenic	1E-07	--	8E-09	--	1E-07	Skin, CVS	0.002	--	0.0001	0.002
			Chromium VI	4E-07	--	2E-07	--	6E-07	None Specified	0.002	--	0.001	0.003
			Cobalt	- -	--	- -	--	- -	Thyroid	0.007	--	0.00009	0.007
			Iron	- -	--	- -	--	- -	GS	0.008	--	0.0001	0.008
			Manganese	- -	--	- -	--	- -	CNS	0.002	--	0.0005	0.002
			Trichloroethene	3E-09	--	1E-10	--	4E-09	Immune System, Developmental	0.001	--	0.00005	0.001
			Chemical Total	5E-07	--	2E-07	--	8E-07		0.03	--	0.002	0.03
		Exposure Point Total						8E-07					0.03
	Exposure Medium Total							8E-07					0.03
	Air	Site 43	Aluminum	--	- -	--	--	- -	CNS	--	0.0001	--	0.0001
			Arsenic	--	8E-11	--	--	8E-11	NA	--	0.000010	--	0.000010
			Chromium VI	--	1E-08	--	--	1E-08	Respiratory	--	0.000010	--	0.000010
			Cobalt	--	4E-10	--	--	4E-10	Respiratory	--	0.00005	--	0.00005
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	0.0001	--	0.0001
			Trichloroethene	--	5E-08	--	--	5E-08	Liver, Kidney	--	0.05	--	0.05
			Chemical Total	--	6E-08	--	--	6E-08		- -	0.05	- -	0.05
		Exposure Point Total						6E-08					0.05
	Exposure Medium Total							6E-08					0.05
Medium Total								8E-07					0.07

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.10.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Site 43	Aluminum	- -	--	- -	--	- -	CNS	0.08	--	0.0008	0.08
			Arsenic	8E-07	--	4E-08	--	8E-07	Skin, CVS	0.06	--	0.003	0.06
			Cadmium	- -	--	- -	--	- -	Kidney	0.05	--	0.002	0.05
			Chromium VI	1E-05	--	5E-06	--	2E-05	None Specified	0.04	--	0.02	0.06
			Cobalt	- -	--	- -	--	- -	Thyroid	0.2	--	0.002	0.2
			Iron	- -	--	- -	--	- -	GS	0.1	--	0.002	0.1
			Manganese	- -	--	- -	--	- -	CNS	0.2	--	0.06	0.3
			Thallium	- -	--	- -	--	- -	Skin	--	--	--	--
			Vanadium	- -	--	- -	--	- -	Kidney	0.03	--	0.01	0.05
			Trichloroethene (Mutagenic)	2E-08	--	7E-10	--	2E-08	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	1E-08	--	4E-10	--	1E-08	Immune System, Developmental	0.02	--	0.0008	0.02
			Chemical Total	1E-05	--	5E-06	--	2E-05		0.8	--	0.1	0.9
		Exposure Point Total						2E-05					0.9
	Exposure Medium Total							2E-05					0.9
	Air	Site 43	Aluminum	--	- -	--	--	- -	CNS	--	0.0007	--	0.0007
			Arsenic	--	2E-10	--	--	2E-10	NA	--	0.00010	--	0.00010
			Cadmium	--	1E-10	--	--	1E-10	Kidney, Respiratory	--	0.0002	--	0.0002
			Chromium VI	--	9E-08	--	--	9E-08	Respiratory	--	0.00006	--	0.00006
			Cobalt	--	6E-10	--	--	6E-10	Respiratory	--	0.0004	--	0.0004
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	0.005	--	0.005
			Thallium	--	- -	--	--	- -	NA	--	--	--	--
			Vanadium	--	- -	--	--	- -	NA	--	0.00008	--	0.00008
			Trichloroethene (Mutagenic)	--	1E-07	--	--	1E-07	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	--	5E-08	--	--	5E-08	Liver, Kidney	--	0.3	--	0.3
			Chemical Total	--	2E-07	--	--	2E-07		- -	0.3	- -	0.3
		Exposure Point Total						2E-07					0.3
	Exposure Medium Total							2E-07					0.3
Medium Total								2E-05					1
Subsurface Soil	Subsurface Soil	Site 43	Aluminum	- -	--	- -	--	- -	CNS	0.04	--	0.0004	0.04
			Arsenic	3E-07	--	1E-08	--	3E-07	Skin, CVS	0.02	--	0.001	0.02
			Chromium VI	6E-06	--	3E-06	--	9E-06	None Specified	0.02	--	0.010	0.03
			Cobalt	- -	--	- -	--	- -	Thyroid	0.07	--	0.0008	0.07
			Iron	- -	--	- -	--	- -	GS	0.08	--	0.0009	0.08
			Manganese	- -	--	- -	--	- -	CNS	0.02	--	0.005	0.02
			Trichloroethene (Mutagenic)	1E-08	--	3E-10	--	1E-08	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	6E-09	--	2E-10	--	6E-09	Immune System, Developmental	0.01	--	0.0004	0.01
			Chemical Total	6E-06	--	3E-06	--	9E-06		0.3	--	0.02	0.3
		Exposure Point Total						9E-06					0.3
	Exposure Medium Total							9E-06					0.3
	Air	Site 43	Aluminum	--	- -	--	--	- -	CNS	--	0.0004	--	0.0004
			Arsenic	--	6E-11	--	--	6E-11	NA	--	0.00003	--	0.00003
			Chromium VI	--	5E-08	--	--	5E-08	Respiratory	--	0.00003	--	0.00003
			Cobalt	--	3E-10	--	--	3E-10	Respiratory	--	0.0002	--	0.0002
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	0.0004	--	0.0004
			Trichloroethene (Mutagenic)	--	5E-08	--	--	5E-08	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	--	3E-08	--	--	3E-08	Liver, Kidney	--	0.1	--	0.1
			Chemical Total	--	1E-07	--	--	1E-07		- -	0.1	- -	0.1
		Exposure Point Total						1E-07					0.1
	Exposure Medium Total							1E-07					0.1
Medium Total								9E-06					0.4

TABLE 9.10.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Site 43	1,3-Dinitrobenzene	- -	--	- -	--	- -	Spleen	0.09	--	0.002	0.09
			2,6-Dinitrotoluene	9E-07	--	3E-08	--	9E-07	CNS, Blood, Liver	0.07	--	0.002	0.07
			3-Nitrotoluene	- -	--	- -	--	- -	NA	0.2	--	0.02	0.2
			Arsenic	5E-06	--	2E-08	--	5E-06	Skin, CVS	0.4	--	0.001	0.4
			Barium	- -	--	- -	--	- -	Kidney	0.03	--	0.001	0.03
			Beryllium	- -	--	- -	--	- -	GS	0.02	--	0.008	0.03
			Cadmium	- -	--	- -	--	- -	Kidney	0.02	--	0.002	0.02
			Chromium VI	6E-06	--	2E-06	--	7E-06	None Specified	0.02	--	0.006	0.03
			Cobalt	- -	--	- -	--	- -	Thyroid	7	--	0.009	7
			Iron	- -	--	- -	--	- -	GS	1	--	0.005	1
			Manganese	- -	--	- -	--	- -	CNS	0.8	--	0.07	0.9
			Nickel	- -	--	- -	--	- -	Body Weight	0.07	--	0.001	0.07
			Thallium	- -	--	- -	--	- -	Skin	--	--	--	--
			Vanadium	- -	--	- -	--	- -	Kidney	0.02	--	0.003	0.02
			1,1-Dichloroethane	3E-08	--	2E-09	--	3E-08	Kidney	0.0010	--	0.00007	0.001
			1,1-Dichloroethene	- -	--	- -	--	- -	Liver	0.004	--	0.0004	0.004
			1,2-Dichloroethane	4E-08	--	2E-09	--	4E-08	Kidney	0.003	--	0.0001	0.003
			Cis-1,2-Dichloroethene	- -	--	- -	--	- -	Kidney	1	--	0.1	1
			Trichloroethene (Mutagenic)	2E-04	--	3E-05	--	2E-04	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	1E-04	--	2E-05	--	1E-04	Immune System, Developmental	226	--	32	258
			Vinyl Chloride	3E-04	--	1E-05	--	3E-04	Liver	0.1	--	0.005	0.1
			Chemical Total	6E-04	--	6E-05	--	6E-04		238	--	32	270
		Exposure Point Total						6E-04					270
	Exposure Medium Total							6E-04					270
Medium Total								6E-04					270
Surface Water	Surface Water	Site 43	Arsenic	5E-09	--	1E-09	--	6E-09	Skin, CVS	0.0004	--	0.0001	0.0005
			Cobalt	- -	--	- -	--	- -	Thyroid	0.008	--	0.0009	0.009
			Cis-1,2-Dichloroethene	- -	--	- -	--	- -	Kidney	0.009	--	0.04	0.05
			Trichloroethene (Mutagenic)	4E-08	--	2E-07	--	2E-07	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	2E-08	--	1E-07	--	1E-07	Immune System, Developmental	0.05	--	0.2	0.3
			Vinyl Chloride	1E-06	--	2E-06	--	4E-06	Liver	0.00004	--	0.00008	0.0001
			Chemical Total	1E-06	--	3E-06	--	4E-06		0.06	--	0.3	0.3
		Exposure Point Total						4E-06					0.3
	Exposure Medium Total							4E-06					0.3
Medium Total								4E-06					0.3
Receptor Total							Receptor Risk Total	7E-04				Receptor HI Total	272

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Blood HI	0.07
Total Body Weight HI	0.07
Total CNS HI	1
Total CVS HI	0.5
Total Developmental HI	258
Total GS HI	2
Total Kidney HI	2
Total Liver HI	0.6
Total Respiratory HI	0.0009
Total None Specified HI	0.1
Total Skin HI	0.5
Total Thyroid HI	7
Total Spleen HI	0.09

TABLE 9.11.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Site 43	Aluminum	- -	--	- -	--	- -	CNS	0.008	--	0.00009	0.008
			Arsenic	3E-07	--	2E-08	--	3E-07	Skin, CVS	0.007	--	0.0004	0.007
			Cadmium	- -	--	- -	--	- -	Kidney	0.005	--	0.0002	0.005
			Chromium VI	1E-06	--	5E-07	--	1E-06	None Specified	0.004	--	0.002	0.006
			Cobalt	- -	--	- -	--	- -	Thyroid	0.02	--	0.0002	0.02
			Iron	- -	--	- -	--	- -	GS	0.01	--	0.0002	0.02
			Manganese	- -	--	- -	--	- -	CNS	0.02	--	0.007	0.03
			Thallium	- -	--	- -	--	- -	Skin	--	--	--	--
			Vanadium	- -	--	- -	--	- -	Kidney	0.003	--	0.002	0.005
			Trichloroethene (Mutagenic)	2E-09	--	6E-11	--	2E-09	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	5E-09	--	2E-10	--	5E-09	Immune System, Developmental	0.002	--	0.00009	0.003
			Chemical Total	1E-06	--	5E-07	--	2E-06		0.09	--	0.01	0.10
		Exposure Point Total						2E-06					0.10
	Exposure Medium Total							2E-06					0.10
	Air	Site 43	Aluminum	--	- -	--	--	- -	CNS	--	0.0007	--	0.0007
			Arsenic	--	6E-10	--	--	6E-10	NA	--	0.00010	--	0.00010
			Cadmium	--	4E-10	--	--	4E-10	Kidney, Respiratory	--	0.0002	--	0.0002
			Chromium VI	--	7E-08	--	--	7E-08	Respiratory	--	0.00006	--	0.00006
			Cobalt	--	2E-09	--	--	2E-09	Respiratory	--	0.0004	--	0.0004
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	0.005	--	0.005
			Thallium	--	- -	--	--	- -	NA	--	--	--	--
			Vanadium	--	- -	--	--	- -	NA	--	0.00008	--	0.00008
			Trichloroethene (Mutagenic)	--	9E-08	--	--	9E-08	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	--	2E-07	--	--	2E-07	Liver, Kidney	--	0.3	--	0.3
			Chemical Total	--	3E-07	--	--	3E-07		- -	0.3	- -	0.3
		Exposure Point Total						3E-07					0.3
	Exposure Medium Total							3E-07					0.3
Medium Total								2E-06					0.4
Subsurface Soil	Subsurface Soil	Site 43	Aluminum	- -	--	- -	--	- -	CNS	0.004	--	0.00005	0.004
			Arsenic	1E-07	--	6E-09	--	1E-07	Skin, CVS	0.002	--	0.0001	0.002
			Chromium VI	6E-07	--	3E-07	--	8E-07	None Specified	0.002	--	0.001	0.003
			Cobalt	- -	--	- -	--	- -	Thyroid	0.007	--	0.00009	0.008
			Iron	- -	--	- -	--	- -	GS	0.009	--	0.00010	0.009
			Manganese	- -	--	- -	--	- -	CNS	0.002	--	0.0005	0.002
			Trichloroethene (Mutagenic)	9E-10	--	3E-11	--	9E-10	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	2E-09	--	8E-11	--	2E-09	Immune System, Developmental	0.001	--	0.00004	0.001
			Chemical Total	7E-07	--	3E-07	--	9E-07		0.03	--	0.002	0.03
		Exposure Point Total						9E-07					0.03
	Exposure Medium Total							9E-07					0.03
	Air	Site 43	Aluminum	--	- -	--	--	- -	CNS	--	0.0004	--	0.0004
			Arsenic	--	2E-10	--	--	2E-10	NA	--	0.00003	--	0.00003
			Chromium VI	--	4E-08	--	--	4E-08	Respiratory	--	0.00003	--	0.00003
			Cobalt	--	9E-10	--	--	9E-10	Respiratory	--	0.0002	--	0.0002
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	0.0004	--	0.0004
			Trichloroethene (Mutagenic)	--	5E-08	--	--	5E-08	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	--	9E-08	--	--	9E-08	Liver, Kidney	--	0.1	--	0.1
			Chemical Total	--	2E-07	--	--	2E-07		- -	0.1	- -	0.1
		Exposure Point Total						2E-07					0.1
	Exposure Medium Total							2E-07					0.1
Medium Total								1E-06					0.2

TABLE 9.11.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Site 43	1,3-Dinitrobenzene	- -	--	- -	--	- -	Spleen	0.04	--	0.001	0.04
			2,6-Dinitrotoluene	1E-06	--	6E-08	--	2E-06	CNS, Blood, Liver	0.03	--	0.001	0.03
			3-Nitrotoluene	- -	--	- -	--	- -	NA	0.07	--	0.01	0.08
			Arsenic	8E-06	--	3E-08	--	8E-06	Skin, CVS	0.2	--	0.0006	0.2
			Barium	- -	--	- -	--	- -	Kidney	0.01	--	0.0006	0.01
			Beryllium	- -	--	- -	--	- -	GS	0.008	--	0.004	0.01
			Cadmium	- -	--	- -	--	- -	Kidney	0.008	--	0.001	0.009
			Chromium VI	2E-06	--	6E-07	--	3E-06	None Specified	0.010	--	0.002	0.01
			Cobalt	- -	--	- -	--	- -	Thyroid	3	--	0.004	3
			Iron	- -	--	- -	--	- -	GS	0.7	--	0.002	0.7
			Manganese	- -	--	- -	--	- -	CNS	0.4	--	0.03	0.4
			Nickel	- -	--	- -	--	- -	Body Weight	0.03	--	0.0005	0.03
			Thallium	- -	--	- -	--	- -	Skin	--	--	--	--
			Vanadium	- -	--	- -	--	- -	Kidney	0.010	--	0.001	0.01
			1,1-Dichloroethane	5E-08	--	4E-09	--	6E-08	Kidney	0.0005	--	0.00003	0.0005
			1,1-Dichloroethene	- -	--	- -	--	- -	Liver	0.002	--	0.0002	0.002
			1,2-Dichloroethane	6E-08	--	3E-09	--	7E-08	Kidney	0.001	--	0.00005	0.001
			Cis-1,2-Dichloroethene	- -	--	- -	--	- -	Kidney	0.6	--	0.07	0.6
			Trichloroethene (Mutagenic)	8E-05	--	1E-05	--	9E-05	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	2E-04	--	3E-05	--	2E-04	Immune System, Developmental	103	--	16	119
			Vinyl Chloride	1E-05	--	5E-07	--	1E-05	Liver	0.05	--	0.002	0.05
			Chemical Total	3E-04	--	4E-05	--	3E-04		108	--	16	124
		Exposure Point Total						3E-04					124
	Exposure Medium Total							3E-04					124
	Air	Site 43	1,3-Dinitrobenzene	--	- -	--	--	- -	NA	--	--	--	--
			2,6-Dinitrotoluene	--	- -	--	--	- -	NA	--	--	--	--
			3-Nitrotoluene	--	- -	--	--	- -	NA	--	--	--	--
			Arsenic	--	- -	--	--	- -	NA	--	--	--	--
			Barium	--	- -	--	--	- -	CVS	--	--	--	--
			Beryllium	--	- -	--	--	- -	Respiratory	--	--	--	--
			Cadmium	--	- -	--	--	- -	Kidney, Respiratory	--	--	--	--
			Chromium VI	--	- -	--	--	- -	Respiratory	--	--	--	--
			Cobalt	--	- -	--	--	- -	Respiratory	--	--	--	--
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	--	--	--
			Nickel	--	- -	--	--	- -	Respiratory	--	--	--	--
			Thallium	--	- -	--	--	- -	NA	--	--	--	--
			Vanadium	--	- -	--	--	- -	NA	--	--	--	--
			1,1-Dichloroethane	--	3E-08	--	--	3E-08	NA	--	--	--	--
			1,1-Dichloroethene	--	- -	--	--	- -	Liver	--	0.0008	--	0.0008
			1,2-Dichloroethane	--	3E-08	--	--	3E-08	NA	--	0.002	--	0.002
			Cis-1,2-Dichloroethene	--	- -	--	--	- -	NA	--	--	--	--
			Trichloroethene (Mutagenic)	--	1E-05	--	--	1E-05	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	--	3E-05	--	--	3E-05	Liver, Kidney	--	41	--	41
			Vinyl Chloride	--	2E-07	--	--	2E-07	Liver	--	0.004	--	0.004
			Chemical Total	--	4E-05	--	--	4E-05		- -	41	- -	41
		Exposure Point Total						4E-05					41
	Exposure Medium Total							4E-05					41
Medium Total								4E-04					166
Surface Water	Surface Water	Site 43	Arsenic	4E-09	--	2E-09	--	6E-09	Skin, CVS	0.00008	--	0.00005	0.0001
			Cobalt	- -	--	- -	--	- -	Thyroid	0.002	--	0.0004	0.002
			Cis-1,2-Dichloroethene	- -	--	- -	--	- -	Kidney	0.002	--	0.02	0.02
			Trichloroethene (Mutagenic)	7E-09	--	7E-08	--	8E-08	NA	--	--	--	--
			Trichloroethene (Nonmutagenic)	2E-08	--	2E-07	--	2E-07	Immune System, Developmental	0.010	--	0.1	0.1
			Vinyl Chloride	2E-09	--	7E-09	--	9E-09	Liver	0.000009	--	0.00003	0.00004
			Chemical Total	3E-08	--	3E-07	--	3E-07		0.01	--	0.1	0.1
		Exposure Point Total						3E-07					0.1
	Exposure Medium Total							3E-07					0.1
Medium Total								3E-07					0.1
Receptor Total							Receptor Risk Total	4E-04				Receptor HI Total	166

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

		Total Blood HI	0.03
Total Liver HI	42	Total Body Weight HI	0.03
Total Respiratory HI	0.0009	Total CNS HI	0.5
Total None Specified HI	0.02	Total CVS HI	0.2
Total Skin HI	0.2	Total Developmental HI	119
Total Thyroid HI	3	Total GS HI	0.7
Total Spleen HI	0.04	Total Kidney HI	42

TABLE 9.12.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Lifelong (Child and Adult)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Site 43	Aluminum	- -	--	- -	--	- -					
			Arsenic	1E-06	--	6E-08	--	1E-06					
			Cadmium	- -	--	- -	--	- -					
			Chromium VI	1E-05	--	5E-06	--	2E-05					
			Cobalt	- -	--	- -	--	- -					
			Iron	- -	--	- -	--	- -					
			Manganese	- -	--	- -	--	- -					
			Thallium	- -	--	- -	--	- -					
			Vanadium	- -	--	- -	--	- -					
			Trichloroethene (Mutagenic)	2E-08	--	7E-10	--	2E-08					
			Trichloroethene (Nonmutagenic)	2E-08	--	6E-10	--	2E-08					
			Chemical Total	1E-05	--	6E-06	--	2E-05					
		Exposure Point Total						2E-05					
	Exposure Medium Total							2E-05					
	Air	Site 43	Aluminum	--	- -	--	--	- -					
			Arsenic	--	8E-10	--	--	8E-10					
			Cadmium	--	5E-10	--	--	5E-10					
			Chromium VI	--	2E-07	--	--	2E-07					
			Cobalt	--	3E-09	--	--	3E-09					
			Iron	--	- -	--	--	- -					
			Manganese	--	- -	--	--	- -					
			Thallium	--	- -	--	--	- -					
			Vanadium	--	- -	--	--	- -					
			Trichloroethene (Mutagenic)	--	2E-07	--	--	2E-07					
			Trichloroethene (Nonmutagenic)	--	2E-07	--	--	2E-07					
			Chemical Total	--	6E-07	--	--	6E-07					
		Exposure Point Total						6E-07					
	Exposure Medium Total							6E-07					
Medium Total								2E-05					
Subsurface Soil	Subsurface Soil	Site 43	Aluminum	- -	--	- -	--	- -					
			Arsenic	4E-07	--	2E-08	--	4E-07					
			Chromium VI	7E-06	--	3E-06	--	1E-05					
			Cobalt	- -	--	- -	--	- -					
			Iron	- -	--	- -	--	- -					
			Manganese	- -	--	- -	--	- -					
			Trichloroethene (Mutagenic)	1E-08	--	4E-10	--	1E-08					
			Trichloroethene (Nonmutagenic)	8E-09	--	3E-10	--	9E-09					
			Chemical Total	7E-06	--	3E-06	--	1E-05					
		Exposure Point Total						1E-05					
	Exposure Medium Total							1E-05					
	Air	Site 43	Aluminum	--	- -	--	--	- -					
			Arsenic	--	3E-10	--	--	3E-10					
			Chromium VI	--	9E-08	--	--	9E-08					
			Cobalt	--	1E-09	--	--	1E-09					
			Iron	--	- -	--	--	- -					
			Manganese	--	- -	--	--	- -					
			Trichloroethene (Mutagenic)	--	1E-07	--	--	1E-07					
			Trichloroethene (Nonmutagenic)	--	1E-07	--	--	1E-07					
			Chemical Total	--	3E-07	--	--	3E-07					
		Exposure Point Total						3E-07					
	Exposure Medium Total							3E-07					
Medium Total								1E-05					

TABLE 9.12.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
SITE 43 - TOLUENE DISPOSAL, NSF INDIAN HEAD, INDIAN HEAD, MARYLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Lifelong (Child and Adult)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Site 43	1,3-Dinitrobenzene	- -	--	- -	--	- -					
			2,6-Dinitrotoluene	2E-06	--	9E-08	--	2E-06					
			3-Nitrotoluene	- -	--	- -	--	- -					
			Arsenic	1E-05	--	4E-08	--	1E-05					
			Barium	- -	--	- -	--	- -					
			Beryllium	- -	--	- -	--	- -					
			Cadmium	- -	--	- -	--	- -					
			Chromium VI	8E-06	--	2E-06	--	1E-05					
			Cobalt	- -	--	- -	--	- -					
			Iron	- -	--	- -	--	- -					
			Manganese	- -	--	- -	--	- -					
			Nickel	- -	--	- -	--	- -					
			Thallium	- -	--	- -	--	- -					
			Vanadium	- -	--	- -	--	- -					
			1,1-Dichloroethane	8E-08	--	6E-09	--	9E-08					
			1,1-Dichloroethene	- -	--	- -	--	- -					
			1,2-Dichloroethane	1E-07	--	5E-09	--	1E-07					
			Cis-1,2-Dichloroethene	- -	--	- -	--	- -					
			Trichloroethene (Mutagenic)	3E-04	--	4E-05	--	3E-04					
			Trichloroethene (Nonmutagenic)	3E-04	--	5E-05	--	4E-04					
			Vinyl Chloride	3E-04	--	1E-05	--	3E-04					
			Chemical Total	9E-04	--	1E-04	--	1E-03					
		Exposure Point Total						1E-03					
	Exposure Medium Total							1E-03					
	Air	Site 43	1,3-Dinitrobenzene	--	- -	--	--	- -					
			2,6-Dinitrotoluene	--	- -	--	--	- -					
			3-Nitrotoluene	--	- -	--	--	- -					
			Arsenic	--	- -	--	--	- -					
			Barium	--	- -	--	--	- -					
			Beryllium	--	- -	--	--	- -					
			Cadmium	--	- -	--	--	- -					
			Chromium VI	--	- -	--	--	- -					
			Cobalt	--	- -	--	--	- -					
			Iron	--	- -	--	--	- -					
			Manganese	--	- -	--	--	- -					
			Nickel	--	- -	--	--	- -					
			Thallium	--	- -	--	--	- -					
			Vanadium	--	- -	--	--	- -					
			1,1-Dichloroethane	--	3E-08	--	--	3E-08					
			1,1-Dichloroethene	--	- -	--	--	- -					
			1,2-Dichloroethane	--	3E-08	--	--	3E-08					
			Cis-1,2-Dichloroethene	--	- -	--	--	- -					
			Trichloroethene (Mutagenic)	--	1E-05	--	--	1E-05					
			Trichloroethene (Nonmutagenic)	--	3E-05	--	--	3E-05					
			Vinyl Chloride	--	2E-07	--	--	2E-07					
			Chemical Total	--	4E-05	--	--	4E-05					
		Exposure Point Total						4E-05					
	Exposure Medium Total							4E-05					
Medium Total								1E-03					
Surface Water	Surface Water	Site 43	Arsenic	4E-09	--	2E-09	--	6E-09					
			Cobalt	- -	--	- -	--	- -					
			Cis-1,2-Dichloroethene	4E-06	--	- -	--	4E-06					
			Trichloroethene (Mutagenic)	7E-09	--	7E-08	--	8E-08					
			Trichloroethene (Nonmutagenic)	2E-08	--	2E-07	--	2E-07					
			Vinyl Chloride	2E-09	--	7E-09	--	9E-09					
			Chemical Total	4E-06	--	3E-07	--	4E-06					
		Exposure Point Total						4E-06					
	Exposure Medium Total							4E-06					
Medium Total								4E-06					
Receptor Total							Receptor Risk Total	1E-03					

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Q.8 SAMPLE CALCULATIONS

CALCULATION WORKSHEET

CLIENT: NSF INDIAN HEAD, INDIAN HEAD, MARYLAND		**JOB NUMBER:** 112G00771
SUBJECT: CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SOIL CONSTRUCTION WORKER		
BASED ON: USEPA, DECEMBER 1989		
BY: A.CHRISTIAN	**CHECKED BY:**	**DATE:** 8/30/2013

PURPOSE: To estimate intake, carcinogenic and noncarcinogenic risks from incidental ingestion of surface soil.

EQUATION:

$$IEX = \frac{CS \times IR \times EF \times ED \times FI \times CF}{BW \times AT}$$

Where:

IEX	=	estimated exposure intake (mg/kg/day)
Cs	=	exposure point concentration in soil (mg/kg)
IR	=	incidental ingestion rate (mg/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
FI	=	fraction ingested from contaminated source (unitless)
CF	=	conversion factor (1E-06 kg/mg)
BW	=	body weight (kg)
AT	=	averaging time (days)
CSFo	=	oral carcinogenic slope factor ($(mg/kg/day)^{-1}$)
RfDo	=	oral noncarcinogenic reference dose (mg/kg/day)

RISKS:

ILCR (Carcinogens) = Intake (mg/kg/day) x CSFo (mg/kg/day)-1

HQ (Noncarcinogens) = Intake (mg/kg/day) / RFDo (mg/kg/day)

ASSUMPTIONS:

Cs	=	28.1	mg/kg	Chemical: Chromium VI
IR	=	330	mg/day	
EF	=	150	days/year	
ED	=	1	years	
FI	=	1		
CF	=	1E-06	kg/mg	
BW	=	70	kg	
ATc	=	25,550	days	
ATnc	=	365	days	
CSFo	=	5.0E-01	$(mg/kg/day)^{-1}$	
RfDo	=	5.0E-03	(mg/kg/day)	

CLIENT: NSF INDIAN HEAD, INDIAN HEAD, MARYLAND		**JOB NUMBER:** 112G00771
SUBJECT: CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SOIL CONSTRUCTION WORKER		
BASED ON: USEPA, DECEMBER 1989		
BY: A.CHRISTIAN	**CHECKED BY:**	**DATE:** 8/30/2013

EXAMPLE CARCINOGENIC CALCULATION

$$IEXc = \frac{28.1 \text{ mg/kg} \times 330 \text{ mg/day} \times 150 \text{ days/year} \times 1 \text{ years} \times 1 \times 1E\text{-}06 \text{ kg/mg}}{70 \text{ kg} \times 25550 \text{ days}}$$

IEXc = 7.78E-07 mg/kg/day

ILCR = 7.78E-07 mg/kg/day x 5.00E-01 (mg/kg/day)-1 = Incremental Lifetime Cancer Risk

ILCR = 3.9E-07

EXAMPLE NONCARCINOGENIC CALCULATION

$$IEXnc = \frac{28.1 \text{ mg/kg} \times 330 \text{ mg/day} \times 150 \text{ days/year} \times 1 \text{ years} \times 1 \times 1E\text{-}06 \text{ kg/mg}}{70 \text{ kg} \times 365 \text{ days}}$$

IEXnc = 5.44E-05 mg/kg/day

HQ = 5.44E-05 mg/kg/day / 5.00E-03 (mg/kg/day) = Hazard Quotient

HQ = 1.1E-02

CALCULATION WORKSHEET

CLIENT: NSF INDIAN HEAD, INDIAN HEAD, MARYLAND		**JOB NUMBER:** 112G00771
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH SOIL INDUSTRIAL WORKERS		
BASED ON: USEPA, JULY 2004		
BY: A.CHRISTIAN	**CHECKED BY:**	**DATE:** 8/30/2013

PURPOSE: To estimate intake, carcinogenic and noncarcinogenic risks from dermal contact with surface soil.

EQUATION:

$$DEX = \frac{Cs \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$$

Where:

DEX	=	estimated exposure intake (mg/kg/day)
Cs	=	exposure point concentration in soil (mg/kg)
CF	=	conversion factor (1E-06 kg/mg)
SA	=	skin surface available for contact (cm2/day)
ABS	=	absorption factor (unitless)
AF	=	adherence factor (mg/cm2)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
BW	=	body weight (kg)
AT	=	averaging time (days)
CSFd	=	dermal carcinogenic slope factor ($(mg/kg/day)^{-1}$)
RfDd	=	dermal noncarcinogenic reference dose (mg/kg/day)

RISKS:

ILCR (Carcinogens) = Intake (mg/kg/day) x CSFd (mg/kg/day)-1
HQ (Noncarcinogens) = Intake (mg/kg/day) / RFDd (mg/kg/day)

ASSUMPTIONS:

Cs	=	7.2	mg/kg	Chemical: Arsenic
CF	=	1E-06	kg/mg	
SA	=	3,300	cm^2/day	
AF	=	0.2	mg/cm^2	
ABS	=	0.03		
EF	=	250	days/year	
ED	=	25	years	
BW	=	70	kg	
ATc	=	25,550	days	
ATnc	=	9125	days	
CSFd	=	1.5E+00	$(mg/kg/day)^{-1}$	
RfDd	=	3.0E-04	(mg/kg/day)	

CLIENT: NSF INDIAN HEAD, INDIAN HEAD, MARYLAND		**JOB NUMBER:** 112G00771
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH SOIL INDUSTRIAL WORKERS		
BASED ON: USEPA, JULY 2004		
BY: A.CHRISTIAN	**CHECKED BY:**	**DATE:** 8/30/2013

EXAMPLE CARCINOGENIC CALCULATION

$$DEXc = \frac{7.2 \text{ mg/kg} \times 1E\text{-}06 \text{ kg/mg} \times 3300 \text{ cm2/day} \times 0.2 \text{ mg/cm2} \times 0.03 \times 250 \text{ days/year} \times 25 \text{ years}}{70 \text{ kg} \times 25550 \text{ days}}$$

DEXc = 4.98E-07 mg/kg/day

ILCR = 4.98E-07 mg/kg/day x 1.50E+00 (mg/kg/day)-1 = Incremental Lifetime Cancer Risk

ILCR = 7.5E-07

EXAMPLE NONCARCINOGENIC CALCULATION

$$DEXnc = \frac{7.2 \text{ mg/kg} \times 1E\text{-}06 \text{ kg/mg} \times 3300 \text{ cm2/day} \times 0.2 \text{ mg/cm2} \times 0.03 \times 250 \text{ days/year} \times 25 \text{ years}}{70 \text{ kg} \times 9125 \text{ days}}$$

DEXnc = 1.39E-06 mg/kg/day

HQ = 1.39E-06 mg/kg/day / 3.00E-04 (mg/kg/day) = Hazard Quotient

HQ = 4.6E-03

CLIENT: NSF INDIAN HEAD, INDIAN HEAD, MARYLAND		**JOB NUMBER:** 112G00771
SUBJECT: CALCULATION OF INTAKE/RISK FROM INHALATION OF FUGATIVE DUST EMISSIONS MAINTENANCE WORKERS		
BASED ON: USEPA, JANUARY 2009		
BY: A.CHRISTIAN	**CHECKED BY:**	**DATE:** 8/30/2013

PURPOSE: To estimate intake, carcinogenic and noncarcinogenic risks from inhalation of surface soil.

EQUATION:

$$EC = \frac{Ca \times ET \times EF \times ED}{AT \times 24 \text{ hours/day}}$$

Where:

EC	=	exposure concentration (mg/m3)
Ca	=	exposure point concentration in air (mg/m3)
	=	Cs x 1/PEF
Cs	=	exposure point concentration in soil (mg/kg)
PEF	=	particulate emission factor (m3/kg)
ET	=	exposure time (hrs/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
BW	=	body weight (kg)
AT	=	averaging time (hours)
IUR	=	inhalation unit risk ($(ug/m3)^{-1}$)
RfC	=	inhalation reference concentration (mg/m3)

RISKS:

ILCR (Carcinogens) = Exposure Concentration (mg/m3) x IURi (ug/m3)-1 x 1000 ug/mg
HQ (Noncarcinogens) = Exposure Concentration (mg/m3) / RFCi (mg/m3)

ASSUMPTIONS:

Cs	=	10.8	mg/kg	Chemical: Cadmium
PEF	=	3.23E+09	m3/kg	
Ca	=	3.34E-09	mg/m3	
ET	=	8	hours/day	
EF	=	24	days/year	
ED	=	25	years	
ATc	=	25,550	days	
ATnc	=	9,125	days	
IUR	=	1.8E-03	$(ug/m3)^{-1}$	
RfC	=	1.0E-05	(mg/m3)	

CLIENT: NSF INDIAN HEAD, INDIAN HEAD, MARYLAND		**JOB NUMBER:** 112G00771
SUBJECT: CALCULATION OF INTAKE/RISK FROM INHALATION OF FUGATIVE DUST EMISSIONS MAINTENANCE WORKERS		
BASED ON: USEPA, JANUARY 2009		
BY: A.CHRISTIAN	**CHECKED BY:**	**DATE:** 8/30/2013

EXAMPLE CARCINOGENIC CALCULATION

$$IEXc = \frac{3.34E\text{-}09\ mg/m3 \times 8\ hours/day \times 24\ days/year \times 25\ years}{25550\ days \times 24\ hours/day}$$

IEXc = 2.62E-11 mg/m3

ILCR = 2.62E-11 mg/m3 x 1.80E-03 (ug/m3)-1 x 1000 ug/mg = Incremental Lifetime Cancer Risk

ILCR = 4.7E-11

EXAMPLE NONCARCINOGENIC CALCULATION

$$IEXnc = \frac{3.34E\text{-}09\ mg/m3 \times 8\ hours/day \times 24\ days/year \times 25\ years}{9125\ days \times 24\ hours/day}$$

IEXnc = 7.33E-11 mg/m3

HQ = 7.33E-11 mg/m3 / 1.00E-05 (mg/m3) = Hazard Quotient

HQ **7.3E-06**

CLIENT: NSF INDIAN HEAD, INDIAN HEAD, MARYLAND		JOB NUMBER: 112G00771
SUBJECT: CALCULATION OF PARTICULATE EMISSION FACTOR FOR CONSTRUCTION WORKERS		
BASED ON: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites (USEPA, December 2002)		
BY: A.CHRISTIAN	CHECKED BY:	DATE: 8/30/2013

Equation 5-5
Derivation of the Particulate Emission Factor
Construction Scenario - Construction Worker

$$PEF_{sc} = Q/C_{sr} \times \frac{1}{F_D} \times \left[\frac{T \times A_R}{556 \times (W/3)^{0.4} \times \frac{(365d/yr - p)}{365d/yr} \times \Sigma VKT} \right]$$

Parameter/Definition (units)	Default
PEF_{sc}/subchronic road particulate emission factor (m^3/kg)	site-specific
Q/C_{sr}/ inverse of the ratio of the 1-h geometric mean air concentration to the emission flux along a straight road segment bisecting a square site (g/m^2-s per kg/m^3)	23.02[a] (Equation 5-6)
F_D/dispersion correction factor (unitless)	0.185 (Appendix E)
T/total time over which construction occurs (s)	site-specific
A_R/surface area of contaminated road segment (m^2) L_R/length of road segment (ft) W_R/width of road segment (ft)	274.213 ($A_R = L_R \times W_R \times 0.092903 m^2/ft^2$)
W/mean vehicle weight (tons)	site-specific
p/number of days with at least 0.01 inches of precipitation (days/year)	site-specific (Exhibit 5-2)
ΣVKT/sum of fleet vehicle kilometers traveled during the exposure duration (km)	site-specific

[a] Assumes a 0.5 acre site

Calculation of PEF for Construction Workers

Q/C	23.02	(g/m^2-s per kg/m^3)	
Fd	0.185	dispersion correction factor (unitless)	
T	4.32E+06	sec	3600 sec/hr x 8hr/day x 150 days/yr
A_R	274.213	m^2	
W	8	tons	
p	135	day/year	
VKT	175.5	km	30 vehicles x 0.045 km/day x 130 days

PEF = 1.62E+06 m^3/kg

CLIENT: NSF INDIAN HEAD, INDIAN HEAD, MARYLAND		**JOB NUMBER:** 112G00771
SUBJECT: ESTIMATION OF AMBIENT AIR CONCENTRATIONS RESULTING FROM FUGITIVE DUST EMISSIONS AND VOLATILIZATION FROM SOIL FOR CONSTRUCTION WORKERS		
BASED ON: U.S. EPA 2002		
BY: A.CHRISTIAN	**CHECKED BY:**	**DATE:** 9/4/2013

PURPOSE: To calculate ambient air concentrations resulting from fugitive dust and volatilization from soil.

RELEVANT EQUATIONS:

$$Cair = Cs \times (1/PEF + 1/VF)$$

$$VF = \frac{Q/C \times (3.14 \times DA \times T)^{1/2} \times 10^{-4}\ m^2/cm^2}{2 \times pb \times DA} \times \frac{1}{F_D}$$

$$DA = \frac{(\theta a^{10/3} \times Di \times H + \theta w^{10/3} \times Dw)/\theta_T^{\ 2}}{pb \times Kd + \theta w + \theta a \times H}$$

$$Csat = S/pb \times (Kd \times pb + \theta w + H \times \theta a)$$

Where:

Cair	=	Chemical concentration in air (mg/m^3)
Cs	=	Chemical concentration in soil (mg/kg)
PEF	=	Particulate emission factor (m^3/kg)
VF_{sc}	=	Subchronic volatilization factor (m^3/kg)
Q/C_{sa}	=	Inverse of mean conc. at center of source (g/m^2-s per kg/m^3).
F_D	=	Dispersion correction factor (unitless)
T	=	Total time over which construction occurs (seconds).
pb	=	Dry soil bulk density (g/cm^3).
ps	=	soil particle density (g/cm^3).
θ_T	=	Total soil porosity (Lpore/Lsoil).
θw	=	Water-filled soil porosity (Lpore/Lsoil).
θa	=	Air-filled soil porosity (Lair/Lsoil).
Di	=	Diffusivity in air (cm^2/sec).
H	=	Dimensionless Henry's Law Constant.
S	=	Solubility limit (mg/L)
Dw	=	Diffusivity in water (cm^2/sec).
DA	=	Apparent diffusivity (cm^2/sec).
Kd	=	Soil-water partition coefficient (cm^3/g).
Koc	=	Soil organic carbon partition coefficient (cm^3/g).
foc	=	Fraction organic carbon in soil (g/g).

CLIENT: NSF INDIAN HEAD, INDIAN HEAD, MARYLAND		JOB NUMBER: 112G00771
SUBJECT: ESTIMATION OF AMBIENT AIR CONCENTRATIONS RESULTING FROM FUGITIVE DUST EMISSIONS AND VOLATILIZATION FROM SOIL FOR CONSTRUCTION WORKERS		
BASED ON: U.S. EPA 2002		
BY: A.CHRISTIAN	CHECKED BY:	DATE: 9/4/2013

ASSUMPTIONS:

Cs	=	2.72	mg/kg	Chemical: Trichloroethene
PEF	=	1.62E+06	m3/kg	
Q/C	=	14.31	g/m2-s per kg/m3	
F_D	=	0.185		
T	=	3.20E+07	sec	
pb	=	1.5	g/cm3	
ps	=	2.65	g/cm3	
θ_T	=	0.434	Lpore/Lsoil	
θw	=	0.15	Lpore/Lsoil	
θa	=	0.284	Lair/Lsoil	
Di	=	6.87E-02	cm2/sec	
H	=	4.03E-01	Uniltess	
S	=	1.28E+03	mg/L	
Dw	=	1.02E-05	cm2/sec	
Koc	=	6.07E+01	cm3/g	
foc	=	0.006	g/g	
Kd	=	0.3642	cm3/g	

EXAMPLE CALCULATIONS

$$DA = \frac{(0.284^{10/3} \times (0.0687\ cm2/sec) \times (4.03E\text{-}01) + (0.15^{10/3} \times (1.02E\text{-}05\ cm2/sec)]/(0.434^2)}{(1.5\ g/cm3 \times 0.3642\ cm3/g) + (0.15 + 0.284 \times 0.403)}$$

DA = 2.73E-03 cm^2/sec

$$VF = \frac{(14.31\ g/m2\text{-}s\ per\ kg/m3) \times [(3.14) \times (2.73E\text{-}03\ cm2/sec) \times (3.20E+07\ sec)]^{1/2} \times (1E\text{-}4\ m2/cm2)}{2 \times 1.5g/cm3 \times 2.73E\text{-}03\ cm2/sec} \times \frac{1}{0.185}$$

VF = 4.95E+02 m^3/kg

Csat = (1.28E+03 mg/L)/(1.5 g/cm3) x [(0.3642 cm3/g) x (1.5 g/cm3) + (0.15 + 4.03E-01 x 0.284)]

Csat = 6.92E+02 mg/kg

Csat is greater than Cs, therfore use Cs in calculation of air concentration.

Cair = 2.72 mg/kg x [(1/1.62E+06 m3/kg) + (1/4.95E+02 m3/kg)]

Cair = 5.50E-03 mg/m^3

CLIENT: NSF INDIAN HEAD, INDIAN HEAD, MARYLAND		**JOB NUMBER:** 112G00771
SUBJECT: CALCULATION OF THE PARTICULATE EMISSION FACTOR (PEF) FOR RESIDENTIAL AND COMMERCIAL/INDUSTRIAL EXPOSURES		
BASED ON: SUPPLEMENTAL GUIDANCE FOR DEVELOPING SOIL SCREENING LEVELS FOR SUPERFUND SITES (USEPA, DECEMBER, 2002)		
BY: A.CHRISTIAN	**CHECKED BY:**	**DATE:** 9/4/2013

PURPOSE: To calculate the particulate emission factor for residential and commercial/industrial exposure scenarios.

EQUATIONS:

$$PEF = Q/C_{wind} \times \frac{3600 \text{ sec/hr}}{0.036 \times (1 - V) \times (U_m/U_t)^3 \times F(x)}$$

Where:

PEF	=	particulate emission factor (m^3/kg)
Q/C_{wind}	=	Inverse of mean conc. at center of source (g/m^2-s per kg/m^3).
V	=	fraction of vegetative cover (unitless)
U_m	=	mean annual wind speed (m/sec)
U_t	=	equivalent threshold value of wind speed at 7m (m/sec)
F(x)	=	function dependent on Um/Ut derived using Cowherd et al. (1985) (unitless)
A,B,C	=	constants based on air dispersion modeling for specific climate zones
A_{site}	=	areal extent of the site or contamination (acres)

ASSUMPTIONS:

V	=	0.5	unitless	
U_m	=	4.29	m/sec	Values are for Philadelphia, Pennslvania.
U_t	=	11.32	m/sec	
F(x)	=	0.0993	unitless	
Q/C_{wind}	=	87.36898	g/m2-s per kg/m3	

CLIENT: NSF INDIAN HEAD, INDIAN HEAD, MARYLAND		JOB NUMBER: 112G00771
SUBJECT: CALCULATION OF THE PARTICULATE EMISSION FACTOR (PEF) FOR RESIDENTIAL AND COMMERCIAL/INDUSTRIAL EXPOSURES		
BASED ON: SUPPLEMENTAL GUIDANCE FOR DEVELOPING SOIL SCREENING LEVELS FOR SUPERFUND SITES (USEPA, DECEMBER, 2002)		
BY: A.CHRISTIAN	CHECKED BY: L Larson	DATE: 9/4/2013

EXAMPLE CALCULATION FOR PEF

$$PEF = 87.36898 \text{ g/m2-s per kg/m3} \times \frac{3600 \text{ sec/hr}}{0.036 \times (1 - 0.5) \times (4.29 \text{ m/sec}/11.32 \text{ m/sec})^3 \times 0.0993}$$

$$PEF = 3.23E+09 \ m^3/kg$$

CLIENT: NSF INDIAN HEAD, INDIAN HEAD, MARYLAND		**JOB NUMBER:** 112G00771
SUBJECT: CALCULATION OF INTAKE/RISK FROM INGESTION OF GROUNDWATER ADULT RESIDENTS		
BASED ON: USEPA, DECEMBER 1989		
BY: A.CHRISTIAN	**CHECKED BY:**	**DATE:** 9/4/2013

PURPOSE: To estimate intake, carcinogenic and noncarcinogenic risks from ingestion of groundwater at Site 43.

EQUATION:

$$IEX = \frac{Cgw \times CF \times IR \times EF \times ED}{BW \times AT}$$

Where:

IEX	=	estimated exposure intake (mg/kg/day)
Cgw	=	exposure point concentration in groundwater (ug/L)
CF	=	conversion factor (1.0E-3 mg/ug)
IR	=	ingestion rate (L/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
BW	=	body weight (kg)
AT	=	averaging time (days)
CSFo	=	oral carcinogenic slope factor ($(mg/kg/day)^{-1}$)
RfDo	=	oral noncarcinogenic reference dose (mg/kg/day)

RISKS:

ILCR (Carcinogens) = Intake (mg/kg/day) x CSFo (mg/kg/day)-1
HQ (Noncarcinogens) = Intake (mg/kg/day) / RFDo (mg/kg/day)

ASSUMPTIONS:

Cgw	=	0.504	ug/L	Chemical: 2,6-Dinitrotoluene
IR	=	2	L/day	
CF	=	1.0E-03	mg/ug	
EF	=	350	days/year	
ED	=	24	years	
BW	=	70	kg	
ATc	=	25,550	days	
ATnc	=	8,760	days	
CSFo	=	1.5E+00	$(mg/kg/day)^{-1}$	
RfDo	=	3.0E-04	(mg/kg/day)	

CLIENT: NSF INDIAN HEAD, INDIAN HEAD, MARYLAND		**JOB NUMBER:** 112G00771
SUBJECT: CALCULATION OF INTAKE/RISK FROM INGESTION OF GROUNDWATER ADULT RESIDENTS		
BASED ON: USEPA, DECEMBER 1989		
BY: A.CHRISTIAN	**CHECKED BY:**	**DATE:** 9/4/2013

EXAMPLE CARCINOGENIC CALCULATION

$$IEXc = \frac{0.504\ ug/L \times 0.001\ mg/ug \times 2\ L/day \times 350\ days/year \times 24\ years}{70\ kg \times 25550\ days}$$

IEXc = 4.73E-06 mg/kg/day

ILCR = 4.73E-06 mg/kg/day x 1.50E+00 (mg/kg/day)-1 = Incremental Lifetime Cancer Risk

ILCR = 7.1E-06

EXAMPLE NONCARCINOGENIC CALCULATION

$$IEXnc = \frac{0.504\ ug/L \times 0.001\ mg/ug \times 2\ L/day \times 350\ days/year \times 24\ years}{70\ kg \times 8760\ days}$$

IEXnc = 1.38E-05 mg/kg/day

$$HQ = \frac{1.38E\text{-}05\ mg/kg/day}{3.00E\text{-}04\ (mg/kg/day)} = \text{Hazard Quotient}$$

HQ = 4.6E-02

CLIENT: NSF INDIAN HEAD, INDIAN HEAD, MARYLAND		**JOB NUMBER:** 112G00771
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH GROUNDWATER ADULT RESIDENTS		
BASED ON: USEPA, DECEMBER 1989, JULY 2004		
BY: A.CHRISTIAN	**CHECKED BY:**	**DATE:** 9/4/2013

PURPOSE: To estimate intake, carcinogenic and noncarcinogenic risks from dermal contact with groundwater at Site 43.

EQUATION:

$$DAD = \frac{DAevent \times EV \times ED \times EF \times A}{BW \times AT}$$

Where:

DAD	=	dermally absorbed dose (mg/kg/day)
DAevent	=	absorbed does per event (mg/cm^2/event)
EV	=	event frequency (events/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
A	=	skin surface available for contact (cm^2)
BW	=	body weight (kg)
AT	=	averaging time (days)
CSFd	=	dermal carcinogenic slope factor ((mg/kg/day)$^{-1}$)
RfDd	=	dermal noncarcinogenic reference dose (mg/kg/day)

RISKS:

ILCR (Carcinogens) = DAD (mg/kg/day) x CSFd (mg/kg/day)-1
HQ (Noncarcinogens) = DAD (mg/kg/day) / RFDd (mg/kg/day)

EQUATIONS for DAevent:

For Inorganics:

DAevent = Kp x Cw x CF x tevent

For Organics:

$$\text{If } tevent \le t^*, \text{ then: } DAevent = 2 \times FA \times Kp \times Cw \times CF \times \sqrt{\frac{6 \times tau \times tevent}{\pi}}$$

$$\text{If } tevent > t^*, \text{ then: } DAevent = FA \times Kp \times Cw \times CF \times \left[\frac{tevent}{1+B} + 2 \times tau \times \left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

CLIENT: NSF INDIAN HEAD, INDIAN HEAD, MARYLAND		**JOB NUMBER:** 112G00771
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH GROUNDWATER ADULT RESIDENTS		
BASED ON: USEPA, DECEMBER 1989, JULY 2004		
BY: A.CHRISTIAN	**CHECKED BY:**	**DATE:** 9/4/2013

Where:

Kp	=	permeability coefficient from water (cm/hr)
FA	=	fraction absorbed water (dimensionless)
Cgw	=	concentration of chemical in groundwater (mg/L)
tevent	=	duration of event (hr/event)
CF	=	conversion factor (0.001 L/cm^3)
t*	=	time it takes to reach steady-state (hr/event)
τ	=	lag time (hr/event)
B	=	Bunge Model Constant (dimensionless)

EXAMPLE CALCULATION OF DAevent

ASSUMPTIONS:

Cgw	=	0.0047	mg/L	Chemical: 1,1-Dichloroethane
Kp	=	6.74E-03	cm/hr	
FA	=	1	unitless	
tevent	=	5.80E-01	hr/event	
CF	=	0.001	L/cm^3	
t*	=	0.92	hr/event	
τ	=	0.38	hr/event	
B	=	0.003		

tevent < t*, therefore,

$$DAevent = (2 \times 0.00674\ cm/hr)\ (1)\ (0.0047\ mg/L)\ (0.001\ L/cm3) \times \sqrt{\frac{6 \times 0.382\ hr/event \times 0.58\ hr/event}{\pi}}$$

DAevent = 4.12E-08 mg/cm^2-event

RISK CALCULATIONS

ASSUMPTIONS:

A	=	18,000	cm^2
EV	=	1	event/day
ED	=	24	years
EF	=	350	days/year
BW	=	70	kg
ATc	=	25,550	days
ATnc	=	8,760	days
CSFd	=	5.7E-03	(mg/kg/day)$^{-1}$
RfDd	=	2.0E-01	(mg/kg/day)

CLIENT: NSF INDIAN HEAD, INDIAN HEAD, MARYLAND		JOB NUMBER: 112G00771
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH GROUNDWATER ADULT RESIDENTS		
BASED ON: USEPA, DECEMBER 1989, JULY 2004		
BY: A.CHRISTIAN	CHECKED BY:	DATE: 9/4/2013

EXAMPLE CARCINOGENIC CALCULATION

$$DADc = \frac{4.12E\text{-}08 \text{ mg/cm2-event} \times 1 \text{ event/day} \times 24 \text{ years} \times 350 \text{ days/year} \times 18000 \text{ cm2}}{70 \text{ kg} \times 25550 \text{ days}}$$

DADc = 3.48E-06 mg/kg/day

DADc = 3.48E-06 mg/kg/day x 5.70E-03 (mg/kg/day)-1 = Incremental Lifetime Cancer Risk

ILCR = 2.0E-08

EXAMPLE NONCARCINOGENIC CALCULATION

$$DADnc = \frac{4.12E\text{-}08 \text{ mg/cm2-event} \times 1 \text{ event/day} \times 24 \text{ years} \times 350 \text{ days/year} \times 18000 \text{ cm2}}{70 \text{ kg} \times 8760 \text{ days}}$$

DADnc = 1.02E-05 mg/kg/day

HQ = 1.02E-05 mg/kg/day / 2.00E-01 (mg/kg/day) = Hazard Quotient

HQ = 5.1E-05

CALCULATION WORKSHEET

CLIENT: NSF INDIAN HEAD, INDIAN HEAD, MARYLAND		**JOB NUMBER:** 112G00771
SUBJECT: CALCULATION OF INTAKE/RISK FROM INHALATION OF VOLATILES FROM GROUNDWATER - CONSTRUCTION WORKERS		
BASED ON: USEPA, DECEMBER 1989		
BY: A.CHRISTIAN	**CHECKED BY:**	**DATE:** 9/4/2013

PURPOSE: To estimate intake, carcinogenic and noncarcinogenic risks from inhalation of volatiles from groundwater at former Building 234.

EQUATION:

$$EC = \frac{Ca \times ET \times EF \times ED}{AT \times 24 \text{ hours/day}}$$

Where:

EC	=	exposure concentration (mg/m3)
Ca	=	exposure point concentration in air (mg/m3)
ET	=	exposure time (hrs/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
AT	=	averaging time (days)
IURi	=	inhalation unit risk ($(ug/m3)^{-1}$)
RfCi	=	inhalation reference concentration (mg/m3)

RISKS:

ILCR (Carcinogens) = Exposure Concentration (mg/m3) x IURi (ug/m3)-1 x 1000 ug/mg
HQ (Noncarcinogens) = Exposure Concentration (mg/m3) / RFCi (mg/m3)

ASSUMPTIONS:

Ca	=	8.60E-02	mg/m3	Chemical: Trichloroethene
ET	=	4	hr/day	
EF	=	90	days/year	
ED	=	1	years	
ATc	=	25,550	days	
ATnc	=	365	days	
IURi	=	3.1E-06	$(ug/m^3)^{-1}$	
RfCi	=	2.0E-03	mg/m^3	

CLIENT: NSF INDIAN HEAD, INDIAN HEAD, MARYLAND		**JOB NUMBER:** 112G00771
SUBJECT: CALCULATION OF INTAKE/RISK FROM INHALATION OF VOLATILES FROM GROUNDWATER - CONSTRUCTION WORKERS		
BASED ON: USEPA, DECEMBER 1989		
BY: A.CHRISTIAN	**CHECKED BY:**	**DATE:** 9/4/2013

EXAMPLE CARCINOGENIC CALCULATION

$$IEXc = \frac{8.60E\text{-}02 \text{ mg/m3} \times 4 \text{ hr/day} \times 90 \text{ days/year} \times 1 \text{ years}}{25550 \text{ days} \times 24 \text{ hours/day}}$$

IEXc = 5.05E-05 mg/m3

ILCR = 5.05E-05 mg/m3 x 3.10E-06 (ug/m3)-1 x 1000 ug/mg = Incremental Lifetime Cancer Risk

ILCR = 1.6E-07

EXAMPLE NONCARCINOGENIC CALCULATION

$$IEXnc = \frac{8.60E\text{-}02 \text{ mg/m3} \times 4 \text{ hr/day} \times 90 \text{ days/year} \times 1 \text{ years}}{365 \text{ days} \times 24 \text{ hours/day}}$$

IEXnc = 3.53E-03 mg/m3

HQ = 3.53E-03 mg/m3 / 2.00E-03 mg/m3 = Hazard Quotient

HQ **1.8E+00**

CLIENT: NSF INDIAN HEAD, INDIAN HEAD, MARYLAND		**JOB NUMBER:** 112G00771
SUBJECT: CALCULATION OF INTAKE/RISK FROM INHALATION OF VOLATILES WHILE SHOWERING BY AN ADULT RESIDENT		
BASED ON: EPA, 1989 AND FOSTER AND CHROSTOWSKI, 1987		
BY: A.CHRISTIAN	**CHECKED BY:**	**DATE:** 9/4/2013

PURPOSE: To estimate intake, carcinogenic and noncarcinogenic risks from inhalation of volatiles while showering by an adult resident at Site 43.

EQUATIONS:

$$EC = \frac{S \times K \times EF \times ED}{AT \times Ra \times CF}$$

Where:

$$K = Ds + \frac{\exp(-Ra \times Dt) - \exp[Ra \times (Ds - Dt)]}{Ra}$$

$S = Cwd \times FR/SV$ $\quad$ $Cwd = Cw \times [1-\exp(-Kal \times ts/60d)]$

$Kal = Kl \times [(T1 \times Us)/(Ts \times U1)^{-0.5}$ $\quad$ $Kl = 1/[1/k1 + RT/(H \times kg)]$

$k1 = 20\ cm/hr \times (44/MW)^{0.5}$ $\quad$ $kg = 3000\ cm/hr \times (18/MW)^{0.5}$

RISKS:

ILCR (Carcinogens) = Exposure Concentration (mg/m3) x IUR (ug/m3)-1 x 1000 ug/mg
HQ (Noncarcinogens) = Exposure Concentration (mg/m3) / RFC (mg/m3)

Where:

EC	=	exposure concentration (mg/m3)
S	=	volatile chemical generation rate (mg/m3-min - shower)
EF	=	exposure frequency (showers/year)
ED	=	exposure duration (years)
AT	=	averaging time (days)
Ra	=	air exchange rate (1/min)
Ds	=	shower duration (min)
Dt	=	total time in bathroom (min)
FR	=	shower water flow rate (L/min)
SV	=	shower room air volume (m3)
CW	=	chemical concentration in groundwater (mg/L)
ts	=	shower droplet drop time (sec)
d	=	shower droplet diameter (mm)
MW	=	molecular weight of compound (g/mole)
H	=	Henry's Law constant (atm-m3/mole)
RT	=	Ideal gas constant x absolute temperature (2.4E-02 atm-m3/mole)
T1	=	calibration water temperature (K)
Ts	=	shower water temperature (K)
U1	=	water viscosity at T1 (cp)
Us	=	water viscosity at Ts (cp)
IUR	=	inhalation unit risk ($(ug/m3)^{-1}$)
RfC	=	inhalation reference concentration (mg/m3)

CLIENT: NSF INDIAN HEAD, INDIAN HEAD, MARYLAND		**JOB NUMBER:** 112G00771
SUBJECT: CALCULATION OF INTAKE/RISK FROM INHALATION OF VOLATILES WHILE SHOWERING BY AN ADULT RESIDENT		
BASED ON: EPA, 1989 AND FOSTER AND CHROSTOWSKI, 1987		
BY: A.CHRISTIAN	**CHECKED BY:**	**DATE:** 9/4/2013

ASSUMPTIONS: Chemical: Trichloroethene

EF	=	350	showers/year
ED	=	24	years
ATc	=	25550	days
ATn	=	8760	days
Ra	=	0.0167	1/min
CF	=	1440	min/day
Ds	=	30	min
Dt	=	60	min
FR	=	10	L/min
SV	=	12	m3
Cw	=	2.68	mg/L
ts	=	0.5	sec
d	=	1	mm
MW	=	1.31E+02	g/mole
H	=	9.85E-03	atm-m3/mole
RT	=	2.40E-02	atm-m3/mole
T1	=	293	K
Ts	=	318	K
U1	=	1.002	centipoise
Us	=	0.596	centipoise
IUR	=	3.1E-06	(ug/m3)-1
RfC	=	2.0E-03	(mg/m3)

EXAMPLE CALCULATION:

k1 = 20 cm/hr x (44 g/mole / 131 g/mole)^0.5

k1 = **11.59 cm/hr**

kg = 3000 cm/hr x (18 g/mole / 131 g/mole)^0.5

kg = **1112.04 cm/hr**

Kl = 1/[1/11.6 cm/hr + 2.40E-02 atm-m3/mole/(9.85E-03 atm-m3/mole x 1112.0 cm/hr)]

Kl = **1.13E+01 cm/hr**

CLIENT: NSF INDIAN HEAD, INDIAN HEAD, MARYLAND		**JOB NUMBER:** 112G00771
SUBJECT: CALCULATION OF INTAKE/RISK FROM INHALATION OF VOLATILES WHILE SHOWERING BY AN ADULT RESIDENT		
BASED ON: EPA, 1989 AND FOSTER AND CHROSTOWSKI, 1987		
BY: A.CHRISTIAN	**CHECKED BY:**	**DATE:** 9/4/2013

Kal = 1.13E+01 cm/hr x [(293 K x 0.596 centipoise)/(318 K x 1.002 centipoise)]^-0.5

Kal = **15.3 cm/hr**

Cwd = 2.68 mg/L x [1 - exp((-15.3 cm/hr x 0.5 sec)/(60 x 1 mm))]

Cwd = **3.20E-01 mg/L**

S = 3.20E-01 mg/L x 10 L/min / 12 m3

S = **2.67E-01 mg/m3-min-shower**

$$K = 30\text{ min} + \frac{\exp(-0.0167\text{ 1/min} \times 60\text{ min}) - \exp[0.0167\text{ 1/min} \times (30\text{ min} - 60\text{ min})]}{0.0167\text{ 1/min}}$$

K = **15.70 min**

CARCINOGENIC INTAKE:

$$EC = \frac{2.67\text{E-01 mg/m3-min-shower} \times 15.70\text{ min} \times 350\text{ showers/year} \times 24\text{ years}}{25550\text{ days} \times 0.0167\text{ 1/min} \times 1440\text{ min/day}}$$

EC = **5.73E-02 mg/m3**

Risk = 5.73E-02 mg/m3 x 3.10E-06 (ug/m3)-1 x 1000 ug/mg

Risk = **1.78E-04**

NONCARCINOGENIC INTAKE:

$$EC = \frac{2.67\text{E-01 mg/m3-min-shower} \times 15.70\text{ min} \times 350\text{ showers/year} \times 24\text{ years}}{8760\text{ days} \times 0.0167\text{ 1/min} \times 1440\text{ min/day}}$$

EC = **1.67E-01 mg/m3**

HQ = 1.67E-01 mg/m3 / 2.00E-03 (mg/m3)

HQ = **8.35E+01**

CLIENT: NSF INDIAN HEAD, INDIAN HEAD, MARYLAND		**JOB NUMBER:** 112G00771
SUBJECT: CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SURFACE WATER MAINTENANCE WORKER		
BASED ON: USEPA, DEC. 1989		
BY: A.CHRISTIAN	**CHECKED BY:**	**DATE:** 9/4/2013

PURPOSE: To estimate intake, carcinogenic and noncarcinogenic risks from incidental ingestion of surface water.

EQUATION:

$$IEX = \frac{Csw \times CF \times CRsw \times ET \times EF \times ED}{BW \times AT}$$

Where:

IEX	=	estimated exposure intake (mg/kg/day)
Csw	=	exposure point concentration in surface water (ug/L)
CF	=	conversion factor (1.0E-3 mg/ug)
CRsw	=	contact rate (L/hour)
ET	=	exposure time (hours/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
BW	=	body weight (kg)
AT	=	averaging time (days)
CSFo	=	oral carcinogenic slope factor ($(mg/kg/day)^{-1}$)
RfDo	=	oral noncarcinogenic reference dose (mg/kg/day)

RISKS:

ICLR (Carcinogens) = Intake (mg/kg/day) x CSFo $(mg/kg/day)^{-1}$
HQ (Noncarcinogens) = Intake (mg/kg/day) / RFDo (mg/kg/day)

ASSUMPTIONS:

Csw	=	1.21	ug/L	Chemical: Arsenic
CRsw	=	0.01	L/hr	
CF	=	1.0E-03	mg/ug	
ET	=	4	hours	
EF	=	24	days/year	
ED	=	10	years	
BW	=	70	kg	
ATc	=	25550	days	
ATnc	=	3650	days	
CSFo	=	1.5E+00	$(mg/kg/day)^{-1}$	
RfDo	=	3.0E-04	(mg/kg/day)	

CLIENT: NSF INDIAN HEAD, INDIAN HEAD, MARYLAND		**JOB NUMBER:** 112G00771
SUBJECT: CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SURFACE WATER MAINTENANCE WORKER		
BASED ON: USEPA, DEC. 1989		
BY: A.CHRISTIAN	**CHECKED BY:**	**DATE:** 9/4/2013

EXAMPLE CARCINOGENIC CALCULATION

$$IEXc = \frac{1.21\ ug/L \times 1.0E\text{-}03\ mg/ug \times 0.01\ L/hr \times 4\ hours \times 24\ days/year \times 10\ years}{70\ kg \times 25550\ days}$$

IEXc = 6.49E-09 mg/kg/day

ICLR = 6.49E-09 mg/kg/day x 1.50E+00 (mg/kg/day)-1 = Incremental Lifetime Cancer Risk

ICLR **9.7E-09**

EXAMPLE NONCARCINOGENIC CALCULATION

$$IEXnc = \frac{1.21\ ug/L \times 1.0E\text{-}03\ mg/ug \times 0.01\ L/hr \times 4\ hours \times 24\ days/year \times 10\ years}{70\ kg \times 3650\ days}$$

IEXnc = 4.55E-08 mg/kg/day

$$HQ = \frac{4.55E\text{-}08\ mg/kg/day}{3.00E\text{-}04\ (mg/kg/day)} = \text{Hazard Quotient}$$

HQ = 1.5E-04

CLIENT: NSF INDIAN HEAD, INDIAN HEAD, MARYLAND		**JOB NUMBER:** 112G00771
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH SURFACE WATER MAINTENANCE WORKER		
BASED ON: USEPA, DECEMBER 1989, JULY 2004		
BY: A.CHRISTIAN	**CHECKED BY:**	**DATE:** 9/4/2013

PURPOSE: To estimate intake, carcinogenic and noncarcinogenic risks from dermal contact with surface water.

EQUATION:

$$DAD = \frac{DAevent \times EV \times ED \times EF \times A}{BW \times AT}$$

Where:

DAD	=	dermally absorbed dose (mg/kg/day)
DAevent	=	absorbed dose per event (mg/cm^2/event)
EV	=	event frequency (events/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
A	=	skin surface available for contact (cm^2)
BW	=	body weight (kg)
AT	=	averaging time (days)
CSFd	=	dermal carcinogenic slope factor ((mg/kg/day)$^{-1}$)
RfDd	=	dermal noncarcinogenic reference dose (mg/kg/day)

RISKS:

ILCR (Carcinogens) = DAD (mg/kg/day) x CSFd (mg/kg/day)-1
HQ (Noncarcinogens) = DAD (mg/kg/day) / RFDd (mg/kg/day)

EQUATIONS for DAevent:

For Inorganics:

DAevent = Kp x Cw x CF x tevent

For Organics:

$$\text{If } tevent \le t^*, \text{ then: } DAevent = 2 \times FA \times Kp \times Cw \times CF \times \sqrt{\frac{6 \times tau \times tevent}{\pi}}$$

$$\text{If } tevent > t^*, \text{ then: } DAevent = FA \times Kp \times Cw \times CF \times \left[\frac{tevent}{1+B} + 2 \times tau \times \left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

CLIENT: NSF INDIAN HEAD, INDIAN HEAD, MARYLAND		**JOB NUMBER:** 112G00771
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH SURFACE WATER MAINTENANCE WORKER		
BASED ON: USEPA, DECEMBER 1989, JULY 2004		
BY: A.CHRISTIAN	**CHECKED BY:**	**DATE:** 9/4/2013

Where:

Kp	=	permeability coefficient from water (cm/hr)
Csw	=	concentration of chemical in surface water (mg/L)
tevent	=	duration of event (hr/event)
CF	=	conversion factor (0.001 L/cm^3)
t*	=	time it takes to reach steady-state (hr/event)
τ	=	lag time (hr/event)
B	=	Bunge Model Constant (dimensionless)

EXAMPLE CALCULATION OF DAevent

ASSUMPTIONS:

Csw	=	0.00121	mg/L	Chemical: Arsenic
Kp	=	1.00E-03	cm/hr	
tevent	=	4	hr/event	

DA_{event} = 0.001 cm/hr x 0.00121 mg/L x 0.001 L/cm3 x 4 hr/event

DA_{event} 4.84E-09 mg/cm2-event

RISK CALCULATIONS

ASSUMPTIONS:

A	=	3,300	cm^2
EV	=	1	event/day
ED	=	10	years
EF	=	24	days/year
BW	=	70	kg
ATc	=	25,550	days
ATnc	=	3,650	days
CSFd	=	1.5E+00	(mg/kg/day)$^{-1}$
RfDd	=	3.0E-04	(mg/kg/day)

CLIENT: NSF INDIAN HEAD, INDIAN HEAD, MARYLAND		JOB NUMBER: 112G00771
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH SURFACE WATER MAINTENANCE WORKER		
BASED ON: USEPA, DECEMBER 1989, JULY 2004		
BY: A.CHRISTIAN	CHECKED BY:	DATE: 9/4/2013

EXAMPLE CARCINOGENIC CALCULATION

$$DADc = \frac{4.84E\text{-}09 \text{ mg/cm2-event} \times 1 \text{ event/day} \times 10 \text{ years} \times 24 \text{ days/year} \times 3300 \text{ cm2}}{70 \text{ kg} \times 25550 \text{ days}}$$

DADc = 2.14E-09 mg/kg/day

DADc = 2.14E-09 mg/kg/day x 1.50E+00 (mg/kg/day)-1 = Incremental Lifetime Cancer Risk

ILCR = 3.2E-09

EXAMPLE NONCARCINOGENIC CALCULATION

$$DADnc = \frac{4.84E\text{-}09 \text{ mg/cm2-event} \times 1 \text{ event/day} \times 10 \text{ years} \times 24 \text{ days/year} \times 3300 \text{ cm2}}{70 \text{ kg} \times 3650 \text{ days}}$$

DADnc = 1.50E-08 mg/kg/day

HQ = 1.50E-08 mg/kg/day / 3.00E-04 (mg/kg/day) = Hazard Quotient

HQ = 5.0E-05

CLIENT: NSF INIDAN HEAD, INDIAN HEAD, MARYLAND		**JOB NUMBER:** 112G00771
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH SOIL FOR MUTAGENIC CHEMICALS HYPOTHETICAL CHILD RESIDENTS		
BASED ON: USEPA, JULY 2004, MARCH 2005		
BY: A.CHRISTIAN	**CHECKED BY:**	**DATE:** 9/9/2013

PURPOSE: To estimate intake and cancer risks for mutagenic chemicals from dermal contact with surface soil.

EQUATION:

$$DEX = \frac{Cs \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT} \times ADAF$$

Where:

DEX	=	estimated exposure intake (mg/kg/day)
Cs	=	exposure point concentration in soil (mg/kg)
CF	=	conversion factor (1.0E-6 kg/mg)
SA	=	skin surface available for contact (cm^2/day)
ABS	=	absorption factor (unitless)
AF	=	adherence factor (mg/cm^2)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
BW	=	body weight (kg)
AT	=	averaging time (days)
ADAF	=	age-dependent adjustment factor
CSFd	=	dermal carcinogenic slope factor ($(mg/kg/day)^{-1}$)

RISKS:

ILCR (Carcinogens) = Intake (mg/kg/day) x CSFd (mg/kg/day)-1

ASSUMPTIONS:

Cs	=	2.72	mg/kg	Chemical:Trichloroethene
CF	=	1.0E-06	kg/mg	
SA	=	2,800	cm^2/day	
AF	=	0.2	mg/cm^2	
ABS	=	0.03		
EF	=	350	days/year	
ED_1	=	2	years	
ED_2	=	4	years	
BW	=	15	kg	
AT	=	25,550	days	
CSFd	=	9.3E-03	$(mg/kg/day)^{-1}$	
$ADAF_1$	=	10		
$ADAF_2$	=	3		

CLIENT: NSF INIDAN HEAD, INDIAN HEAD, MARYLAND		JOB NUMBER: 112G00771
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH SOIL FOR MUTAGENIC CHEMICALS HYPOTHETICAL CHILD RESIDENTS		
BASED ON: USEPA, JULY 2004, MARCH 2005		
BY: A.CHRISTIAN	CHECKED BY:	DATE: 9/9/2013

EXAMPLE CARCINOGENIC CALCULATION

$$DEXc = \frac{2.72\ mg/kg \times 1.0E\text{-}06\ kg/mg \times 2800\ cm2/day \times 0.2\ mg/cm2 \times 0.03 \times 350\ days/year \times 2\ years}{15\ kg \times 25550\ days} \times 10$$

DEXc = 8.35E-07 mg/kg/day

$$DEXc = \frac{2.72\ mg/kg \times 1.0E\text{-}06\ kg/mg \times 2800\ cm2/day \times 0.2\ mg/cm2 \times 0.03 \times 350\ days/year \times 4\ years}{15\ kg \times 25550\ days} \times 3$$

DEXc = 5.01E-07 mg/kg/day

ILCR = (8.35E-07 mg/kg/day + 5.01E-07 mg/kg/day) x 9.30E-03 (mg/kg/day)-1

ILCR = 1.2E-08

CLIENT: NSF INDIAN HEAD, INDIAN HEAD, MARYLAND		**JOB NUMBER:** 112G00771
SUBJECT: CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SOIL FOR MUTAGENIC CHEMICALS - HYPOTHETICAL CHILD RESIDENTS		
BASED ON: USEPA, DECEMBER 1989, MARCH 2005		
BY: A.CHRISTIAN	**CHECKED BY:**	**DATE:** 9/4/2013

PURPOSE: To estimate intake and cancer risks for mutagenic chemicals from incidental ingestion of surface soil.

EQUATION:

$$IEX = \frac{CS \times IR \times EF \times ED \times FI \times CF}{BW \times AT} \times ADAF$$

Where:

IEX	=	estimated exposure intake (mg/kg/day)
Cs	=	exposure point concentration in soil (mg/kg)
IR	=	incidental ingestion rate (mg/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
FI	=	fraction ingested from contaminated source (unitless)
CF	=	conversion factor (1.0E-6 kg/mg)
BW	=	body weight (kg)
AT	=	averaging time (days)
ADAF	=	age-dependent adjustment factor
CSFo	=	oral carcinogenic slope factor ($(mg/kg/day)^{-1}$)

RISKS:

ILCR (Carcinogens) = Intake (mg/kg/day) x CSFo (mg/kg/day)-1

ASSUMPTIONS:

Cs	=	2.72	mg/kg	Chemical: Trichloroethene
IR	=	200	mg/day	
EF	=	350	days/year	
ED_1	=	2	years	
ED_2	=	4	years	
FI	=	1		
CF	=	1.0E-06	kg/mg	
BW	=	15	kg	
AT	=	25,550	days	
CSFo	=	9.3E-03	$(mg/kg/day)^{-1}$	
$ADAF_1$	=	10		
$ADAF_2$	=	3		

CLIENT: NSF INDIAN HEAD, INDIAN HEAD, MARYLAND		**JOB NUMBER:** 112G00771
SUBJECT: CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SOIL FOR MUTAGENIC CHEMICALS - HYPOTHETICAL CHILD RESIDENTS		
BASED ON: USEPA, DECEMBER 1989, MARCH 2005		
BY: A.CHRISTIAN	**CHECKED BY:**	**DATE:** 9/4/2013

EXAMPLE CARCINOGENIC CALCULATION

$$IEX_1 = \frac{2.72 \text{ mg/kg} \times 200 \text{ mg/day} \times 350 \text{ days/year} \times 2 \text{ years} \times 1 \times 1.0\text{E-06 kg/mg}}{15 \text{ kg} \times 25550 \text{ days}} \times 10$$

IEX_1 = 9.94E-06 mg/kg/day

$$IEX_2 = \frac{2.72 \text{ mg/kg} \times 200 \text{ mg/day} \times 350 \text{ days/year} \times 4 \text{ years} \times 1 \times 1.0\text{E-06 kg/mg}}{15 \text{ kg} \times 25550 \text{ days}} \times 3$$

IEX_2 = 5.96E-06 mg/kg/day

ILCR = (9.94E-06 mg/kg/day + 5.96E-06 mg/kg/day) x 9.30E-03 (mg/kg/day)-1

ILCR = 1.5E-07

CALCULATION WORKSHEET

CLIENT: NSF INDIAN HEAD, INDIAN HEAD, MARYLAND		**JOB NUMBER:** 112G00771
SUBJECT: CALCULATION OF INTAKE/RISK FROM INHALATION OF FUGATIVE DUST EMISSIONS FOR MUTAGENIC CHEMICALS - HYPOTHETICAL CHILD RESIDENTS		
BASED ON: USEPA, DECEMBER 1989, MARCH 2005		
BY: A.CHRISTIAN	**CHECKED BY:** [illegible]	**DATE:** 9/4/2013

PURPOSE: To estimate intake, carcinogenic risks for mutagenic chemicals from inhalation of surface soil.

EQUATION:

$$EC = \frac{Ca \times ET \times EF \times ED}{AT \times 24 \text{ hours/day}} \times ADAF$$

Where:

EC	=	estimated exposure concentration (mg/m3)
Ca	=	exposure point concentration in air (mg/m3)
	=	Cs x (1/PEF + 1/VF)
Cs	=	exposure point concentration in soil (mg/kg)
VF	=	Volatilization Factor
PEF	=	particulate emission factor (m3/kg)
ET	=	exposure time (hrs/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
AT	=	averaging time (hours)
ADAF	=	age-dependent adjustment factor
IUR	=	inhalation unit risk($(ug/mg)^{-1}$)

RISKS:

ILCR = Exposure concentration (mg/m3) x IURi (ug/m3)-1 x 1000 ug/mg

ASSUMPTIONS:

Cs	=	2.72	mg/kg	Chemical: Trichloroethene
PEF	=	3.23E+09	m3/kg	
VF	=	3.04E+03		
Ca	=	8.90E-04	mg/m3	
ET	=	24	hr/day	
EF	=	350	days/year	
ED_1	=	2	years	
ED_2	=	4	years	
ATc	=	25,550	days	
IUR	=	1.0E-06	$(ug/m3)^{-1}$	
$ADAF_1$	=	10		
$ADAF_2$	=	3		

CLIENT: NSF INDIAN HEAD, INDIAN HEAD, MARYLAND		**JOB NUMBER:** 112G00771
SUBJECT: CALCULATION OF INTAKE/RISK FROM INHALATION OF FUGATIVE DUST EMISSIONS FOR MUTAGENIC CHEMICALS - HYPOTHETICAL CHILD RESIDENTS		
BASED ON: USEPA, DECEMBER 1989, MARCH 2005		
BY: A.CHRISTIAN	**CHECKED BY:**	**DATE:** 9/4/2013

EXAMPLE CARCINOGENIC CALCULATION

$$EC = \frac{8.90E\text{-}04\ mg/m3 \times 24\ hr/day \times 350\ days/year \times 2\ years}{25550\ days \times 24\ hours/day} \times 10$$

EC = 2.44E-04 mg/m3

$$EC = \frac{8.90E\text{-}04\ mg/m3 \times 24\ hr/day \times 350\ days/year \times 4\ years}{25550\ days \times 24\ hours/day} \times 3$$

EC = 1.46E-04 mg/m3

ILCR = (2.44E-04 mg/m3 + 1.46E-04 mg/m3) x 1.00E-06 (ug/m3)-1 x 1000 ug/mg

ILCR = 3.9E-07

CLIENT: NSF INDIAN HEAD, INDIAN HEAD, MARYLAND		**JOB NUMBER:** 112G00771
SUBJECT: CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SOIL FOR MUTAGENIC CHEMICALS - HYPOTHETICAL ADULT RESIDENTS		
BASED ON: USEPA, DECEMBER 1989, MARCH 2005		
BY: A.CHRISTIAN	**CHECKED BY:**	**DATE:** 9/4/2013

PURPOSE: To estimate intake and cancer risks for mutagenic chemicals from incidental ingestion of surface soil.

EQUATION:

$$IEX = \frac{CS \times IR \times EF \times ED \times FI \times CF}{BW \times AT} \times ADAF$$

Where:

IEX	=	estimated exposure intake (mg/kg/day)
Cs	=	exposure point concentration in soil (mg/kg)
IR	=	incidental ingestion rate (mg/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
FI	=	fraction ingested from contaminated source (unitless)
CF	=	conversion factor (1.0E-6 kg/mg)
BW	=	body weight (kg)
AT	=	averaging time (days)
ADAF	=	age-dependent adjustment factor
CSFo	=	oral carcinogenic slope factor ($(mg/kg/day)^{-1}$)

RISKS:

ILCR (Carcinogens) = Intake (mg/kg/day) x CSFo (mg/kg/day)-1

ASSUMPTIONS:

Cs	=	2.72	mg/kg	Chemical: Trichloroethene
IR	=	100	mg/day	
EF	=	350	days/year	
ED_1	=	10	years	
ED_2	=	14	years	
FI	=	1		
CF	=	1.0E-06	kg/mg	
BW	=	70	kg	
AT	=	25,550	days	
CSFo	=	9.3E-03	$(mg/kg/day)^{-1}$	
$ADAF_1$	=	3		
$ADAF_2$	=	1		

CLIENT: NSF INDIAN HEAD, INDIAN HEAD, MARYLAND		**JOB NUMBER:** 112G00771
SUBJECT: CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SOIL FOR MUTAGENIC CHEMICALS - HYPOTHETICAL ADULT RESIDENTS		
BASED ON: USEPA, DECEMBER 1989, MARCH 2005		
BY: A.CHRISTIAN	**CHECKED BY:**	**DATE:** 9/4/2013

EXAMPLE CARCINOGENIC CALCULATION

$$IEX_1 = \frac{2.72 \text{ mg/kg} \times 100 \text{ mg/day} \times 350 \text{ days/year} \times 10 \text{ years} \times 1 \times 1.0\text{E-06 kg/mg}}{70 \text{ kg} \times 25550 \text{ days}} \times 3$$

IEX_1 = 1.60E-06 mg/kg/day

$$IEX_2 = \frac{2.72 \text{ mg/kg} \times 100 \text{ mg/day} \times 350 \text{ days/year} \times 14 \text{ years} \times 1 \times 1.0\text{E-06 kg/mg}}{70 \text{ kg} \times 25550 \text{ days}} \times 1$$

IEX_2 = 7.45E-07 mg/kg/day

ILCR = (1.60E-06 mg/kg/day + 7.45E-07 mg/kg/day) x 9.30E-03 (mg/kg/day)-1

ILCR = 2.2E-08

CLIENT: NSF INIDAN HEAD, INDIAN HEAD, MARYLAND		JOB NUMBER: 112G00771
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH SOIL FOR MUTAGENIC CHEMICALS HYPOTHETICAL ADULT RESIDENTS		
BASED ON: USEPA, JULY 2004, MARCH 2005		
BY: A.CHRISTIAN	CHECKED BY:	DATE: 9/4/2013

PURPOSE: To estimate intake and cancer risks for mutagenic chemicals from dermal contact with surface soil.

EQUATION:

$$DEX = \frac{Cs \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT} \times ADAF$$

Where:

DEX	=	estimated exposure intake (mg/kg/day)
Cs	=	exposure point concentration in soil (mg/kg)
CF	=	conversion factor (1.0E-6 kg/mg)
SA	=	skin surface available for contact (cm^2/day)
ABS	=	absorption factor (unitless)
AF	=	adherence factor (mg/cm^2)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
BW	=	body weight (kg)
AT	=	averaging time (days)
ADAF	=	age-dependent adjustment factor
CSFd	=	dermal carcinogenic slope factor ((mg/kg/day)$^{-1}$)

RISKS:

ILCR (Carcinogens) = Intake (mg/kg/day) x CSFd (mg/kg/day)-1

ASSUMPTIONS:

Cs	=	2.72	mg/kg	Chemical: Trichloroethene
CF	=	1.0E-06	kg/mg	
SA	=	5,700	cm^2/day	
AF	=	0.07	mg/cm^2	
ABS	=	0.03		
EF	=	350	days/year	
ED_1	=	10	years	
ED_2	=	14	years	
BW	=	70	kg	
AT	=	25,550	days	
CSFd	=	9.30E-03	(mg/kg/day)$^{-1}$	
$ADAF_1$	=	3		
$ADAF_2$	=	1		

CLIENT: NSF INIDAN HEAD, INDIAN HEAD, MARYLAND		JOB NUMBER: 112G00771
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH SOIL FOR MUTAGENIC CHEMICALS HYPOTHETICAL ADULT RESIDENTS		
BASED ON: USEPA, JULY 2004, MARCH 2005		
BY: A.CHRISTIAN	CHECKED BY:	DATE: 9/4/2013

EXAMPLE CARCINOGENIC CALCULATION

$$DEXc = \frac{2.72\ mg/kg \times 1.0E\text{-}06\ kg/mg \times 5700\ cm2/day \times 0.07\ mg/cm2 \times 0.03 \times 350\ days/year \times 10\ years}{70\ kg \times 25550\ days} \times 3$$

DEXc = 1.91E-07 mg/kg/day

$$DEXc = \frac{2.72\ mg/kg \times 1.0E\text{-}06\ kg/mg \times 5700\ cm2/day \times 0.07\ mg/cm2 \times 0.03 \times 350\ days/year \times 14\ years}{70\ kg \times 25550\ days} \times 1$$

DEXc = 8.92E-08 mg/kg/day

ILCR = (1.91E-07 mg/kg/day + 8.92E-08 mg/kg/day) x 9.30E-03 (mg/kg/day)-1

ILCR = 2.6E-09

CLIENT: NSF INDIAN HEAD, INDIAN HEAD, MARYLAND		**JOB NUMBER:** 112G00771
SUBJECT: CALCULATION OF INTAKE/RISK FROM INHALATION OF FUGATIVE DUST EMISSIONS FOR MUTAGENIC CHEMICALS - HYPOTHETICAL ADULT RESIDENTS		
BASED ON: USEPA, DECEMBER 1989, MARCH 2005		
BY: A.CHRISTIAN	**CHECKED BY:**	**DATE:** 9/4/2013

PURPOSE: To estimate intake, carcinogenic risks for mutagenic chemicals from inhalation of surface soil.

EQUATION:

$$EC = \frac{Ca \times ET \times EF \times ED}{AT \times 24\ hours/day} \times ADAF$$

Where:

EC	=	estimated exposure intake (mg/kg/day)
Ca	=	exposure point concentration in air (mg/m3)
	=	Cs x (1/PEF + 1/VF)
Cs	=	exposure point concentration in soil (mg/kg)
VF	=	Volatilization Factor
PEF	=	particulate emission factor (m3/kg)
ET	=	exposure time (hrs/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
BW	=	body weight (kg)
AT	=	averaging time (hours)
ADAF	=	age-dependent adjustment factor
IURi	=	inhalation unit risk($(ug/mg)^{-1}$)

RISKS:

ILCR = Exposure concentration (mg/m3) x IUR (ug/m3)-1 x 1000 ug/mg

ASSUMPTIONS:

Cs	=	2.72	mg/kg	Chemical: Trichloroethene
PEF	=	3.23E+09	m3/kg	
VF	=	3.04E+03		
Ca	=	8.94E-04	mg/m3	
ET	=	24	hr/day	
EF	=	350	days/year	
ED_1	=	10	years	
ED_2	=	14	years	
ATc	=	25,550	days	
IUR	=	1.0E-06	$(ug/m3)^{-1}$	
$ADAF_1$	=	3		
$ADAF_2$	=	1		

CLIENT: NSF INDIAN HEAD, INDIAN HEAD, MARYLAND		**JOB NUMBER:** 112G00771
SUBJECT: CALCULATION OF INTAKE/RISK FROM INHALATION OF FUGATIVE DUST EMISSIONS FOR MUTAGENIC CHEMICALS - HYPOTHETICAL ADULT RESIDENTS		
BASED ON: USEPA, DECEMBER 1989, MARCH 2005		
BY: A.CHRISTIAN	**CHECKED BY:**	**DATE:** 9/4/2013

EXAMPLE CARCINOGENIC CALCULATION

$$EC = \frac{8.94E\text{-}04\ mg/m3 \times 24\ hr/day \times 350\ days/year \times 10\ years}{25550\ days \times 24\ hours/day} \times 3$$

EC = 3.67E-04 mg/m3

$$EC = \frac{8.94E\text{-}04\ mg/m3 \times 24\ hr/day \times 350\ days/year \times 14\ years}{25550\ days \times 24\ hours/day} \times 1$$

EC = 1.71E-04 mg/m3

ILCR = (3.67E-04 mg/m3 + 1.71E-04 mg/m3) x 1.00E-06 (ug/m3)-1 x 1000 ug/mg

ILCR = 5.4E-07

CLIENT: NSF INDIAN HEAD, INDIAN HEAD, MARYLAND		**JOB NUMBER:** 112G00771
SUBJECT: CALCULATION OF INTAKE/RISK FROM INGESTION OF GROUNDWATER FOR MUTAGENIC CHEMICALS - HYPOTHETICAL CHILD RESIDENTS		
BASED ON: USEPA, DECEMBER 1989, MARCH 2005		
BY: A.CHRISTIAN	**CHECKED BY:**	**DATE:** 9/4/2013

PURPOSE: To estimate intake, carcinogenic risks for mutagenic chemicals from ingestion of groundwater at Site 43.

EQUATION:

$$IEX = \frac{Cgw \times CF \times IF \times EF \times ED}{BW \times AT} \times ADAF$$

Where:

IEX	=	estimated exposure intake (mg/kg/day)
Cgw	=	exposure point concentration in groundwater (ug/L)
CF	=	conversion factor (1.0E-3 mg/ug)
IR	=	ingestion rate (L/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
BW	=	body weight (kg)
AT	=	averaging time (days)
ADAF	=	age-dependent adjustment factor
CSFo	=	oral carcinogenic slope factor ($(mg/kg/day)^{-1}$)

RISKS:

ILCR (Carcinogens) = Intake (mg/kg/day) x CSFo (mg/kg/day)-1

ASSUMPTIONS:

Cgw	=	1.5	ug/L	Chemical: Chromium VI
IR	=	1	L/day	
CF	=	1.0E-03	mg/ug	
EF	=	350	days/year	
ED_1	=	2	years	
ED_2	=	4	years	
BW	=	15	kg	
ATc	=	25550	days	
CSFo	=	5.0E-01	$(mg/kg/day)^{-1}$	
$ADAF_1$	=	10		
$ADAF_2$	=	3		

CLIENT: NSF INDIAN HEAD, INDIAN HEAD, MARYLAND		**JOB NUMBER:** 112G00771
SUBJECT: CALCULATION OF INTAKE/RISK FROM INGESTION OF GROUNDWATER FOR MUTAGENIC CHEMICALS - HYPOTHETICAL CHILD RESIDENTS		
BASED ON: USEPA, DECEMBER 1989, MARCH 2005		
BY: A.CHRISTIAN	**CHECKED BY:**	**DATE:** 9/4/2013

EXAMPLE CARCINOGENIC CALCULATION

$$IEXc = \frac{1.5\ ug/L \times 0.001\ mg/ug \times 1\ L/day \times 350\ days/year \times 2\ years}{15\ kg \times 25550\ days} \times 10$$

IEXc = 2.74E-05 mg/kg/day

$$IEXc = \frac{1.5\ ug/L \times 0.001\ mg/ug \times 1\ L/day \times 350\ days/year \times 4\ years}{15\ kg \times 25550\ days} \times 3$$

IEXc = 1.64E-05 mg/kg/day

ILCR = (2.74E-05 mg/kg/day + 1.64E-05 mg/kg/day) x 5.00E-01 (mg/kg/day)-1

ILCR = 2.2E-05

CALCULATION WORKSHEET

CLIENT: NSF INDIAN HEAD, INDIAN HEAD, MARYLAND		**JOB NUMBER:** 112G00771
SUBJECT: CALCULATION OF INTAKE/RISK FROM INGESTION OF GROUNDWATER FOR MUTAGENIC CHEMICALS - HYPOTHETICAL ADULT RESIDENT		
BASED ON: USEPA, DECEMBER 1989, MARCH 2005		
BY: A.CHRISTIAN	**CHECKED BY:**	**DATE:** 9/4/2013

PURPOSE: To estimate intake, carcinogenic risks for mutagenic chemicals from ingestion of groundwater at Site 43.

EQUATION:

$$IEX = \frac{Cgw \times CF \times IF \times EF \times ED}{BW \times AT} \times ADAF$$

Where:

IEX	=	estimated exposure intake (mg/kg/day)
Cgw	=	exposure point concentration in groundwater (ug/L)
CF	=	conversion factor (1.0E-3 mg/ug)
IR	=	ingestion rate (L/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
BW	=	body weight (kg)
AT	=	averaging time (days)
ADAF	=	age-dependent adjustment factor
CSFo	=	oral carcinogenic slope factor ($(mg/kg/day)^{-1}$)

RISKS:

ILCR (Carcinogens) = Intake (mg/kg/day) x CSFo (mg/kg/day)-1

ASSUMPTIONS:

Cgw	=	1.5	ug/L	Chemical: Chromium VI
IR	=	2	L/day	
CF	=	1.0E-03	mg/ug	
EF	=	350	days/year	
ED_1	=	10	years	
ED_2	=	14	years	
BW	=	70	kg	
ATc	=	25550	days	
CSFo	=	5.0E-01	$(mg/kg/day)^{-1}$	
$ADAF_1$	=	3		
$ADAF_2$	=	1		

CLIENT: NSF INDIAN HEAD, INDIAN HEAD, MARYLAND		**JOB NUMBER:** 112G00771
SUBJECT: CALCULATION OF INTAKE/RISK FROM INGESTION OF GROUNDWATER FOR MUTAGENIC CHEMICALS - HYPOTHETICAL ADULT RESIDENT		
BASED ON: USEPA, DECEMBER 1989, MARCH 2005		
BY: A.CHRISTIAN	**CHECKED BY:**	**DATE:** 9/4/2013

EXAMPLE CARCINOGENIC CALCULATION

$$IEXc = \frac{1.5\ ug/L \times 0.001\ mg/ug \times 2\ L/day \times 350\ days/year \times 10\ years}{70\ kg \times 25550\ days} \times 3$$

IEXc = 1.76E-05 mg/kg/day

$$IEXc = \frac{1.5\ ug/L \times 0.001\ mg/ug \times 2\ L/day \times 350\ days/year \times 14\ years}{70\ kg \times 25550\ days} \times 1$$

IEXc = 8.22E-06 mg/kg/day

ILCR = (1.76E-05 mg/kg/day + 8.22E-06 mg/kg/day) x 5.00E-01 (mg/kg/day)-1

ILCR = 1.3E-05

CALCULATION WORKSHEET

CLIENT: NSF INDIAN HEAD, INDIAN HEAD, MARYLAND		**JOB NUMBER:** 112G00771
SUBJECT: MUTAGENIC CALCULATION OF INTAKE/RISK FROM INGESTION OF GROUNDWATER FOR VINYL CHLORIDE CHILD RESIDENTS		
BASED ON: USEPA, DECEMBER 1989		
BY: A.CHRISTIAN	**CHECKED BY:**	**DATE:** 9/4/2013

PURPOSE: To estimate intake and carcinogenic risk for vinyl chloride from ingestion of groundwater.

EQUATION:

$$IEX = \frac{Cgw \times CF \times IR \times EF \times ED}{BW \times AT} + \frac{Cgw \times IR \times CF}{BW}$$

Where:

IEX	=	estimated exposure intake (mg/kg/day)
Cgw	=	exposure point concentration in groundwater (ug/L)
CF	=	conversion factor (1.0E-3 mg/ug)
IR	=	ingestion rate (L/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
BW	=	body weight (kg)
AT	=	averaging time (days)
CSFo	=	oral carcinogenic slope factor ($(mg/kg/day)^{-1}$)

RISKS:

ILCR (Carcinogens) = Intake (mg/kg/day) x CSFo (mg/kg/day)-1

CLIENT: NSF INDIAN HEAD, INDIAN HEAD, MARYLAND		**JOB NUMBER:** 112G00771
SUBJECT: MUTAGENIC CALCULATION OF INTAKE/RISK FROM INGESTION OF GROUNDWATER FOR VINYL CHLORIDE CHILD RESIDENTS		
BASED ON: USEPA, DECEMBER 1989		
BY: A.CHRISTIAN	**CHECKED BY:**	**DATE:** 9/4/2013

ASSUMPTIONS:

Cgw	=	8	ug/L
IR	=	1	L/day
CF	=	1.0E-03	mg/ug
EF	=	350	days/year
ED	=	6	years
BW	=	15	kg
ATc	=	25,550	days
ATnc	=	2,190	days
CSFo	=	7.2E-01	$(mg/kg/day)^{-1}$

EXAMPLE CARCINOGENIC CALCULATION

$$IEXc = \frac{8\ ug/L \times 0.001\ mg/ug \times 1\ L/day \times 350\ days/year \times 6\ years}{15\ kg \times 25550\ days} + \frac{8\ ug/L \times 1\ L/day \times 0.001\ mg/ug}{15\ kg}$$

IEXc = 5.77E-04 mg/kg/day

ILCR = 5.77E-04 mg/kg/day x 7.20E-01 (mg/kg/day)-1 = Incremental Lifetime Cancer Risk

ILCR = 4.2E-04

CLIENT: NSF INDIAN HEAD, INDIAN HEAD, MARYLAND		JOB NUMBER: 112G00771
SUBJECT: MUTAGENIC CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH GROUNDWATER FOR VINYL CHLORIDE CHILD RESIDENTS		
BASED ON: USEPA, JULY 2004, MARCH 2005.		
BY: A.CHRISTIAN	CHECKED BY:	DATE: 9/4/2013

PURPOSE: To estimate intake and carcinogenic risk for vinyl chloride from dermal contact with groundwater.

EQUATION:

$$DAD = \frac{DAevent \times EV \times ED \times EF \times SA}{BW \times AT} + \frac{DAevent \times SA \times EV}{BW}$$

Where:

DAD	=	dermally absorbed dose (mg/kg/day)
DAevent	=	absorbed dose per event (mg/cm^2/event)
EV	=	event frequency (events/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
SA	=	skin surface available for contact (cm^2)
BW	=	body weight (kg)
AT	=	averaging time (days)
CSFd	=	dermal carcinogenic slope factor ((mg/kg/day)$^{-1}$)

RISKS:

ILCR (Carcinogens) = DAD (mg/kg/day) x CSFd (mg/kg/day)-1

CLIENT: NSF INDIAN HEAD, INDIAN HEAD, MARYLAND		**JOB NUMBER:** 112G00771
SUBJECT: MUTAGENIC CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH GROUNDWATER FOR VINYL CHLORIDE CHILD RESIDENTS		
BASED ON: USEPA, JULY 2004, MARCH 2005.		
BY: A.CHRISTIAN	**CHECKED BY:**	**DATE:** 9/4/2013

EQUATIONS for DAevent:

For Inorganics:

DAevent = Kp x Cw x CF x tevent

For Organics:

$$\text{If tevent} \le t^*\text{, then: DAevent} = 2 \times FA \times Kp \times Cw \times CF \times \sqrt{\frac{6 \times tau \times tevent}{\pi}}$$

$$\text{If tevent} > t^*\text{, then: DAevent} = FA \times Kp \times Cw \times CF \times \left[\frac{tevent}{1+B} + 2 \times tau \times \left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

Where:

Kp	=	permeability coefficient from water (cm/hr)
FA	=	fraction absorbed water (dimensionless)
Cgw	=	concentration of chemical in groundwater (mg/L)
tevent	=	duration of event (hr/event)
CF	=	conversion factor (0.001 L/cm^3)
t*	=	time it takes to reach steady-state (hr/event)
τ	=	lag time (hr/event)
B	=	Bunge Model Constant (dimensionless)

CLIENT: NSF INDIAN HEAD, INDIAN HEAD, MARYLAND		JOB NUMBER: 112G00771
SUBJECT: MUTAGENIC CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH GROUNDWATER FOR VINYL CHLORIDE CHILD RESIDENTS		
BASED ON: USEPA, JULY 2004, MARCH 2005.		
BY: A.CHRISTIAN	CHECKED BY:	DATE: 9/4/2013

EXAMPLE CALCULATION OF DAevent

ASSUMPTIONS:

Cgw	=	0.008	mg/L
Kp	=	5.60E-03	cm/hr
FA	=	1	unitless
tevent	=	0.1	hr/event
CF	=	0.001	L/cm^3
t*	=	0.57	hr/event
τ	=	0.24	hr/event
B	=	0.017	

tevent < t*, therefore,

$$DAevent = (2 \times 0.0056\ cm/hr)\ (1)\ (0.008\ mg/L)\ (0.001\ L/cm3) \times \sqrt{\frac{6 \times 0.239\ hr/event \times 0.1\ hr/event}{\pi}}$$

DAevent = 1.91E-08 mg/cm^2-event

RISK CALCULATIONS

ASSUMPTIONS:

SA	=	6,600	cm^2
EV	=	1	event/day
ED	=	6	years
EF	=	350	days/year
BW	=	15	kg
ATc	=	25,550	days
CSFd	=	7.2E-01	$(mg/kg/day)^{-1}$

CLIENT: NSF INDIAN HEAD, INDIAN HEAD, MARYLAND		**JOB NUMBER:** 112G00771
SUBJECT: MUTAGENIC CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH GROUNDWATER FOR VINYL CHLORIDE CHILD RESIDENTS		
BASED ON: USEPA, JULY 2004, MARCH 2005.		
BY: A.CHRISTIAN	**CHECKED BY:**	**DATE:** 9/4/2013

EXAMPLE CARCINOGENIC CALCULATION

$$DADc = \frac{1.91E\text{-}08\ mg/cm2\text{-}event \times 1\ event/day \times 6\ years \times 350\ days/year \times 6600\ cm2}{15\ kg \times 25550\ days} + \frac{1.91E\text{-}08\ mg/cm2\text{-}event \times 6600\ cm2 \times 1\ event/day}{15\ kg}$$

DADc = 9.12E-06 mg/kg/day

DADc = 9.12E-06 mg/kg/day x 7.20E-01 (mg/kg/day)-1 = Incremental Lifetime Cancer Risk

ILCR = 6.6E-06

Q.9 PROUCL OUTPUTS

	General UCL Statistics for Full Data Sets
User Selected Options	
From File	Converted_Data.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

ALUMINUM

General Statistics			
Number of Valid Observations	8	Number of Distinct Observations	8
Raw Statistics		**Log-transformed Statistics**	
Minimum	4410	Minimum of Log Data	8.392
Maximum	20100	Maximum of Log Data	9.908
Mean	13943	Mean of log Data	9.444
Geometric Mean	12626	SD of log Data	0.528
Median	15850		
SD	5441		
Std. Error of Mean	1924		
Coefficient of Variation	0.39		
Skewness	-0.983		

Warning: There are only 8 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics			
Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.885	Shapiro Wilk Test Statistic	0.801
Shapiro Wilk Critical Value	0.818	Shapiro Wilk Critical Value	0.818
Data appear Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	17587	95% H-UCL	23443
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	25956
95% Adjusted-CLT UCL (Chen-1995)	16392	97.5% Chebyshev (MVUE) UCL	31025
95% Modified-t UCL (Johnson-1978)	17475	99% Chebyshev (MVUE) UCL	40982
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	3.335	Data appear Normal at 5% Significance Level	
Theta Star	4181		
MLE of Mean	13943		
MLE of Standard Deviation	7635		
nu star	53.35		
Approximate Chi Square Value (.05)	37.57	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0195	95% CLT UCL	17106
Adjusted Chi Square Value	34.25	95% Jackknife UCL	17587
		95% Standard Bootstrap UCL	16943
Anderson-Darling Test Statistic	0.726	95% Bootstrap-t UCL	16997
Anderson-Darling 5% Critical Value	0.719	95% Hall's Bootstrap UCL	16316
Kolmogorov-Smirnov Test Statistic	0.288	95% Percentile Bootstrap UCL	16814
Kolmogorov-Smirnov 5% Critical Value	0.295	95% BCA Bootstrap UCL	16513
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	22327
		97.5% Chebyshev(Mean, Sd) UCL	25955
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	33082
95% Approximate Gamma UCL (Use when n >= 40)	19798		
95% Adjusted Gamma UCL (Use when n < 40)	21718		
Potential UCL to Use		Use 95% Student's-t UCL	17587

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.
Note: For highly negative-skewed data, confidence limits
(e.g., Chen, Johnson, Lognormal, and Gamma) may not be
reliable. Chen's and Johnson's methods provide
adjustments for positvely skewed data sets.

CADMIUM

General Statistics			
Number of Valid Observations	8	Number of Distinct Observations	8
Raw Statistics		**Log-transformed Statistics**	
Minimum	0.072	Minimum of Log Data	-2.631
Maximum	12.2	Maximum of Log Data	2.501
Mean	1.998	Mean of log Data	-0.717
Geometric Mean	0.488	SD of log Data	1.757
Median	0.646		
SD	4.147		
Std. Error of Mean	1.466		
Coefficient of Variation	2.076		
Skewness	2.761		

Warning: There are only 8 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics			
Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.517	Shapiro Wilk Test Statistic	0.905
Shapiro Wilk Critical Value	0.818	Shapiro Wilk Critical Value	0.818
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	4.776	95% H-UCL	85.23
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	5.919
95% Adjusted-CLT UCL (Chen-1995)	5.939	97.5% Chebyshev (MVUE) UCL	7.782
95% Modified-t UCL (Johnson-1978)	5.015	99% Chebyshev (MVUE) UCL	11.44
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.369	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	5.415		
MLE of Mean	1.998		
MLE of Standard Deviation	3.289		
nu star	5.903		
Approximate Chi Square Value (.05)	1.591	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0195	95% CLT UCL	4.41
Adjusted Chi Square Value	1.092	95% Jackknife UCL	4.776
		95% Standard Bootstrap UCL	4.234
Anderson-Darling Test Statistic	0.707	95% Bootstrap-t UCL	19.93
Anderson-Darling 5% Critical Value	0.77	95% Hall's Bootstrap UCL	16.58
Kolmogorov-Smirnov Test Statistic	0.283	95% Percentile Bootstrap UCL	4.827
Kolmogorov-Smirnov 5% Critical Value	0.311	95% BCA Bootstrap UCL	6.402
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	8.389
		97.5% Chebyshev(Mean, Sd) UCL	11.15
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	16.59
95% Approximate Gamma UCL (Use when n >= 40)	7.415		
95% Adjusted Gamma UCL (Use when n < 40)	10.8		
Potential UCL to Use		Use 95% Adjusted Gamma UCL	10.8

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

CHROMIUM

General Statistics			
Number of Valid Observations	8	Number of Distinct Observations	8

Raw Statistics		Log-transformed Statistics	
Minimum	17.1	Minimum of Log Data	2.839
Maximum	37.5	Maximum of Log Data	3.624
Mean	23.07	Mean of log Data	3.103
Geometric Mean	22.26	SD of log Data	0.275
Median	19.7		
SD	7.146		
Std. Error of Mean	2.527		
Coefficient of Variation	0.31		
Skewness	1.525		

Warning: There are only 8 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.791	Shapiro Wilk Test Statistic	0.841
Shapiro Wilk Critical Value	0.818	Shapiro Wilk Critical Value	0.818
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	27.86	95% H-UCL	28.54
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	32.78
95% Adjusted-CLT UCL (Chen-1995)	28.68	97.5% Chebyshev (MVUE) UCL	37.02
95% Modified-t UCL (Johnson-1978)	28.08	99% Chebyshev (MVUE) UCL	45.33
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	8.91	Data appear Lognormal at 5% Significance Level	
Theta Star	2.589		
MLE of Mean	23.07		
MLE of Standard Deviation	7.729		
nu star	142.6		
Approximate Chi Square Value (.05)	116	Nonparametric Statistics	
Adjusted Level of Significance	0.0195	95% CLT UCL	27.22
Adjusted Chi Square Value	109.9	95% Jackknife UCL	27.86
		95% Standard Bootstrap UCL	27.06
Anderson-Darling Test Statistic	0.732	95% Bootstrap-t UCL	39.02
Anderson-Darling 5% Critical Value	0.715	95% Hall's Bootstrap UCL	49.21
Kolmogorov-Smirnov Test Statistic	0.299	95% Percentile Bootstrap UCL	27.25
Kolmogorov-Smirnov 5% Critical Value	0.294	95% BCA Bootstrap UCL	28.1
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	34.08
		97.5% Chebyshev(Mean, Sd) UCL	38.85
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	48.21
95% Approximate Gamma UCL (Use when n >= 40)	28.36		
95% Adjusted Gamma UCL (Use when n < 40)	29.92		
Potential UCL to Use		Use 95% Student's-t UCL	27.86
		or 95% Modified-t UCL	28.08
		or 95% H-UCL	28.54

ProUCL computes and outputs H-statistic based UCLs for historical reasons only.
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

	General UCL Statistics for Data Sets with Non-Detects
User Selected Options	
From File	Converted_Data.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

TRICHLOROETHENE

General Statistics			
Number of Valid Data	8	Number of Detected Data	3
Number of Distinct Detected Data	3	Number of Non-Detect Data	5
		Percent Non-Detects	62.50%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	1.91	Minimum Detected	0.647
Maximum Detected	2720	Maximum Detected	7.908
Mean of Detected	930.4	Mean of Detected	4.265
SD of Detected	1550	SD of Detected	3.631
Minimum Non-Detect	2.3	Minimum Non-Detect	0.833
Maximum Non-Detect	243	Maximum Non-Detect	5.493
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	7
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	1
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	87.50%

Warning: There are only 3 Distinct Detected Values in this data set
The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.
Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.
However, results obtained using 4 to 9 distinct values may not be reliable.
It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.769	Shapiro Wilk Test Statistic	1
5% Shapiro Wilk Critical Value	0.767	5% Shapiro Wilk Critical Value	0.767
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	366.6	Mean	2.787
SD	951.9	SD	2.706
95% DL/2 (t) UCL	1004	95% H-Stat (DL/2) UCL	2658100
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	1.941
		SD in Log Scale	2.744
		Mean in Original Scale	350
		SD in Original Scale	957.9
		95% t UCL	991.7
		95% Percentile Bootstrap UCL	1021
		95% BCA Bootstrap UCL	1361
		95% H-UCL	1582944

TRICHLOROETHENE (Continued)

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	N/A	Data appear Normal at 5% Significance Level	
Theta Star	N/A		
nu star	N/A		
A-D Test Statistic	N/A	Nonparametric Statistics	
5% A-D Critical Value	N/A	Kaplan-Meier (KM) Method	
K-S Test Statistic	N/A	Mean	351.5
5% K-S Critical Value	N/A	SD	895.5
Data not Gamma Distributed at 5% Significance Level		SE of Mean	387.8
		95% KM (t) UCL	1086
Assuming Gamma Distribution		95% KM (z) UCL	989.4
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	968.1
Minimum	N/A	95% KM (bootstrap t) UCL	11781
Maximum	N/A	95% KM (BCA) UCL	2720
Mean	N/A	95% KM (Percentile Bootstrap) UCL	2720
Median	N/A	95% KM (Chebyshev) UCL	2042
SD	N/A	97.5% KM (Chebyshev) UCL	2773
k star	N/A	99% KM (Chebyshev) UCL	4210
Theta star	N/A		
Nu star	N/A	Potential UCLs to Use	
AppChi2	N/A	95% KM (t) UCL	1086
95% Gamma Approximate UCL (Use when n >= 40)	N/A	95% KM (Percentile Bootstrap) UCL	2720
95% Adjusted Gamma UCL (Use when n < 40)	N/A		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

	General UCL Statistics for Full Data Sets
User Selected Options	
From File	Converted_Data.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

ARSENIC

General Statistics			
Number of Valid Observations	8	Number of Distinct Observations	8
Raw Statistics		**Log-transformed Statistics**	
Minimum	1.6	Minimum of Log Data	0.47
Maximum	12.3	Maximum of Log Data	2.51
Mean	4.236	Mean of log Data	1.229
Geometric Mean	3.417	SD of log Data	0.655
Median	3.085		
SD	3.488		
Std. Error of Mean	1.233		
Coefficient of Variation	0.823		
Skewness	2.169		

Warning: There are only 8 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics			
Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.739	Shapiro Wilk Test Statistic	0.936
Shapiro Wilk Critical Value	0.818	Shapiro Wilk Critical Value	0.818
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	6.573	95% H-UCL	8.144
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	8.314
95% Adjusted-CLT UCL (Chen-1995)	7.276	97.5% Chebyshev (MVUE) UCL	10.13
95% Modified-t UCL (Johnson-1978)	6.731	99% Chebyshev (MVUE) UCL	13.71
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	1.633	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	2.594		
MLE of Mean	4.236		
MLE of Standard Deviation	3.315		
nu star	26.13		
Approximate Chi Square Value (.05)	15.48	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0195	95% CLT UCL	6.265
Adjusted Chi Square Value	13.45	95% Jackknife UCL	6.573
		95% Standard Bootstrap UCL	6.128
Anderson-Darling Test Statistic	0.443	95% Bootstrap-t UCL	9.828
Anderson-Darling 5% Critical Value	0.723	95% Hall's Bootstrap UCL	14.4
Kolmogorov-Smirnov Test Statistic	0.174	95% Percentile Bootstrap UCL	6.331
Kolmogorov-Smirnov 5% Critical Value	0.297	95% BCA Bootstrap UCL	7.155
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	9.612
		97.5% Chebyshev(Mean, Sd) UCL	11.94
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	16.51
95% Approximate Gamma UCL (Use when n >= 40)	7.151		
95% Adjusted Gamma UCL (Use when n < 40)	8.23		
Potential UCL to Use		Use 95% Approximate Gamma UCL	7.151

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

COBALT

General Statistics			
Number of Valid Observations	8	Number of Distinct Observations	8
Raw Statistics		**Log-transformed Statistics**	
Minimum	2.94	Minimum of Log Data	1.078
Maximum	19.3	Maximum of Log Data	2.96
Mean	7.099	Mean of log Data	1.74
Geometric Mean	5.697	SD of log Data	0.666
Median	4.375		
SD	5.704		
Std. Error of Mean	2.017		
Coefficient of Variation	0.803		
Skewness	1.754		

Warning: There are only 8 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics			
Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.76	Shapiro Wilk Test Statistic	0.881
Shapiro Wilk Critical Value	0.818	Shapiro Wilk Critical Value	0.818
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	10.92	95% H-UCL	13.9
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	14.06
95% Adjusted-CLT UCL (Chen-1995)	11.75	97.5% Chebyshev (MVUE) UCL	17.17
95% Modified-t UCL (Johnson-1978)	11.13	99% Chebyshev (MVUE) UCL	23.26
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	1.6	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	4.437		
MLE of Mean	7.099		
MLE of Standard Deviation	5.613		
nu star	25.6		
Approximate Chi Square Value (.05)	15.07	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0195	95% CLT UCL	10.42
Adjusted Chi Square Value	13.07	95% Jackknife UCL	10.92
		95% Standard Bootstrap UCL	10.14
Anderson-Darling Test Statistic	0.627	95% Bootstrap-t UCL	19.48
Anderson-Darling 5% Critical Value	0.723	95% Hall's Bootstrap UCL	25.12
Kolmogorov-Smirnov Test Statistic	0.268	95% Percentile Bootstrap UCL	10.53
Kolmogorov-Smirnov 5% Critical Value	0.297	95% BCA Bootstrap UCL	11.47
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	15.89
		97.5% Chebyshev(Mean, Sd) UCL	19.69
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	27.16
95% Approximate Gamma UCL (Use when n >= 40)	12.06		
95% Adjusted Gamma UCL (Use when n < 40)	13.9		
Potential UCL to Use		Use 95% Approximate Gamma UCL	12.06

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

IRON

General Statistics			
Number of Valid Observations	8	Number of Distinct Observations	8

Raw Statistics		Log-transformed Statistics	
Minimum	12500	Minimum of Log Data	9.433
Maximum	29000	Maximum of Log Data	10.28
Mean	18613	Mean of log Data	9.785
Geometric Mean	17761	SD of log Data	0.325
Median	16950		
SD	6183		
Std. Error of Mean	2186		
Coefficient of Variation	0.332		
Skewness	0.626		

Warning: There are only 8 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.89	Shapiro Wilk Test Statistic	0.902
Shapiro Wilk Critical Value	0.818	Shapiro Wilk Critical Value	0.818
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	22754	95% H-UCL	24194
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	27941
95% Adjusted-CLT UCL (Chen-1995)	22725	97.5% Chebyshev (MVUE) UCL	31986
95% Modified-t UCL (Johnson-1978)	22834	99% Chebyshev (MVUE) UCL	39930
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	6.86	Data appear Normal at 5% Significance Level	
Theta Star	2713		
MLE of Mean	18613		
MLE of Standard Deviation	7106		
nu star	109.8		
Approximate Chi Square Value (.05)	86.57	Nonparametric Statistics	
Adjusted Level of Significance	0.0195	95% CLT UCL	22208
Adjusted Chi Square Value	81.37	95% Jackknife UCL	22754
		95% Standard Bootstrap UCL	21923
Anderson-Darling Test Statistic	0.425	95% Bootstrap-t UCL	23905
Anderson-Darling 5% Critical Value	0.715	95% Hall's Bootstrap UCL	22001
Kolmogorov-Smirnov Test Statistic	0.192	95% Percentile Bootstrap UCL	22250
Kolmogorov-Smirnov 5% Critical Value	0.294	95% BCA Bootstrap UCL	22338
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	28140
		97.5% Chebyshev(Mean, Sd) UCL	32263
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	40362
95% Approximate Gamma UCL (Use when n >= 40)	23596		
95% Adjusted Gamma UCL (Use when n < 40)	25104		
Potential UCL to Use		Use 95% Student's-t UCL	22754

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

MANGANESE

General Statistics			
Number of Valid Observations	8	Number of Distinct Observations	8
Raw Statistics		**Log-transformed Statistics**	
Minimum	14.7	Minimum of Log Data	2.688
Maximum	813	Maximum of Log Data	6.701
Mean	193.3	Mean of log Data	4.191
Geometric Mean	66.08	SD of log Data	1.582
Median	29.95		
SD	285.3		
Std. Error of Mean	100.9		
Coefficient of Variation	1.476		
Skewness	1.812		

Warning: There are only 8 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics			
Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.713	Shapiro Wilk Test Statistic	0.837
Shapiro Wilk Critical Value	0.818	Shapiro Wilk Critical Value	0.818
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	384.4	95% H-UCL	4498
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	610.9
95% Adjusted-CLT UCL (Chen-1995)	428.2	97.5% Chebyshev (MVUE) UCL	798.4
95% Modified-t UCL (Johnson-1978)	395.1	99% Chebyshev (MVUE) UCL	1167
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.445	Data appear Lognormal at 5% Significance Level	
Theta Star	434.1		
MLE of Mean	193.3		
MLE of Standard Deviation	289.7		
nu star	7.122		
Approximate Chi Square Value (.05)	2.238	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0195	95% CLT UCL	359.2
Adjusted Chi Square Value	1.61	95% Jackknife UCL	384.4
		95% Standard Bootstrap UCL	349.4
Anderson-Darling Test Statistic	0.784	95% Bootstrap-t UCL	759.7
Anderson-Darling 5% Critical Value	0.757	95% Hall's Bootstrap UCL	940.9
Kolmogorov-Smirnov Test Statistic	0.348	95% Percentile Bootstrap UCL	367.5
Kolmogorov-Smirnov 5% Critical Value	0.307	95% BCA Bootstrap UCL	439.1
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	633
		97.5% Chebyshev(Mean, Sd) UCL	823.2
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1197
95% Approximate Gamma UCL (Use when n >= 40)	615		
95% Adjusted Gamma UCL (Use when n < 40)	854.6		
Potential UCL to Use		Use 99% Chebyshev (Mean, Sd) UCL	1197

Recommended UCL exceeds the maximum observation

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

VANADIUM

General Statistics			
Number of Valid Observations	8	Number of Distinct Observations	8
Raw Statistics		**Log-transformed Statistics**	
Minimum	29.5	Minimum of Log Data	3.384
Maximum	44.6	Maximum of Log Data	3.798
Mean	35.26	Mean of log Data	3.555
Geometric Mean	35	SD of log Data	0.129
Median	33.75		
SD	4.764		
Std. Error of Mean	1.684		
Coefficient of Variation	0.135		
Skewness	1.128		

Warning: There are only 8 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics			
Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.91	Shapiro Wilk Test Statistic	0.937
Shapiro Wilk Critical Value	0.818	Shapiro Wilk Critical Value	0.818
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	38.45	95% H-UCL	38.68
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	42.29
95% Adjusted-CLT UCL (Chen-1995)	38.75	97.5% Chebyshev (MVUE) UCL	45.34
95% Modified-t UCL (Johnson-1978)	38.57	99% Chebyshev (MVUE) UCL	51.32
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	41.65	Data appear Normal at 5% Significance Level	
Theta Star	0.847		
MLE of Mean	35.26		
MLE of Standard Deviation	5.464		
nu star	666.4		
Approximate Chi Square Value (.05)	607.5	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0195	95% CLT UCL	38.03
Adjusted Chi Square Value	593.2	95% Jackknife UCL	38.45
		95% Standard Bootstrap UCL	37.84
Anderson-Darling Test Statistic	0.364	95% Bootstrap-t UCL	40.95
Anderson-Darling 5% Critical Value	0.715	95% Hall's Bootstrap UCL	55.18
Kolmogorov-Smirnov Test Statistic	0.198	95% Percentile Bootstrap UCL	38.04
Kolmogorov-Smirnov 5% Critical Value	0.293	95% BCA Bootstrap UCL	38.64
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	42.6
		97.5% Chebyshev(Mean, Sd) UCL	45.78
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	52.02
95% Approximate Gamma UCL (Use when n >= 40)	38.68		
95% Adjusted Gamma UCL (Use when n < 40)	39.61		
Potential UCL to Use		Use 95% Student's-t UCL	38.45

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

PROUCL OUTPUT - SUBSURFACE SOIL

	General UCL Statistics for Full Data Sets
User Selected Options	
From File	Converted_Data.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

MANGANESE

General Statistics			
Number of Valid Observations	19	Number of Distinct Observations	18
Raw Statistics		**Log-transformed Statistics**	
Minimum	9.75	Minimum of Log Data	2.277
Maximum	227	Maximum of Log Data	5.425
Mean	38.26	Mean of log Data	3.161
Geometric Mean	23.6	SD of log Data	0.852
Median	18.3		
SD	54.03		
Std. Error of Mean	12.39		
Coefficient of Variation	1.412		
Skewness	2.85		

Relevant UCL Statistics			
Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.535	Shapiro Wilk Test Statistic	0.785
Shapiro Wilk Critical Value	0.901	Shapiro Wilk Critical Value	0.901
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	59.75	95% H-UCL	54.99
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	63.79
95% Adjusted-CLT UCL (Chen-1995)	67.31	97.5% Chebyshev (MVUE) UCL	77.07
95% Modified-t UCL (Johnson-1978)	61.1	99% Chebyshev (MVUE) UCL	103.2
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	1.023	Data do not follow a Discernable Distribution (0.05)	
Theta Star	37.4		
MLE of Mean	38.26		
MLE of Standard Deviation	37.83		
nu star	38.87		
Approximate Chi Square Value (.05)	25.59	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0369	95% CLT UCL	58.65
Adjusted Chi Square Value	24.65	95% Jackknife UCL	59.75
		95% Standard Bootstrap UCL	58.3
Anderson-Darling Test Statistic	2.582	95% Bootstrap-t UCL	81.72
Anderson-Darling 5% Critical Value	0.765	95% Hall's Bootstrap UCL	62.85
Kolmogorov-Smirnov Test Statistic	0.341	95% Percentile Bootstrap UCL	60.57
Kolmogorov-Smirnov 5% Critical Value	0.204	95% BCA Bootstrap UCL	67.45
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	92.29
		97.5% Chebyshev(Mean, Sd) UCL	115.7
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	161.6
95% Approximate Gamma UCL (Use when n >= 40)	58.12		
95% Adjusted Gamma UCL (Use when n < 40)	60.33		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	92.29

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

PROUCL OUTPUT - SUBSURFACE SOIL

	General UCL Statistics for Data Sets with Non-Detects
User Selected Options	
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Trichloroethene

General Statistics			
Number of Valid Data	20	Number of Detected Data	8
Number of Distinct Detected Data	8	Number of Non-Detect Data	12
Number of Missing Values	5	Percent Non-Detects	60.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	8	Minimum Detected	2.079
Maximum Detected	4790	Maximum Detected	8.474
Mean of Detected	1926	Mean of Detected	6.751
SD of Detected	1698	SD of Detected	2.045
Minimum Non-Detect	2.26	Minimum Non-Detect	0.815
Maximum Non-Detect	2510	Maximum Non-Detect	7.828
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	18
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	2
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	90.00%

Warning: There are only 8 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set

the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.921	Shapiro Wilk Test Statistic	0.776
5% Shapiro Wilk Critical Value	0.818	5% Shapiro Wilk Critical Value	0.818
Data appear Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	837.1	Mean	3.451
SD	1403	SD	3.463
95% DL/2 (t) UCL	1380	95% H-Stat (DL/2) UCL	3408281
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	4.187
		SD in Log Scale	2.497
		Mean in Original Scale	778
		SD in Original Scale	1409
		95% t UCL	1323
		95% Percentile Bootstrap UCL	1312
		95% BCA Bootstrap UCL	1428
		95% H-UCL	29534

Trichloroethene (Continued)

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.545	Data appear Normal at 5% Significance Level	
Theta Star	3533		
nu star	8.72		
A-D Test Statistic	0.338	Nonparametric Statistics	
5% A-D Critical Value	0.746	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.746	Mean	794.5
5% K-S Critical Value	0.304	SD	1377
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	331.4
		95% KM (t) UCL	1368
Assuming Gamma Distribution		95% KM (z) UCL	1340
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	1292
Minimum	0.000001	95% KM (bootstrap t) UCL	1497
Maximum	4790	95% KM (BCA) UCL	1920
Mean	770.2	95% KM (Percentile Bootstrap) UCL	1605
Median	0.000001	95% KM (Chebyshev) UCL	2239
SD	1414	97.5% KM (Chebyshev) UCL	2864
k star	0.0922	99% KM (Chebyshev) UCL	4092
Theta star	8353		
Nu star	3.688	Potential UCLs to Use	
AppChi2	0.603	95% KM (t) UCL	1368
95% Gamma Approximate UCL	4714	95% KM (Percentile Bootstrap) UCL	1605
95% Adjusted Gamma UCL	5503		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

	General UCL Statistics for Full Data Sets
User Selected Options	
From File	Converted_Data.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

ALUMINUM

General Statistics			
Number of Valid Observations	19	Number of Distinct Observations	19
Number of Missing Values	6		

Raw Statistics		Log-transformed Statistics	
Minimum	2180	Minimum of Log Data	7.687
Maximum	12300	Maximum of Log Data	9.417
Mean	7854	Mean of log Data	8.888
Geometric Mean	7246	SD of log Data	0.454
Median	8390		
SD	2747		
Std. Error of Mean	630.1		
Coefficient of Variation	0.35		
Skewness	-0.571		

Relevant UCL Statistics			
Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.957	Shapiro Wilk Test Statistic	0.852
Shapiro Wilk Critical Value	0.901	Shapiro Wilk Critical Value	0.901
Data appear Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	8947	95% H-UCL	9915
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	11720
95% Adjusted-CLT UCL (Chen-1995)	8802	97.5% Chebyshev (MVUE) UCL	13335
95% Modified-t UCL (Johnson-1978)	8933	99% Chebyshev (MVUE) UCL	16509
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	5.397	Data appear Normal at 5% Significance Level	
Theta Star	1455		
MLE of Mean	7854		
MLE of Standard Deviation	3381		
nu star	205.1		
Approximate Chi Square Value (.05)	172.9	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0369	95% CLT UCL	8891
Adjusted Chi Square Value	170.4	95% Jackknife UCL	8947
		95% Standard Bootstrap UCL	8852
Anderson-Darling Test Statistic	0.794	95% Bootstrap-t UCL	8854
Anderson-Darling 5% Critical Value	0.742	95% Hall's Bootstrap UCL	8823
Kolmogorov-Smirnov Test Statistic	0.2	95% Percentile Bootstrap UCL	8827
Kolmogorov-Smirnov 5% Critical Value	0.199	95% BCA Bootstrap UCL	8785
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	10601
		97.5% Chebyshev(Mean, Sd) UCL	11789
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	14124
95% Approximate Gamma UCL (Use when n >= 40)	9314		
95% Adjusted Gamma UCL (Use when n < 40)	9455		
Potential UCL to Use		Use 95% Student's-t UCL	8947

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Note: For highly negative-skewed data, confidence limits
(e.g., Chen, Johnson, Lognormal, and Gamma) may not be
reliable. Chen's and Johnson's methods provide
adjustments for positvely skewed data sets.

ARSENIC

General Statistics			
Number of Valid Observations	19	Number of Distinct Observations	19
Number of Missing Values	6		

Raw Statistics		Log-transformed Statistics	
Minimum	0.834	Minimum of Log Data	-0.182
Maximum	3.75	Maximum of Log Data	1.322
Mean	2.018	Mean of log Data	0.6
Geometric Mean	1.821	SD of log Data	0.476
Median	1.88		
SD	0.908		
Std. Error of Mean	0.208		
Coefficient of Variation	0.45		
Skewness	0.422		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.941	Shapiro Wilk Test Statistic	0.95
Shapiro Wilk Critical Value	0.901	Shapiro Wilk Critical Value	0.901
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	2.38	95% H-UCL	2.55
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	3.024
95% Adjusted-CLT UCL (Chen-1995)	2.383	97.5% Chebyshev (MVUE) UCL	3.455
95% Modified-t UCL (Johnson-1978)	2.383	99% Chebyshev (MVUE) UCL	4.302
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	4.272	Data appear Normal at 5% Significance Level	
Theta Star	0.472		
MLE of Mean	2.018		
MLE of Standard Deviation	0.977		
nu star	162.3		
Approximate Chi Square Value (.05)	133.9	Nonparametric Statistics	
Adjusted Level of Significance	0.0369	95% CLT UCL	2.361
Adjusted Chi Square Value	131.6	95% Jackknife UCL	2.38
		95% Standard Bootstrap UCL	2.364
Anderson-Darling Test Statistic	0.302	95% Bootstrap-t UCL	2.401
Anderson-Darling 5% Critical Value	0.742	95% Hall's Bootstrap UCL	2.393
Kolmogorov-Smirnov Test Statistic	0.108	95% Percentile Bootstrap UCL	2.375
Kolmogorov-Smirnov 5% Critical Value	0.199	95% BCA Bootstrap UCL	2.35
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	2.926
		97.5% Chebyshev(Mean, Sd) UCL	3.319
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	4.091
95% Approximate Gamma UCL (Use when n >= 40)	2.447		
95% Adjusted Gamma UCL (Use when n < 40)	2.489		
Potential UCL to Use		Use 95% Student's-t UCL	2.38

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

CHROMIUM

General Statistics			
Number of Valid Observations	19	Number of Distinct Observations	18
Number of Missing Values	6		

Raw Statistics		Log-transformed Statistics	
Minimum	8.03	Minimum of Log Data	2.083
Maximum	18.5	Maximum of Log Data	2.918
Mean	14.27	Mean of log Data	2.637
Geometric Mean	13.97	SD of log Data	0.219
Median	14.2		
SD	2.889		
Std. Error of Mean	0.663		
Coefficient of Variation	0.202		
Skewness	-0.338		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.968	Shapiro Wilk Test Statistic	0.937
Shapiro Wilk Critical Value	0.901	Shapiro Wilk Critical Value	0.901
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	15.42	95% H-UCL	15.7
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	17.44
95% Adjusted-CLT UCL (Chen-1995)	15.31	97.5% Chebyshev (MVUE) UCL	18.81
95% Modified-t UCL (Johnson-1978)	15.41	99% Chebyshev (MVUE) UCL	21.49
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	19.83	Data appear Normal at 5% Significance Level	
Theta Star	0.72		
MLE of Mean	14.27		
MLE of Standard Deviation	3.205		
nu star	753.4		
Approximate Chi Square Value (.05)	690.7	Nonparametric Statistics	
Adjusted Level of Significance	0.0369	95% CLT UCL	15.36
Adjusted Chi Square Value	685.5	95% Jackknife UCL	15.42
		95% Standard Bootstrap UCL	15.33
Anderson-Darling Test Statistic	0.284	95% Bootstrap-t UCL	15.35
Anderson-Darling 5% Critical Value	0.74	95% Hall's Bootstrap UCL	15.35
Kolmogorov-Smirnov Test Statistic	0.104	95% Percentile Bootstrap UCL	15.32
Kolmogorov-Smirnov 5% Critical Value	0.198	95% BCA Bootstrap UCL	15.32
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	17.16
		97.5% Chebyshev(Mean, Sd) UCL	18.41
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	20.87
95% Approximate Gamma UCL (Use when n >= 40)	15.57		
95% Adjusted Gamma UCL (Use when n < 40)	15.69		
Potential UCL to Use		Use 95% Student's-t UCL	15.42

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Note: For highly negative-skewed data, confidence limits
(e.g., Chen, Johnson, Lognormal, and Gamma) may not be
reliable. Chen's and Johnson's methods provide
adjustments for positvely skewed data sets.

COBALT

General Statistics			
Number of Valid Observations	19	Number of Distinct Observations	18
Number of Missing Values	6		

Raw Statistics		Log-transformed Statistics	
Minimum	1.47	Minimum of Log Data	0.385
Maximum	6.28	Maximum of Log Data	1.837
Mean	4.391	Mean of log Data	1.434
Geometric Mean	4.197	SD of log Data	0.337
Median	4.38		
SD	1.179		
Std. Error of Mean	0.271		
Coefficient of Variation	0.269		
Skewness	-0.746		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.962	Shapiro Wilk Test Statistic	0.845
Shapiro Wilk Critical Value	0.901	Shapiro Wilk Critical Value	0.901
Data appear Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	4.861	95% H-UCL	5.154
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	5.946
95% Adjusted-CLT UCL (Chen-1995)	4.787	97.5% Chebyshev (MVUE) UCL	6.603
95% Modified-t UCL (Johnson-1978)	4.853	99% Chebyshev (MVUE) UCL	7.893
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	9.46	Data appear Normal at 5% Significance Level	
Theta Star	0.464		
MLE of Mean	4.391		
MLE of Standard Deviation	1.428		
nu star	359.5		
Approximate Chi Square Value (.05)	316.5	Nonparametric Statistics	
Adjusted Level of Significance	0.0369	95% CLT UCL	4.836
Adjusted Chi Square Value	313	95% Jackknife UCL	4.861
		95% Standard Bootstrap UCL	4.828
Anderson-Darling Test Statistic	0.594	95% Bootstrap-t UCL	4.81
Anderson-Darling 5% Critical Value	0.741	95% Hall's Bootstrap UCL	4.794
Kolmogorov-Smirnov Test Statistic	0.156	95% Percentile Bootstrap UCL	4.823
Kolmogorov-Smirnov 5% Critical Value	0.199	95% BCA Bootstrap UCL	4.772
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	5.571
		97.5% Chebyshev(Mean, Sd) UCL	6.081
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	7.084
95% Approximate Gamma UCL (Use when n >= 40)	4.987		
95% Adjusted Gamma UCL (Use when n < 40)	5.043		
Potential UCL to Use		Use 95% Student's-t UCL	4.861

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Note: For highly negative-skewed data, confidence limits
(e.g., Chen, Johnson, Lognormal, and Gamma) may not be
reliable. Chen's and Johnson's methods provide
adjustments for positvely skewed data sets.

IRON

General Statistics			
Number of Valid Observations	19	Number of Distinct Observations	19
Number of Missing Values	6		

Raw Statistics		Log-transformed Statistics	
Minimum	4010	Minimum of Log Data	8.297
Maximum	18700	Maximum of Log Data	9.836
Mean	11607	Mean of log Data	9.309
Geometric Mean	11039	SD of log Data	0.344
Median	10600		
SD	3511		
Std. Error of Mean	805.5		
Coefficient of Variation	0.303		
Skewness	0.0978		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.968	Shapiro Wilk Test Statistic	0.905
Shapiro Wilk Critical Value	0.901	Shapiro Wilk Critical Value	0.901
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	13004	95% H-UCL	13637
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	15760
95% Adjusted-CLT UCL (Chen-1995)	12951	97.5% Chebyshev (MVUE) UCL	17527
95% Modified-t UCL (Johnson-1978)	13007	99% Chebyshev (MVUE) UCL	21000
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	8.57	Data appear Normal at 5% Significance Level	
Theta Star	1354		
MLE of Mean	11607		
MLE of Standard Deviation	3965		
nu star	325.6		
Approximate Chi Square Value (.05)	284.8	Nonparametric Statistics	
Adjusted Level of Significance	0.0369	95% CLT UCL	12932
Adjusted Chi Square Value	281.5	95% Jackknife UCL	13004
		95% Standard Bootstrap UCL	12917
Anderson-Darling Test Statistic	0.368	95% Bootstrap-t UCL	13055
Anderson-Darling 5% Critical Value	0.741	95% Hall's Bootstrap UCL	13048
Kolmogorov-Smirnov Test Statistic	0.13	95% Percentile Bootstrap UCL	12890
Kolmogorov-Smirnov 5% Critical Value	0.199	95% BCA Bootstrap UCL	12932
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	15118
		97.5% Chebyshev(Mean, Sd) UCL	16638
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	19622
95% Approximate Gamma UCL (Use when n >= 40)	13270		
95% Adjusted Gamma UCL (Use when n < 40)	13427		
Potential UCL to Use		Use 95% Student's-t UCL	13004

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

	General UCL Statistics for Full Data Sets
User Selected Options	
From File	Converted_Data.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

MANGANESE

General Statistics			
Number of Valid Observations	61	Number of Distinct Observations	60
Number of Missing Values	5		

Raw Statistics		Log-transformed Statistics	
Minimum	32.7	Minimum of Log Data	3.487
Maximum	2060	Maximum of Log Data	7.63
Mean	405.3	Mean of log Data	5.693
Geometric Mean	296.6	SD of log Data	0.861
Median	352		
SD	331.5		
Std. Error of Mean	42.44		
Coefficient of Variation	0.818		
Skewness	2.44		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.166	Lilliefors Test Statistic	0.107
Lilliefors Critical Value	0.113	Lilliefors Critical Value	0.113
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	476.2	95% H-UCL	545.3
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	660.2
95% Adjusted-CLT UCL (Chen-1995)	489.3	97.5% Chebyshev (MVUE) UCL	761.5
95% Modified-t UCL (Johnson-1978)	478.4	99% Chebyshev (MVUE) UCL	960.4
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.675	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	241.9		
MLE of Mean	405.3		
MLE of Standard Deviation	313.1		
nu star	204.4		
Approximate Chi Square Value (.05)	172.3	Nonparametric Statistics	
Adjusted Level of Significance	0.0461	95% CLT UCL	475.1
Adjusted Chi Square Value	171.6	95% Jackknife UCL	476.2
		95% Standard Bootstrap UCL	474.8
Anderson-Darling Test Statistic	0.423	95% Bootstrap-t UCL	501.2
Anderson-Darling 5% Critical Value	0.766	95% Hall's Bootstrap UCL	519.3
Kolmogorov-Smirnov Test Statistic	0.0849	95% Percentile Bootstrap UCL	470.2
Kolmogorov-Smirnov 5% Critical Value	0.116	95% BCA Bootstrap UCL	487.7
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	590.3
		97.5% Chebyshev(Mean, Sd) UCL	670.3
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	827.6
95% Approximate Gamma UCL (Use when n >= 40)	480.7		
95% Adjusted Gamma UCL (Use when n < 40)	482.7		
Potential UCL to Use		Use 95% Approximate Gamma UCL	480.7

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

	General UCL Statistics for Data Sets with Non-Detects
User Selected Options	
From File	Converted_Data.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

1,3-DINITROBENZENE

General Statistics			
Number of Valid Data	24	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	22
Number of Missing Values	33	Percent Non-Detects	91.67%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.186	Minimum Detected	-1.682
Maximum Detected	0.212	Maximum Detected	-1.551
Mean of Detected	0.199	Mean of Detected	-1.617
SD of Detected	0.0184	SD of Detected	0.0925
Minimum Non-Detect	0.151	Minimum Non-Detect	-1.89
Maximum Non-Detect	0.168	Maximum Non-Detect	-1.784
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	22
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	2
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	91.67%

Warning: Data set has only 2 Distinct Detected Values.
This may not be adequate enough to compute meaningful and reliable test statistics and estimates.
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.
Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.
However, results obtained using 4 to 9 distinct values may not be reliable.
It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	N/A	Shapiro Wilk Test Statistic	N/A
5% Shapiro Wilk Critical Value	N/A	5% Shapiro Wilk Critical Value	N/A
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.0904	Mean	-2.445
SD	0.0338	SD	0.259
95% DL/2 (t) UCL	0.102	95% H-Stat (DL/2) UCL	0.0988
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	N/A
		SD in Log Scale	N/A
		Mean in Original Scale	N/A
		SD in Original Scale	N/A
		95% t UCL	N/A
		95% Percentile Bootstrap UCL	N/A
		95% BCA Bootstrap UCL	N/A
		95% H-UCL	N/A

1,3-DINITROBENZENE

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	N/A	Data do not follow a Discernable Distribution (0.05)	
Theta Star	N/A		
nu star	N/A		
A-D Test Statistic	N/A	Nonparametric Statistics	
5% A-D Critical Value	N/A	Kaplan-Meier (KM) Method	
K-S Test Statistic	N/A	Mean	0.187
5% K-S Critical Value	N/A	SD	0.0052
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.0015
		95% KM (t) UCL	0.19
Assuming Gamma Distribution		95% KM (z) UCL	0.19
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.204
Minimum	N/A	95% KM (bootstrap t) UCL	N/A
Maximum	N/A	95% KM (BCA) UCL	N/A
Mean	N/A	95% KM (Percentile Bootstrap) UCL	N/A
Median	N/A	95% KM (Chebyshev) UCL	0.194
SD	N/A	97.5% KM (Chebyshev) UCL	0.196
k star	N/A	99% KM (Chebyshev) UCL	0.202
Theta star	N/A		
Nu star	N/A	Potential UCLs to Use	
AppChi2	N/A	95% KM (t) UCL	0.19
95% Gamma Approximate UCL (Use when n >= 40)	N/A	95% KM (% Bootstrap) UCL	N/A
95% Adjusted Gamma UCL (Use when n < 40)	N/A		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

2,6-DINITROTOLUENE

General Statistics			
Number of Valid Data	24	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	22
Number of Missing Values	33	Percent Non-Detects	91.67%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.269	Minimum Detected	-1.313
Maximum Detected	0.504	Maximum Detected	-0.685
Mean of Detected	0.387	Mean of Detected	-0.999
SD of Detected	0.166	SD of Detected	0.444
Minimum Non-Detect	0.151	Minimum Non-Detect	-1.89
Maximum Non-Detect	0.178	Maximum Non-Detect	-1.726
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	22
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	2
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	91.67%

Warning: Data set has only 2 Distinct Detected Values.
This may not be adequate enough to compute meaningful and reliable test statistics and estimates.
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.
Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.
However, results obtained using 4 to 9 distinct values may not be reliable.
It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	N/A	Shapiro Wilk Test Statistic	N/A
5% Shapiro Wilk Critical Value	N/A	5% Shapiro Wilk Critical Value	N/A
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.106	Mean	-2.391
SD	0.0931	SD	0.441
95% DL/2 (t) UCL	0.139	95% H-Stat (DL/2) UCL	0.12
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	N/A
		SD in Log Scale	N/A
		Mean in Original Scale	N/A
		SD in Original Scale	N/A
		95% t UCL	N/A
		95% Percentile Bootstrap UCL	N/A
		95% BCA Bootstrap UCL	N/A
		95% H-UCL	N/A

2,6-DINITROTOLUENE (Continued)

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	N/A	Data do not follow a Discernable Distribution (0.05)	
Theta Star	N/A		
nu star	N/A		
A-D Test Statistic	N/A	Nonparametric Statistics	
5% A-D Critical Value	N/A	Kaplan-Meier (KM) Method	
K-S Test Statistic	N/A	Mean	0.279
5% K-S Critical Value	N/A	SD	0.047
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.0136
		95% KM (t) UCL	0.302
Assuming Gamma Distribution		95% KM (z) UCL	0.301
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.434
Minimum	N/A	95% KM (bootstrap t) UCL	0.279
Maximum	N/A	95% KM (BCA) UCL	0.504
Mean	N/A	95% KM (Percentile Bootstrap) UCL	N/A
Median	N/A	95% KM (Chebyshev) UCL	0.338
SD	N/A	97.5% KM (Chebyshev) UCL	0.363
k star	N/A	99% KM (Chebyshev) UCL	0.414
Theta star	N/A		
Nu star	N/A	Potential UCLs to Use	
AppChi2	N/A	95% KM (t) UCL	0.302
95% Gamma Approximate UCL (Use when n >= 40)	N/A	95% KM (% Bootstrap) UCL	N/A
95% Adjusted Gamma UCL (Use when n < 40)	N/A		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

3-NITROTOLUENE

General Statistics			
Number of Valid Data	24	Number of Detected Data	14
Number of Distinct Detected Data	14	Number of Non-Detect Data	10
Number of Missing Values	33	Percent Non-Detects	41.67%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.107	Minimum Detected	-2.235
Maximum Detected	0.871	Maximum Detected	-0.138
Mean of Detected	0.404	Mean of Detected	-1.036
SD of Detected	0.201	SD of Detected	0.558
Minimum Non-Detect	0.151	Minimum Non-Detect	-1.89
Maximum Non-Detect	0.168	Maximum Non-Detect	-1.784
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	12
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	12
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	50.00%

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.96	Shapiro Wilk Test Statistic	0.96
5% Shapiro Wilk Critical Value	0.874	5% Shapiro Wilk Critical Value	0.874
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.27	Mean	-1.648
SD	0.222	SD	0.85
95% DL/2 (t) UCL	0.347	95% H-Stat (DL/2) UCL	0.419
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.183	Mean in Log Scale	-1.466
SD	0.323	SD in Log Scale	0.694
95% MLE (t) UCL	0.296	Mean in Original Scale	0.29
95% MLE (Tiku) UCL	0.322	SD in Original Scale	0.205
		95% t UCL	0.362
		95% Percentile Bootstrap UCL	0.358
		95% BCA Bootstrap UCL	0.364
		95% H UCL	0.402
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	3.221	Data appear Normal at 5% Significance Level	
Theta Star	0.125		
nu star	90.18		
A-D Test Statistic	0.178	Nonparametric Statistics	
5% A-D Critical Value	0.74	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.74	Mean	0.286
5% K-S Critical Value	0.23	SD	0.204
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.0435
		95% KM (t) UCL	0.36
Assuming Gamma Distribution		95% KM (z) UCL	0.357
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.356
Minimum	0.000001	95% KM (bootstrap t) UCL	0.372
Maximum	0.871	95% KM (BCA) UCL	0.398
Mean	0.264	95% KM (Percentile Bootstrap) UCL	0.378
Median	0.227	95% KM (Chebyshev) UCL	0.475
SD	0.233	97.5% KM (Chebyshev) UCL	0.557
k star	0.295	99% KM (Chebyshev) UCL	0.719
Theta star	0.892		
Nu star	14.18	Potential UCLs to Use	
AppChi2	6.692	95% KM (t) UCL	0.36
95% Gamma Approximate UCL (Use when n >= 40)	0.558	95% KM (Percentile Bootstrap) UCL	0.378
95% Adjusted Gamma UCL (Use when n < 40)	0.59		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

ARSENIC

General Statistics			
Number of Valid Data	61	Number of Detected Data	25
Number of Distinct Detected Data	25	Number of Non-Detect Data	36
Number of Missing Values	5	Percent Non-Detects	59.02%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	1.02	Minimum Detected	0.0198
Maximum Detected	12.2	Maximum Detected	2.501
Mean of Detected	3.917	Mean of Detected	1.093
SD of Detected	3.124	SD of Detected	0.745
Minimum Non-Detect	1.5	Minimum Non-Detect	0.405
Maximum Non-Detect	1.5	Maximum Non-Detect	0.405

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.807	Shapiro Wilk Test Statistic	0.932
5% Shapiro Wilk Critical Value	0.918	5% Shapiro Wilk Critical Value	0.918
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	2.048	Mean	0.278
SD	2.524	SD	0.831
95% DL/2 (t) UCL	2.588	95% H-Stat (DL/2) UCL	2.34
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	0.437
		SD in Log Scale	0.84
		Mean in Original Scale	2.267
		SD in Original Scale	2.448
		95% t UCL	2.791
		95% Percentile Bootstrap UCL	2.819
		95% BCA Bootstrap UCL	2.894
		95% H-UCL	2.774
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	1.774	Data appear Lognormal at 5% Significance Level	
Theta Star	2.208		
nu star	88.68		
A-D Test Statistic	0.809	Nonparametric Statistics	
5% A-D Critical Value	0.757	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.757	Mean	2.315
5% K-S Critical Value	0.177	SD	2.372
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.312
		95% KM (t) UCL	2.836
Assuming Gamma Distribution		95% KM (z) UCL	2.828
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	2.831
Minimum	0.000001	95% KM (bootstrap t) UCL	3.009
Maximum	12.2	95% KM (BCA) UCL	2.819
Mean	2.272	95% KM (Percentile Bootstrap) UCL	2.817
Median	1.64	95% KM (Chebyshev) UCL	3.673
SD	2.585	97.5% KM (Chebyshev) UCL	4.261
k star	0.213	99% KM (Chebyshev) UCL	5.416
Theta star	10.66		
Nu star	26.01	Potential UCLs to Use	
AppChi2	15.39	95% KM (t) UCL	2.836
95% Gamma Approximate UCL (Use when n >= 40)	3.841	95% KM (% Bootstrap) UCL	2.817
95% Adjusted Gamma UCL (Use when n < 40)	3.891		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

BARIUM

General Statistics			
Number of Valid Observations	24	Number of Distinct Observations	22
Number of Missing Values	33		

Raw Statistics		Log-transformed Statistics	
Minimum	27.05	Minimum of Log Data	3.298
Maximum	352	Maximum of Log Data	5.864
Mean	111.5	Mean of log Data	4.55
Geometric Mean	94.61	SD of log Data	0.581
Median	92.35		
SD	71.76		
Std. Error of Mean	14.65		
Coefficient of Variation	0.643		
Skewness	1.927		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.825	Shapiro Wilk Test Statistic	0.984
Shapiro Wilk Critical Value	0.916	Shapiro Wilk Critical Value	0.916
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	136.6	95% H-UCL	143.6
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	171.5
95% Adjusted-CLT UCL (Chen-1995)	141.8	97.5% Chebyshev (MVUE) UCL	197.7
95% Modified-t UCL (Johnson-1978)	137.6	99% Chebyshev (MVUE) UCL	249
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	2.823	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	39.51		
MLE of Mean	111.5		
MLE of Standard Deviation	66.39		
nu star	135.5		
Approximate Chi Square Value (.05)	109.6	Nonparametric Statistics	
Adjusted Level of Significance	0.0392	95% CLT UCL	135.6
Adjusted Chi Square Value	108	95% Jackknife UCL	136.6
		95% Standard Bootstrap UCL	135
Anderson-Darling Test Statistic	0.358	95% Bootstrap-t UCL	148.3
Anderson-Darling 5% Critical Value	0.751	95% Hall's Bootstrap UCL	163.6
Kolmogorov-Smirnov Test Statistic	0.108	95% Percentile Bootstrap UCL	134.6
Kolmogorov-Smirnov 5% Critical Value	0.179	95% BCA Bootstrap UCL	141.8
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	175.4
		97.5% Chebyshev(Mean, Sd) UCL	203
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	257.3
95% Approximate Gamma UCL (Use when n >= 40)	137.9		
95% Adjusted Gamma UCL (Use when n < 40)	140		
Potential UCL to Use		Use 95% Approximate Gamma UCL	137.9

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

BERYLLIUM

General Statistics			
Number of Valid Data	24	Number of Detected Data	14
Number of Distinct Detected Data	14	Number of Non-Detect Data	10
Number of Missing Values	33	Percent Non-Detects	41.67%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.311	Minimum Detected	-1.168
Maximum Detected	1.945	Maximum Detected	0.665
Mean of Detected	0.823	Mean of Detected	-0.418
SD of Detected	0.595	SD of Detected	0.679
Minimum Non-Detect	0.5	Minimum Non-Detect	-0.693
Maximum Non-Detect	0.5	Maximum Non-Detect	-0.693

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.806	Shapiro Wilk Test Statistic	0.886
5% Shapiro Wilk Critical Value	0.874	5% Shapiro Wilk Critical Value	0.874
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.584	Mean	-0.822
SD	0.533	SD	0.706
95% DL/2 (t) UCL	0.77	95% H-Stat (DL/2) UCL	0.778
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-0.643
		SD in Log Scale	0.633
		Mean in Original Scale	0.652
		SD in Original Scale	0.503
		95% t UCL	0.828
		95% Percentile Bootstrap UCL	0.834
		95% BCA Bootstrap UCL	0.843
		95% H-UCL	0.849
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	1.926	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	0.427		
nu star	53.94		
A-D Test Statistic	0.731	Nonparametric Statistics	
5% A-D Critical Value	0.745	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.745	Mean	0.636
5% K-S Critical Value	0.231	SD	0.492
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.105
		95% KM (t) UCL	0.816
Assuming Gamma Distribution		95% KM (z) UCL	0.809
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.814
Minimum	0.000001	95% KM (bootstrap t) UCL	0.898
Maximum	1.945	95% KM (BCA) UCL	0.836
Mean	0.672	95% KM (Percentile Bootstrap) UCL	0.821
Median	0.51	95% KM (Chebyshev) UCL	1.094
SD	0.527	97.5% KM (Chebyshev) UCL	1.293
k star	0.659	99% KM (Chebyshev) UCL	1.682
Theta star	1.019		
Nu star	31.65	Potential UCLs to Use	
AppChi2	19.8	95% KM (t) UCL	0.816
95% Gamma Approximate UCL (Use when n >= 40)	1.075		
95% Adjusted Gamma UCL (Use when n < 40)	1.112		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

COBALT

General Statistics			
Number of Valid Data	66	Number of Detected Data	58
Number of Distinct Detected Data	57	Number of Non-Detect Data	8
		Percent Non-Detects	12.12%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	1.95	Minimum Detected	0.668
Maximum Detected	147	Maximum Detected	4.99
Mean of Detected	33.51	Mean of Detected	2.92
SD of Detected	36.54	SD of Detected	1.159
Minimum Non-Detect	2.5	Minimum Non-Detect	0.916
Maximum Non-Detect	2.5	Maximum Non-Detect	0.916

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Lilliefors Test Statistic	0.194	Lilliefors Test Statistic	0.0776
5% Lilliefors Critical Value	0.116	5% Lilliefors Critical Value	0.116
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	29.6	Mean	2.593
SD	35.82	SD	1.402
95% DL/2 (t) UCL	36.96	95% H-Stat (DL/2) UCL	53.03
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	25.56	Mean in Log Scale	2.644
SD	40.54	SD in Log Scale	1.329
95% MLE (t) UCL	33.89	Mean in Original Scale	29.7
95% MLE (Tiku) UCL	33.74	SD in Original Scale	35.74
		95% t UCL	37.05
		95% Percentile Bootstrap UCL	37.27
		95% BCA Bootstrap UCL	37.89
		95% H UCL	48.93

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.939	Data Follow Appr. Gamma Distribution at 5% Significance Level	
Theta Star	35.69		
nu star	108.9		
A-D Test Statistic	0.764	Nonparametric Statistics	
5% A-D Critical Value	0.78	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.78	Mean	29.72
5% K-S Critical Value	0.12	SD	35.46
Data follow Appr. Gamma Distribution at 5% Significance Level		SE of Mean	4.403
		95% KM (t) UCL	37.06
Assuming Gamma Distribution		95% KM (z) UCL	36.96
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	37.05
Minimum	0.000001	95% KM (bootstrap t) UCL	37.64
Maximum	147	95% KM (BCA) UCL	37.15
Mean	29.45	95% KM (Percentile Bootstrap) UCL	37.17
Median	14.7	95% KM (Chebyshev) UCL	48.91
SD	35.95	97.5% KM (Chebyshev) UCL	57.21
k star	0.277	99% KM (Chebyshev) UCL	73.53
Theta star	106.2		
Nu star	36.61	Potential UCLs to Use	
AppChi2	23.76	95% KM (Chebyshev) UCL	48.91
95% Gamma Approximate UCL (Use when n >= 40)	45.38		
95% Adjusted Gamma UCL (Use when n < 40)	45.83		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

IRON

General Statistics			
Number of Valid Data	61	Number of Detected Data	60
Number of Distinct Detected Data	60	Number of Non-Detect Data	1
Number of Missing Values	5	Percent Non-Detects	1.64%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	12.4	Minimum Detected	2.518
Maximum Detected	54900	Maximum Detected	10.91
Mean of Detected	13346	Mean of Detected	8.185
SD of Detected	14562	SD of Detected	2.245
Minimum Non-Detect	15	Minimum Non-Detect	2.708
Maximum Non-Detect	15	Maximum Non-Detect	2.708

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Lilliefors Test Statistic	0.191	Lilliefors Test Statistic	0.134
5% Lilliefors Critical Value	0.114	5% Lilliefors Critical Value	0.114
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	13127	Mean	8.084
SD	14541	SD	2.363
95% DL/2 (t) UCL	16238	95% H-Stat (DL/2) UCL	149475
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	12860	Mean in Log Scale	8.104
SD	14787	SD in Log Scale	2.316
95% MLE (t) UCL	16023	Mean in Original Scale	13128
95% MLE (Tiku) UCL	15833	SD in Original Scale	14541
		95% t UCL	16238
		95% Percentile Bootstrap UCL	16141
		95% BCA Bootstrap UCL	16233
		95% H UCL	133057
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.473	Data do not follow a Discernable Distribution (0.05)	
Theta Star	28240		
nu star	56.71		
A-D Test Statistic	1.103	Nonparametric Statistics	
5% A-D Critical Value	0.819	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.819	Mean	13127
5% K-S Critical Value	0.122	SD	14421
Data not Gamma Distributed at 5% Significance Level		SE of Mean	1862
		95% KM (t) UCL	16238
Assuming Gamma Distribution		95% KM (z) UCL	16190
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	16238
Minimum	0.000001	95% KM (bootstrap t) UCL	16376
Maximum	54900	95% KM (BCA) UCL	16051
Mean	13127	95% KM (Percentile Bootstrap) UCL	16107
Median	6090	95% KM (Chebyshev) UCL	21244
SD	14541	97.5% KM (Chebyshev) UCL	24756
k star	0.389	99% KM (Chebyshev) UCL	31654
Theta star	33765		
Nu star	47.43	Potential UCLs to Use	
AppChi2	32.63	97.5% KM (Chebyshev) UCL	24756
95% Gamma Approximate UCL (Use when n >= 40)	19084		
95% Adjusted Gamma UCL (Use when n < 40)	19260		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

NICKEL

General Statistics			
Number of Valid Data	24	Number of Detected Data	21
Number of Distinct Detected Data	21	Number of Non-Detect Data	3
Number of Missing Values	33	Percent Non-Detects	12.50%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.761	Minimum Detected	-0.273
Maximum Detected	52.9	Maximum Detected	3.968
Mean of Detected	18.94	Mean of Detected	2.309
SD of Detected	18.28	SD of Detected	1.309
Minimum Non-Detect	1.5	Minimum Non-Detect	0.405
Maximum Non-Detect	1.5	Maximum Non-Detect	0.405

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.823	Shapiro Wilk Test Statistic	0.933
5% Shapiro Wilk Critical Value	0.908	5% Shapiro Wilk Critical Value	0.908
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	16.66	Mean	1.984
SD	18.12	SD	1.503
95% DL/2 (t) UCL	23	95% H-Stat (DL/2) UCL	62.87
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	14.09	Mean in Log Scale	2.021
SD	21.08	SD in Log Scale	1.453
95% MLE (t) UCL	21.46	Mean in Original Scale	16.71
95% MLE (Tiku) UCL	21.54	SD in Original Scale	18.08
		95% t UCL	23.03
		95% Percentile Bootstrap UCL	22.75
		95% BCA Bootstrap UCL	23.15
		95% H UCL	57.26

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.822	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	23.04		
nu star	34.51		
A-D Test Statistic	0.515	Nonparametric Statistics	
5% A-D Critical Value	0.774	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.774	Mean	16.7
5% K-S Critical Value	0.196	SD	17.7
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	3.703
		95% KM (t) UCL	23.05
Assuming Gamma Distribution		95% KM (z) UCL	22.79
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	23.03
Minimum	0.000001	95% KM (bootstrap t) UCL	24.59
Maximum	52.9	95% KM (BCA) UCL	22.77
Mean	16.57	95% KM (Percentile Bootstrap) UCL	22.64
Median	8.705	95% KM (Chebyshev) UCL	32.84
SD	18.2	97.5% KM (Chebyshev) UCL	39.82
k star	0.271	99% KM (Chebyshev) UCL	53.54
Theta star	61.19		
Nu star	13	Potential UCLs to Use	
AppChi2	5.891	95% KM (Chebyshev) UCL	32.84
95% Gamma Approximate UCL (Use when n >= 40)	36.56		
95% Adjusted Gamma UCL (Use when n < 40)	38.76		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

THALLIUM

General Statistics

Number of Valid Data	24	Number of Detected Data	1
Number of Distinct Detected Data	1	Number of Non-Detect Data	23
Number of Missing Values	33	Percent Non-Detects	95.83%

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!

It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable THALLIUM was not processed!

1,1-DICHLOROETHANE

General Statistics			
Number of Valid Data	61	Number of Detected Data	16
Number of Distinct Detected Data	16	Number of Non-Detect Data	45
Number of Missing Values	5	Percent Non-Detects	73.77%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.34	Minimum Detected	-1.079
Maximum Detected	41.9	Maximum Detected	3.735
Mean of Detected	9.403	Mean of Detected	1.128
SD of Detected	13.47	SD of Detected	1.678
Minimum Non-Detect	0.5	Minimum Non-Detect	-0.693
Maximum Non-Detect	50	Maximum Non-Detect	3.912
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	61
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	0
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	100.00%

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.7	Shapiro Wilk Test Statistic	0.916
5% Shapiro Wilk Critical Value	0.887	5% Shapiro Wilk Critical Value	0.887
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	4.341	Mean	-0.0304
SD	8.768	SD	1.671
95% DL/2 (t) UCL	6.217	95% H-Stat (DL/2) UCL	7.072
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-0.651
		SD in Log Scale	1.671
		Mean in Original Scale	2.799
		SD in Original Scale	7.824
		95% t UCL	4.472
		95% Percentile Bootstrap UCL	4.596
		95% BCA Bootstrap UCL	5.232
		95% H-UCL	3.803
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.497	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	18.91		
nu star	15.91		
A-D Test Statistic	0.594	Nonparametric Statistics	
5% A-D Critical Value	0.791	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.791	Mean	2.938
5% K-S Critical Value	0.226	SD	7.893
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	1.067
		95% KM (t) UCL	4.721
Assuming Gamma Distribution		95% KM (z) UCL	4.693
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	4.68
Minimum	0.000001	95% KM (bootstrap t) UCL	6.791
Maximum	41.9	95% KM (BCA) UCL	4.977
Mean	2.853	95% KM (Percentile Bootstrap) UCL	4.768
Median	0.000001	95% KM (Chebyshev) UCL	7.589
SD	7.868	97.5% KM (Chebyshev) UCL	9.602
k star	0.101	99% KM (Chebyshev) UCL	13.56
Theta star	28.11		
Nu star	12.38	Potential UCLs to Use	
AppChi2	5.479	95% KM (t) UCL	4.721
95% Gamma Approximate UCL (Use when n >= 40)	6.446		
95% Adjusted Gamma UCL (Use when n < 40)	6.579		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

1,1-DICHLOROETHENE

General Statistics			
Number of Valid Data	61	Number of Detected Data	23
Number of Distinct Detected Data	21	Number of Non-Detect Data	38
Number of Missing Values	5	Percent Non-Detects	62.30%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.34	Minimum Detected	-1.079
Maximum Detected	63.5	Maximum Detected	4.151
Mean of Detected	6.067	Mean of Detected	0.814
SD of Detected	13.06	SD of Detected	1.334
Minimum Non-Detect	0.5	Minimum Non-Detect	-0.693
Maximum Non-Detect	50	Maximum Non-Detect	3.912
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	60
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	1
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	98.36%

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.431	Shapiro Wilk Test Statistic	0.938
5% Shapiro Wilk Critical Value	0.914	5% Shapiro Wilk Critical Value	0.914
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	3.767	Mean	-0.111
SD	9.344	SD	1.561
95% DL/2 (t) UCL	5.766	95% H-Stat (DL/2) UCL	5.113
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-0.964
		SD in Log Scale	1.871
		Mean in Original Scale	2.428
		SD in Original Scale	8.41
		95% t UCL	4.227
		95% Percentile Bootstrap UCL	4.458
		95% BCA Bootstrap UCL	5.92
		95% H-UCL	4.505
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.57	Data Follow Appr. Gamma Distribution at 5% Significance Level	
Theta Star	10.65		
nu star	26.2		
A-D Test Statistic	1.219	Nonparametric Statistics	
5% A-D Critical Value	0.794	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.794	Mean	2.617
5% K-S Critical Value	0.19	SD	8.33
Data follow Appr. Gamma Distribution at 5% Significance Level		SE of Mean	1.095
		95% KM (t) UCL	4.447
Assuming Gamma Distribution		95% KM (z) UCL	4.418
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	4.338
Minimum	0.000001	95% KM (bootstrap t) UCL	8.052
Maximum	63.5	95% KM (BCA) UCL	4.9
Mean	2.289	95% KM (Percentile Bootstrap) UCL	4.635
Median	0.000001	95% KM (Chebyshev) UCL	7.391
SD	8.446	97.5% KM (Chebyshev) UCL	9.457
k star	0.0982	99% KM (Chebyshev) UCL	13.51
Theta star	23.31		
Nu star	11.98	Potential UCLs to Use	
AppChi2	5.214	95% KM (t) UCL	4.447
95% Gamma Approximate UCL (Use when n >= 40)	5.259		
95% Adjusted Gamma UCL (Use when n < 40)	5.37		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

1,2-DICHLOROETHANE

General Statistics			
Number of Valid Data	61	Number of Detected Data	1
Number of Distinct Detected Data	1	Number of Non-Detect Data	60
Number of Missing Values	5	Percent Non-Detects	98.36%

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!

It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable 1,2-DICHLOROETHANE was not processed!

CIS-1,2-DICHLOROETHENE

General Statistics			
Number of Valid Data	61	Number of Detected Data	28
Number of Distinct Detected Data	28	Number of Non-Detect Data	33
Number of Missing Values	5	Percent Non-Detects	54.10%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.77	Minimum Detected	-0.261
Maximum Detected	377.5	Maximum Detected	5.934
Mean of Detected	87.32	Mean of Detected	3.063
SD of Detected	102	SD of Detected	2.176
Minimum Non-Detect	0.5	Minimum Non-Detect	-0.693
Maximum Non-Detect	0.5	Maximum Non-Detect	-0.693

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.819	Shapiro Wilk Test Statistic	0.867
5% Shapiro Wilk Critical Value	0.924	5% Shapiro Wilk Critical Value	0.924
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	40.21	Mean	0.656
SD	81.2	SD	2.67
95% DL/2 (t) UCL	57.58	95% H-Stat (DL/2) UCL	239.3
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-0.055
		SD in Log Scale	3.597
		Mean in Original Scale	40.22
		SD in Original Scale	81.2
		95% t UCL	57.58
		95% Percentile Bootstrap UCL	58.52
		95% BCA Bootstrap UCL	61.84
		95% H-UCL	6137
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.433	Data Follow Appr. Gamma Distribution at 5% Significance Level	
Theta Star	201.8		
nu star	24.23		
A-D Test Statistic	1.097	Nonparametric Statistics	
5% A-D Critical Value	0.82	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.82	Mean	40.5
5% K-S Critical Value	0.176	SD	80.39
Data follow Appr. Gamma Distribution at 5% Significance Level		SE of Mean	10.48
		95% KM (t) UCL	58.01
Assuming Gamma Distribution		95% KM (z) UCL	57.74
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	57.75
Minimum	0.000001	95% KM (bootstrap t) UCL	62.56
Maximum	377.5	95% KM (BCA) UCL	60.25
Mean	40.08	95% KM (Percentile Bootstrap) UCL	57.88
Median	0.000001	95% KM (Chebyshev) UCL	86.19
SD	81.27	97.5% KM (Chebyshev) UCL	106
k star	0.0916	99% KM (Chebyshev) UCL	144.8
Theta star	437.3		
Nu star	11.18	Potential UCLs to Use	
AppChi2	4.693	95% KM (t) UCL	58.01
95% Gamma Approximate UCL (Use when n >= 40)	95.5		
95% Adjusted Gamma UCL (Use when n < 40)	97.61		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

METHYLENE CHLORIDE

General Statistics			
Number of Valid Data	61	Number of Detected Data	9
Number of Distinct Detected Data	9	Number of Non-Detect Data	52
Number of Missing Values	5	Percent Non-Detects	85.25%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.5	Minimum Detected	-0.693
Maximum Detected	22.5	Maximum Detected	3.114
Mean of Detected	3.656	Mean of Detected	0.204
SD of Detected	7.237	SD of Detected	1.347
Minimum Non-Detect	1	Minimum Non-Detect	0
Maximum Non-Detect	100	Maximum Non-Detect	4.605
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	61
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	0
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	100.00%

Warning: There are only 9 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set

the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.52	Shapiro Wilk Test Statistic	0.732
5% Shapiro Wilk Critical Value	0.829	5% Shapiro Wilk Critical Value	0.829
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	4.285	Mean	0.0882
SD	9.947	SD	1.389
95% DL/2 (t) UCL	6.413	95% H-Stat (DL/2) UCL	4.402
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-0.364
		SD in Log Scale	0.873
		Mean in Original Scale	1.226
		SD in Original Scale	2.88
		95% t UCL	1.842
		95% Percentile Bootstrap UCL	1.945
		95% BCA Bootstrap UCL	2.512
		95% H-UCL	1.296

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.454	Data do not follow a Discernable Distribution (0.05)	
Theta Star	8.052		
nu star	8.172		
A-D Test Statistic	1.451	Nonparametric Statistics	
5% A-D Critical Value	0.765	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.765	Mean	1.089
5% K-S Critical Value	0.293	SD	3.02
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.438
		95% KM (t) UCL	1.82
Assuming Gamma Distribution		95% KM (z) UCL	1.809
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	1.787
Minimum	0.000001	95% KM (bootstrap t) UCL	7.504
Maximum	22.5	95% KM (BCA) UCL	1.919
Mean	1.988	95% KM (Percentile Bootstrap) UCL	1.903
Median	0.54	95% KM (Chebyshev) UCL	2.997
SD	3.403	97.5% KM (Chebyshev) UCL	3.823
k star	0.145	99% KM (Chebyshev) UCL	5.444
Theta star	13.74		
Nu star	17.65	Potential UCLs to Use	
AppChi2	9.139	95% KM (BCA) UCL	1.919
95% Gamma Approximate UCL (Use when n >= 40)	3.839		
95% Adjusted Gamma UCL (Use when n < 40)	3.902		

Note: DL/2 is not a recommended method.

TRICHLOROETHENE

General Statistics			
Number of Valid Data	66	Number of Detected Data	43
Number of Distinct Detected Data	43	Number of Non-Detect Data	23
		Percent Non-Detects	34.85%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.26	Minimum Detected	-1.347
Maximum Detected	16850	Maximum Detected	9.732
Mean of Detected	1206	Mean of Detected	3.244
SD of Detected	2963	SD of Detected	3.572
Minimum Non-Detect	0.5	Minimum Non-Detect	-0.693
Maximum Non-Detect	0.5	Maximum Non-Detect	-0.693

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.474	Shapiro Wilk Test Statistic	0.863
5% Shapiro Wilk Critical Value	0.943	5% Shapiro Wilk Critical Value	0.943
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	785.9	Mean	1.631
SD	2451	SD	3.631
95% DL/2 (t) UCL	1289	95% H-Stat (DL/2) UCL	31103
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	0.852
		SD in Log Scale	4.578
		Mean in Original Scale	785.8
		SD in Original Scale	2451
		95% t UCL	1289
		95% Percentile Bootstrap UCL	1310
		95% BCA Bootstrap UCL	1478
		95% H-UCL	2629672
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.194	Data do not follow a Discernable Distribution (0.05)	
Theta Star	6205		
nu star	16.72		
A-D Test Statistic	2.842	Nonparametric Statistics	
5% A-D Critical Value	0.909	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.909	Mean	785.9
5% K-S Critical Value	0.15	SD	2433
Data not Gamma Distributed at 5% Significance Level		SE of Mean	303
		95% KM (t) UCL	1291
Assuming Gamma Distribution		95% KM (z) UCL	1284
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	1289
Minimum	0.000001	95% KM (bootstrap t) UCL	1906
Maximum	16850	95% KM (BCA) UCL	1306
Mean	785.8	95% KM (Percentile Bootstrap) UCL	1299
Median	1.12	95% KM (Chebyshev) UCL	2107
SD	2451	97.5% KM (Chebyshev) UCL	2678
k star	0.0942	99% KM (Chebyshev) UCL	3800
Theta star	8346		
Nu star	12.43	Potential UCLs to Use	
AppChi2	5.511	97.5% KM (Chebyshev) UCL	2678
95% Gamma Approximate UCL (Use when n >= 40)	1772		
95% Adjusted Gamma UCL (Use when n < 40)	1806		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

VINYL CHLORIDE

General Statistics			
Number of Valid Data	61	Number of Detected Data	16
Number of Distinct Detected Data	16	Number of Non-Detect Data	45
Number of Missing Values	5	Percent Non-Detects	73.77%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.81	Minimum Detected	-0.211
Maximum Detected	65.6	Maximum Detected	4.184
Mean of Detected	17.1	Mean of Detected	2.047
SD of Detected	19.57	SD of Detected	1.446
Minimum Non-Detect	0.5	Minimum Non-Detect	-0.693
Maximum Non-Detect	50	Maximum Non-Detect	3.912
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	60
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	1
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	98.36%

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.808	Shapiro Wilk Test Statistic	0.94
5% Shapiro Wilk Critical Value	0.887	5% Shapiro Wilk Critical Value	0.887
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	5.953	Mean	-0.0896
SD	12.75	SD	1.855
95% DL/2 (t) UCL	8.681	95% H-Stat (DL/2) UCL	10.37
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-1.152
		SD in Log Scale	2.532
		Mean in Original Scale	4.684
		SD in Original Scale	12.31
		95% t UCL	7.317
		95% Percentile Bootstrap UCL	7.549
		95% BCA Bootstrap UCL	8.108
		95% H-UCL	24.41
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.655	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	26.1		
nu star	20.97		
A-D Test Statistic	0.372	Nonparametric Statistics	
5% A-D Critical Value	0.774	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.774	Mean	5.241
5% K-S Critical Value	0.223	SD	12.16
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	1.626
		95% KM (t) UCL	7.958
Assuming Gamma Distribution		95% KM (z) UCL	7.916
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	7.832
Minimum	0.000001	95% KM (bootstrap t) UCL	9.314
Maximum	65.6	95% KM (BCA) UCL	8.754
Mean	4.485	95% KM (Percentile Bootstrap) UCL	8.276
Median	0.000001	95% KM (Chebyshev) UCL	12.33
SD	12.38	97.5% KM (Chebyshev) UCL	15.4
k star	0.0825	99% KM (Chebyshev) UCL	21.42
Theta star	54.36		
Nu star	10.07	Potential UCLs to Use	
AppChi2	3.984	95% KM (t) UCL	7.958
95% Gamma Approximate UCL (Use when n >= 40)	11.34		
95% Adjusted Gamma UCL (Use when n < 40)	11.6		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

	General UCL Statistics for Data Sets with Non-Detects		
User Selected Options			
From File	Converted_Data.wst		
Full Precision	OFF		
Confidence Coefficient	95%		
Number of Bootstrap Operations	2000		
CADMIUM			
General Statistics			
Number of Valid Data	24	Number of Detected Data	5
Number of Distinct Detected Data	5	Number of Non-Detect Data	19
Number of Missing Values	33	Percent Non-Detects	79.17%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.29	Minimum Detected	-1.238
Maximum Detected	0.909	Maximum Detected	-0.0954
Mean of Detected	0.503	Mean of Detected	-0.788
SD of Detected	0.265	SD of Detected	0.492
Minimum Non-Detect	0.5	Minimum Non-Detect	-0.693
Maximum Non-Detect	0.5	Maximum Non-Detect	-0.693
Warning: There are only 5 Detected Values in this data			
Note: It should be noted that even though bootstrap may be performed on this data set			
the resulting calculations may not be reliable enough to draw conclusions			
It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.			
UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.849	Shapiro Wilk Test Statistic	0.887
5% Shapiro Wilk Critical Value	0.762	5% Shapiro Wilk Critical Value	0.762
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.303	Mean	-1.262
SD	0.152	SD	0.322
95% DL/2 (t) UCL	0.356	95% H-Stat (DL/2) UCL	0.337
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-1.048
		SD in Log Scale	0.383
		Mean in Original Scale	0.377
		SD in Original Scale	0.161
		95% t UCL	0.434
		95% Percentile Bootstrap UCL	0.437
		95% BCA Bootstrap UCL	0.443
		95% H-UCL	0.439
CADMIUM (Continued)			

Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	2.167	Data appear Normal at 5% Significance Level	
Theta Star	0.232		
nu star	21.67		
A-D Test Statistic	0.432	**Nonparametric Statistics**	
5% A-D Critical Value	0.681	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.681	Mean	0.362
5% K-S Critical Value	0.358	SD	0.133
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.0352
		95% KM (t) UCL	0.422
Assuming Gamma Distribution		95% KM (z) UCL	0.42
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.425
Minimum	0.000001	95% KM (bootstrap t) UCL	0.447
Maximum	0.909	95% KM (BCA) UCL	0.633
Mean	0.39	95% KM (Percentile Bootstrap) UCL	0.433
Median	0.378	95% KM (Chebyshev) UCL	0.516
SD	0.221	97.5% KM (Chebyshev) UCL	0.582
k star	0.76	99% KM (Chebyshev) UCL	0.713
Theta star	0.514		
Nu star	36.47	**Potential UCLs to Use**	
AppChi2	23.64	95% KM (t) UCL	0.422
95% Gamma Approximate UCL (Use when n >= 40)	0.602	95% KM (Percentile Bootstrap) UCL	0.433
95% Adjusted Gamma UCL (Use when n < 40)	0.621		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

CHROMIUM

General Statistics			
Number of Valid Data	24	Number of Detected Data	7
Number of Distinct Detected Data	7	Number of Non-Detect Data	17
Number of Missing Values	33	Percent Non-Detects	70.83%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.842	Minimum Detected	-0.172
Maximum Detected	4.45	Maximum Detected	1.493
Mean of Detected	1.882	Mean of Detected	0.432
SD of Detected	1.385	SD of Detected	0.657
Minimum Non-Detect	1	Minimum Non-Detect	0
Maximum Non-Detect	1	Maximum Non-Detect	0

Warning: There are only 7 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.791	Shapiro Wilk Test Statistic	0.863
5% Shapiro Wilk Critical Value	0.803	5% Shapiro Wilk Critical Value	0.803
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.903	Mean	-0.365
SD	0.955	SD	0.621
95% DL/2 (t) UCL	1.237	95% H-Stat (DL/2) UCL	1.104
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	2.957	Mean in Log Scale	0.0178
SD	1.246	SD in Log Scale	0.555
95% MLE (t) UCL	3.393	Mean in Original Scale	1.206
95% MLE (Tiku) UCL	3.998	SD in Original Scale	0.888
		95% t UCL	1.517
		95% Percentile Bootstrap UCL	1.526
		95% BCA Bootstrap UCL	1.608
		95% H UCL	1.503

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	1.61	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	1.169		
nu star	22.54		
A-D Test Statistic	0.583	**Nonparametric Statistics**	
5% A-D Critical Value	0.713	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.713	Mean	1.17
5% K-S Critical Value	0.314	SD	0.83
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.183
		95% KM (t) UCL	1.485
Assuming Gamma Distribution		95% KM (z) UCL	1.472
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	1.468
Minimum	0.000001	95% KM (bootstrap t) UCL	2.218
Maximum	4.45	95% KM (BCA) UCL	1.631
Mean	1.271	95% KM (Percentile Bootstrap) UCL	1.56
Median	1.124	95% KM (Chebyshev) UCL	1.97
SD	1.031	97.5% KM (Chebyshev) UCL	2.316
k star	0.346	99% KM (Chebyshev) UCL	2.995
Theta star	3.668		
Nu star	16.63	**Potential UCLs to Use**	
AppChi2	8.409	95% KM (t) UCL	1.485
95% Gamma Approximate UCL (Use when n >= 40)	2.513		
95% Adjusted Gamma UCL (Use when n < 40)	2.642		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

VANADIUM

General Statistics			
Number of Valid Data	24	Number of Detected Data	17
Number of Distinct Detected Data	16	Number of Non-Detect Data	7
Number of Missing Values	33	Percent Non-Detects	29.17%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	1.27	Minimum Detected	0.239
Maximum Detected	6.68	Maximum Detected	1.899
Mean of Detected	2.136	Mean of Detected	0.658
SD of Detected	1.284	SD of Detected	0.411
Minimum Non-Detect	2.5	Minimum Non-Detect	0.916
Maximum Non-Detect	2.5	Maximum Non-Detect	0.916

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.61	Shapiro Wilk Test Statistic	0.816
5% Shapiro Wilk Critical Value	0.892	5% Shapiro Wilk Critical Value	0.892
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	1.878	Mean	0.531
SD	1.147	SD	0.398
95% DL/2 (t) UCL	2.279	95% H-Stat (DL/2) UCL	2.156
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	4.942	Mean in Log Scale	0.625
SD	1.73	SD in Log Scale	0.372
95% MLE (t) UCL	5.547	Mean in Original Scale	2.03
95% MLE (Tiku) UCL	6.597	SD in Original Scale	1.109
		95% t UCL	2.417
		95% Percentile Bootstrap UCL	2.423
		95% BCA Bootstrap UCL	2.669
		95% H UCL	2.315
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	4.263	Data do not follow a Discernable Distribution (0.05)	
Theta Star	0.501		
nu star	144.9		
A-D Test Statistic	1.387	Nonparametric Statistics	
5% A-D Critical Value	0.741	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.741	Mean	2.005
5% K-S Critical Value	0.21	SD	1.082
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.232
		95% KM (t) UCL	2.402
Assuming Gamma Distribution		95% KM (z) UCL	2.386
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	2.4
Minimum	0.853	95% KM (bootstrap t) UCL	2.782
Maximum	6.68	95% KM (BCA) UCL	2.46
Mean	2.086	95% KM (Percentile Bootstrap) UCL	2.443
Median	1.746	95% KM (Chebyshev) UCL	3.015
SD	1.128	97.5% KM (Chebyshev) UCL	3.452
k star	4.994	99% KM (Chebyshev) UCL	4.31
Theta star	0.418		
Nu star	239.7	Potential UCLs to Use	
AppChi2	204.9	95% KM (BCA) UCL	2.46
95% Gamma Approximate UCL (Use when n >= 40)	2.441		
95% Adjusted Gamma UCL (Use when n < 40)	2.468		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

	General UCL Statistics for Data Sets with Non-Detects
User Selected Options	
From File	Converted_Data.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

CIS-1,2-DICHLOROETHENE

General Statistics			
Number of Valid Data	9	Number of Detected Data	8
Number of Distinct Detected Data	8	Number of Non-Detect Data	1
		Percent Non-Detects	11.11%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.44	Minimum Detected	-0.821
Maximum Detected	195	Maximum Detected	5.273
Mean of Detected	31.78	Mean of Detected	1.475
SD of Detected	67.92	SD of Detected	2.037
Minimum Non-Detect	0.5	Minimum Non-Detect	-0.693
Maximum Non-Detect	0.5	Maximum Non-Detect	-0.693

Warning: There are only 8 Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.547	Shapiro Wilk Test Statistic	0.845
5% Shapiro Wilk Critical Value	0.818	5% Shapiro Wilk Critical Value	0.818
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	28.28	Mean	1.157
SD	64.4	SD	2.131
95% DL/2 (t) UCL	68.2	95% H-Stat (DL/2) UCL	2937
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	16.82	Mean in Log Scale	1.124
SD	71.75	SD in Log Scale	2.176
95% MLE (t) UCL	61.3	Mean in Original Scale	28.27
95% MLE (Tiku) UCL	60.83	SD in Original Scale	64.4
		95% t UCL	68.19
		95% Percentile Bootstrap UCL	66.19
		95% BCA Bootstrap UCL	87.61
		95% H UCL	3779

CIS-1,2-DICHLOROETHENE (Continued)

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.296	Data appear Lognormal at 5% Significance Level	
Theta Star	107.3		
nu star	4.738		
A-D Test Statistic	1.096	Nonparametric Statistics	
5% A-D Critical Value	0.79	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.79	Mean	28.3
5% K-S Critical Value	0.315	SD	60.71
Data not Gamma Distributed at 5% Significance Level		SE of Mean	21.63
		95% KM (t) UCL	68.53
Assuming Gamma Distribution		95% KM (z) UCL	63.88
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	68.14
Minimum	0.000001	95% KM (bootstrap t) UCL	1836
Maximum	195	95% KM (BCA) UCL	66.41
Mean	28.25	95% KM (Percentile Bootstrap) UCL	66.43
Median	1.79	95% KM (Chebyshev) UCL	122.6
SD	64.41	97.5% KM (Chebyshev) UCL	163.4
k star	0.211	99% KM (Chebyshev) UCL	243.5
Theta star	133.8		
Nu star	3.8	Potential UCLs to Use	
AppChi2	0.644	99% KM (Chebyshev) UCL	243.5
95% Gamma Approximate UCL (Use when n >= 40)	166.6		
95% Adjusted Gamma UCL (Use when n < 40)	252.9		

Warning: Recommended UCL exceeds the maximum observation

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

TRICHLOROETHENE

General Statistics			
Number of Valid Data	9	Number of Detected Data	8
Number of Distinct Detected Data	8	Number of Non-Detect Data	1
		Percent Non-Detects	11.11%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	1.86	Minimum Detected	0.621
Maximum Detected	354	Maximum Detected	5.869
Mean of Detected	76.64	Mean of Detected	3.192
SD of Detected	122.6	SD of Detected	1.715
Minimum Non-Detect	0.5	Minimum Non-Detect	-0.693
Maximum Non-Detect	0.5	Maximum Non-Detect	-0.693

Warning: There are only 8 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.665	Shapiro Wilk Test Statistic	0.966
5% Shapiro Wilk Critical Value	0.818	5% Shapiro Wilk Critical Value	0.818
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	68.15	Mean	2.683
SD	117.5	SD	2.214
95% DL/2 (t) UCL	141	95% H-Stat (DL/2) UCL	22967
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	59.59	Mean in Log Scale	2.72
SD	120.2	SD in Log Scale	2.14
95% MLE (t) UCL	134.1	Mean in Original Scale	68.17
95% MLE (Tiku) UCL	129.9	SD in Original Scale	117.5
		95% t UCL	141
		95% Percentile Bootstrap UCL	132
		95% BCA Bootstrap UCL	160.5
		95% H UCL	14804

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.425	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	180.5		
nu star	6.795		
A-D Test Statistic	0.45	**Nonparametric Statistics**	
5% A-D Critical Value	0.759	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.759	Mean	68.33
5% K-S Critical Value	0.308	SD	110.7
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	39.44
		95% KM (t) UCL	141.7
Assuming Gamma Distribution		95% KM (z) UCL	133.2
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	140.9
Minimum	0.000001	95% KM (bootstrap t) UCL	581.6
Maximum	354	95% KM (BCA) UCL	137.8
Mean	68.13	95% KM (Percentile Bootstrap) UCL	137.5
Median	26.9	95% KM (Chebyshev) UCL	240.2
SD	117.5	97.5% KM (Chebyshev) UCL	314.6
k star	0.237	99% KM (Chebyshev) UCL	460.7
Theta star	287.6		
Nu star	4.264	**Potential UCLs to Use**	
AppChi2	0.829	95% KM (Chebyshev) UCL	240.2
95% Gamma Approximate UCL (Use when n >= 40)	350.5		
95% Adjusted Gamma UCL (Use when n < 40)	517		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

VINYL CHLORIDE

General Statistics			
Number of Valid Data	9	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	7
		Percent Non-Detects	77.78%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	1.16	Minimum Detected	0.148
Maximum Detected	1.26	Maximum Detected	0.231
Mean of Detected	1.21	Mean of Detected	0.19
SD of Detected	0.0707	SD of Detected	0.0585
Minimum Non-Detect	0.5	Minimum Non-Detect	-0.693
Maximum Non-Detect	1	Maximum Non-Detect	0
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	7
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	2
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	77.78%

Warning: Data set has only 2 Distinct Detected Values.
This may not be adequate enough to compute meaningful and reliable test statistics and estimates.
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.
Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.
However, results obtained using 4 to 9 distinct values may not be reliable.
It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	N/A	Shapiro Wilk Test Statistic	N/A
5% Shapiro Wilk Critical Value	N/A	5% Shapiro Wilk Critical Value	N/A
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.519	Mean	-0.882
SD	0.407	SD	0.675
95% DL/2 (t) UCL	0.771	95% H-Stat (DL/2) UCL	0.961
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	N/A
		SD in Log Scale	N/A
		Mean in Original Scale	N/A
		SD in Original Scale	N/A
		95% t UCL	N/A
		95% Percentile Bootstrap UCL	N/A
		95% BCA Bootstrap UCL	N/A
		95% H-UCL	N/A

VINYL CHLORIDE (Continued)

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	N/A	Data do not follow a Discernable Distribution (0.05)	
Theta Star	N/A		
nu star	N/A		
A-D Test Statistic	N/A	Nonparametric Statistics	
5% A-D Critical Value	N/A	Kaplan-Meier (KM) Method	
K-S Test Statistic	N/A	Mean	1.171
5% K-S Critical Value	N/A	SD	0.0314
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.0148
		95% KM (t) UCL	1.199
Assuming Gamma Distribution		95% KM (z) UCL	1.195
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	1.242
Minimum	N/A	95% KM (bootstrap t) UCL	1.171
Maximum	N/A	95% KM (BCA) UCL	1.26
Mean	N/A	95% KM (Percentile Bootstrap) UCL	1.26
Median	N/A	95% KM (Chebyshev) UCL	1.236
SD	N/A	97.5% KM (Chebyshev) UCL	1.264
k star	N/A	99% KM (Chebyshev) UCL	1.319
Theta star	N/A		
Nu star	N/A	Potential UCLs to Use	
AppChi2	N/A	95% KM (t) UCL	1.199
95% Gamma Approximate UCL (Use when n >= 40)	N/A	95% KM (% Bootstrap) UCL	1.26
95% Adjusted Gamma UCL (Use when n < 40)	N/A		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

	General UCL Statistics for Data Sets with Non-Detects
User Selected Options	
From File	Converted_Data1.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

ARSENIC

General Statistics			
Number of Valid Data	9	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	7
Number of Missing Values	2	Percent Non-Detects	77.78%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.751	Minimum Detected	-0.286
Maximum Detected	1.21	Maximum Detected	0.191
Mean of Detected	0.981	Mean of Detected	-0.0479
SD of Detected	0.325	SD of Detected	0.337
Minimum Non-Detect	1.5	Minimum Non-Detect	0.405
Maximum Non-Detect	1.5	Maximum Non-Detect	0.405

Warning: Data set has only 2 Distinct Detected Values.
This may not be adequate enough to compute meaningful and reliable test statistics and estimates.
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.
Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.
However, results obtained using 4 to 9 distinct values may not be reliable.
It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	N/A	Shapiro Wilk Test Statistic	N/A
5% Shapiro Wilk Critical Value	N/A	5% Shapiro Wilk Critical Value	N/A
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.801	Mean	-0.234
SD	0.153	SD	0.159
95% DL/2 (t) UCL	0.896	95% H-Stat (DL/2) UCL	0.89
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	N/A
		SD in Log Scale	N/A
		Mean in Original Scale	N/A
		SD in Original Scale	N/A
		95% t UCL	N/A
		95% Percentile Bootstrap UCL	N/A
		95% BCA Bootstrap UCL	N/A
		95% H-UCL	N/A

ARSENIC (Continued)

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	N/A	Data do not follow a Discernable Distribution (0.05)	
Theta Star	N/A		
nu star	N/A		
A-D Test Statistic	N/A	Nonparametric Statistics	
5% A-D Critical Value	N/A	Kaplan-Meier (KM) Method	
K-S Test Statistic	N/A	Mean	0.981
5% K-S Critical Value	N/A	SD	0.23
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.23
		95% KM (t) UCL	1.407
Assuming Gamma Distribution		95% KM (z) UCL	1.358
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	N/A
Minimum	N/A	95% KM (bootstrap t) UCL	N/A
Maximum	N/A	95% KM (BCA) UCL	N/A
Mean	N/A	95% KM (Percentile Bootstrap) UCL	N/A
Median	N/A	95% KM (Chebyshev) UCL	1.981
SD	N/A	97.5% KM (Chebyshev) UCL	2.414
k star	N/A	99% KM (Chebyshev) UCL	3.264
Theta star	N/A		
Nu star	N/A	Potential UCLs to Use	
AppChi2	N/A	95% KM (t) UCL	1.407
95% Gamma Approximate UCL (Use when n >= 40)	N/A	95% KM (% Bootstrap) UCL	N/A
95% Adjusted Gamma UCL (Use when n < 40)	N/A		

Warning: Recommended UCL exceeds the maximum observation

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

COBALT

General Statistics			
Number of Valid Data	9	Number of Detected Data	8
Number of Distinct Detected Data	8	Number of Non-Detect Data	1
Number of Missing Values	2	Percent Non-Detects	11.11%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	4.16	Minimum Detected	1.426
Maximum Detected	25.9	Maximum Detected	3.254
Mean of Detected	8.648	Mean of Detected	1.951
SD of Detected	7.308	SD of Detected	0.623
Minimum Non-Detect	2.5	Minimum Non-Detect	0.916
Maximum Non-Detect	2.5	Maximum Non-Detect	0.916

Warning: There are only 8 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.664	Shapiro Wilk Test Statistic	0.83
5% Shapiro Wilk Critical Value	0.818	5% Shapiro Wilk Critical Value	0.818
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	7.826	Mean	1.759
SD	7.267	SD	0.819
95% DL/2 (t) UCL	12.33	95% H-Stat (DL/2) UCL	18.54
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	7.479	Mean in Log Scale	1.789
SD	7.343	SD in Log Scale	0.758
95% MLE (t) UCL	12.03	Mean in Original Scale	7.87
95% MLE (Tiku) UCL	11.86	SD in Original Scale	7.224
		95% t UCL	12.35
		95% Percentile Bootstrap UCL	11.82
		95% BCA Bootstrap UCL	13.71
		95% H UCL	16.57
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	1.693	Data Follow Appr. Gamma Distribution at 5% Significance Level	
Theta Star	5.109		
nu star	27.08		
A-D Test Statistic	0.79	Nonparametric Statistics	
5% A-D Critical Value	0.723	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.723	Mean	8.149
5% K-S Critical Value	0.297	SD	6.598
Data follow Appr. Gamma Distribution at 5% Significance Level		SE of Mean	2.351
		95% KM (t) UCL	12.52
Assuming Gamma Distribution		95% KM (z) UCL	12.02
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	12.49
Minimum	0.000001	95% KM (bootstrap t) UCL	23.22
Maximum	25.9	95% KM (BCA) UCL	11.98
Mean	7.687	95% KM (Percentile Bootstrap) UCL	12.38
Median	6.38	95% KM (Chebyshev) UCL	18.4
SD	7.419	97.5% KM (Chebyshev) UCL	22.83
k star	0.316	99% KM (Chebyshev) UCL	31.54
Theta star	24.31		
Nu star	5.691	Potential UCLs to Use	
AppChi2	1.484	95% KM (BCA) UCL	11.98
95% Gamma Approximate UCL (Use when n >= 40)	29.48		
95% Adjusted Gamma UCL (Use when n < 40)	40.52		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.