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VERIFICATION INVESTIGATION REPORT FOR THE NAVAL SCHOOL EOD SITES AT THE NAVAL EXPLOSIVE ORDNANCE DISPOSAL TECHNOLOGY DIVISION STUMP NECK ANNEX NSWC INDIAN HEAD MD
02/01/1996
BROWN AND ROOT ENVIRONMENTAL

Verification Investigation Report
for
The Naval School EOD Sites at The Naval Explosive Ordnance Disposal Technology Division (EPA ID # MD 417 009 0001) NSWC, Stump Neck Annex, Indian Head Division

Indian Head, Maryland

Engineering Field Activity Chesapeake
Naval Facilities Engineering Command
Northern Division Contract Number N62472-90-D-1298
Contract Task Order 0222

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Brown & Root Environmental

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VERIFICATION INVESTIGATION REPORT
FOR
THE NAVAL SCHOOL EOD SITES
AT
THE NAVAL EXPLOSIVE ORDNANCE DISPOSAL TECHNOLOGY DIVISION
NAVAL SURFACE WARFARE CENTER
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

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Environmental Branch Code 18
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GLOSSARY

Acid trepanning	The application of strong acids (nitric or sulfuric acid) to the protective hull of an ordnance in order to access and subsequently extract (via steaming) and detonate an explosive device.
Aluminum powder	Frequently added to explosives and propellants in order to improve their efficiency.
Ammonium nitrate	The most important raw material in the manufacture of industrial explosives.
Black powder	A mechanical mixture of potassium nitrate, sulfur, and charcoal, which is mostly pressed, granulated, and classified into definite grain fractions; is classified as a "low" explosive.
Blasting caps	Initiators of explosive charges consisting of a cylindrical copper and aluminum capsule containing a primary charge of an initiating explosive and a secondary charge of a high-brisance explosive.
Composition C	A Military explosive consisting of cyclonite (RDX) and a plasticizer, which itself may or may not be explosive.
Composition C-3	A military plastic explosive consisting of RDX (78%) and an explosive plasticizer (22%).
Composition C-4	Military plastic explosive consisting of RDX (90%) and polyisobutylene (10%).
Cyclonite (RDX; trimethylene trinitramine)	Probably the most important high brisance explosive. Its brisant power is high due to its density and high detonation velocity.
Cyclotetramethylene tetranitramine (HMX); octogen; homocyclonite	Military explosive, appears in four modifications, of which only the β modification displays a particularly high density and hence also a particularly fast detonation rate.
Detonating cord	Consists of a PETN core (about 12 g/m) with wound hemp or jute threads and a plastic coating around it.
Glycerin	Raw material for manufacture of nitroglycerine
H-6 Shot	A mixture of RDX (45%), TNT (30%), aluminum (20%), and Wax (5%) [USA].
HBX	Pourable mixture of TNT, RDC, and aluminum containing phlegmatizing additives.
Magnesium powder	Used in pyrotechnics

Molotov cocktails	A crude bomb made of a bottle filled with flammable liquid, such as gasoline, usually filled with a wick that is ignited just before the bottle is hurled.
M-Scope	Electric water level indicator.
Nitroglycerine	One of the most important and most frequently used components of explosive materials including gelatinous industrial explosives, powders, and solid rocket propellants.
Nitroguanidine	Can be incorporated into nitrocellulose powder, nitroglycerine powder, or diglycol dinitrate powder; these "cold" (calorie-poor) powders erode gun barrels to a much lesser extent than do conventional powders.
Nitrocellulose	Commonly employed designation for nitric acid esters of cellulose (cellulose nitrates).
Pentaerythritol tetranitrate	One of the most powerful and most brisant explosives; used in high-efficiency blasting cap fillings and detonation cords.
Potassium nitrate	Used as a component in pyrotechnical compositions, in industrial explosives, and in black powder.
Propellant	Solid or liquid material with low rate of combustion which will burn smoothly at uniform rate after ignition without depending on interaction with atmosphere. **Single Base** Consists primarily of matrix of nitrocellulose. **Double Base** Contains nitrocellulose and nitroglycerine. **Multibase** (Composite) Contains oxidizing agent in a matrix of binder.
Red phosphorus	Used for pyrotechnics and for manufacturing of incendiary shells, smoke bombs, and tracer bullets.
Sodium nitrate	Used in industrial explosives and in B-black powder as an oxidizer.
Thermite	An incendiary composition consisting of 2.75 parts of black iron oxide (ferrosoferric oxide) and 1.0 part granular aluminum.
Trinitrotoluene	The most important explosive for blasting charges of each kind of weapon; also an important component of industrial explosives.

ACRONYMNS

ARARs	Applicable and Relevant or Appropriate Requirements.
ASTM	American Society for Testing and Materials.
CAP	Corrective Action Permit.
CLEAN	Comprehensive Long-Term Environmental Action Navy.
COC	Chain of Custody.
COMPD	Ammonium picrate.
CTO	Contract Task Order.
EDM	Electronic distance meter.
EOD	Explosive Ordnance Disposal.
EODS	Explosive Ordnance Disposal School.
EPA	United States Environmental Protection Agency.
FOL	Field Operations Leader.
FSAP	Field Sampling and Analysis Plan.
ft AMSL	Feet above mean sea level.
Halliburton NUS	Halliburton NUS Corporation.
HASP	Health and Safety Plan.
HMX	Cyclotetramethylene tetranitramine; Octogen; Homocyclonite.
IDW	Investigative Derived Wastes.
IED	Improvised Explosive Devices.
IHDIVNAVSURFWARCEN	Indian Head Division, Naval Surface Warfare Center.
IOD	Inert Ordnance Disposal.
NAVEODTECHDIV	Naval Explosive Ordnance Disposal Technology Division.
NAVSCOLEOD	Naval School Explosive Ordnance Disposal.
NC	Nitrocellulose.

NEESA	Naval Energy and Environmental Support Activity.
NG	Nitroglycerine.
NQ	Nitroguanidine.
OVA	Organic vapor analyzer.
PCBs	Polychlorinated biphenyls.
PETN	Pentaerythritol tetranitrate.
PID	Photo-ionization detector
PVC	Polyvinyl chloride.
QA/QC	Quality Assurance/Quality Control.
RBCs	Risk-Based Concentrations.
RCRA	Resource Conservation and Recovery Act.
RDX	Cyclonite; trimethylenetrinitramine.
Semi-VOCs	Semivolatile organic compounds.
SOP	Standard operating procedure.
SWMU	Solid Waste Management Unit.
TAL	Target Analyte List.
TCL	Target Compound List.
TH3	Thermite
TKN	Total Kjeldahl nitrogen.
TNT	2,4,6-Trinitrotoluene.
TOC	Total Organic Carbon.
TOX	Total organic halides.
TPH	Total petroleum hydrocarbons.
USCS	Unified Soil Classification System.
VI/RFI	Verification Investigation/RCRA Facility Investigation.
VOCs	Volatile organic compounds.

1.0 INTRODUCTION

This Verification Investigation (VI) Report presents the results of environmental investigations conducted at four solid waste management units (SWMUs) within the Naval Explosive Ordnance Disposal Technology Division (NAVEODTECHDIV), Stump Neck Annex, Indian Head, Maryland. NAVEODTECHDIV is a tenant activity at the Indian Head Division, Naval Surface Warfare Center (IHDIVNAVSURFWARCEN). The following four SWMUs within NAVEODTECHDIV were the focus of the investigation:

- Range 6 (SWMU 5)
- The Improvised Explosive Devices (IED) Site (SWMU 26)
- The Inert Ordnance Disposal (IOD) Site (SWMU 27)
- Area 8, the Underwater Ordnance Training Area (SWMU 25)

The IHDIVNAVSURFWARCEN is located near Indian Head, Maryland, in the west-central portion of Charles County, approximately 30 miles south-southwest of Washington, D.C., as illustrated in Figure 1-1. This facility occupies two peninsulas of land along the eastern shore of the Potomac River. The NAVEODTECHDIV is located on 1,100 acres situated on the southwest portion of the peninsula known as Stump Neck Annex (Stump Neck). Stump Neck is separated from the main side (IHDIVNAVSURFWARCEN) peninsula by Mattawoman Creek. The locations of IHDIVNAVSURFWARCEN and Stump Neck are illustrated in Figure 1-2. Range 6, the IED, the IOD, and Area 8 are all located on Stump Neck and are controlled by the NAVEODTECHDIV. The sites are located as noted in Figure 1-3.

Authorization for Brown & Root Environmental to preform the Verification Investigation work tasks was provided by the Northern Division of the Naval Facilities Engineering Command via Contract Task Order (CTO) Number 222, under the Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract Number N62472-90-D-1298.

1.1 OBJECTIVES OF THE INVESTIGATION

The primary goal of the verification investigation is to collect information necessary to determine if remediation may be necessary at NAVEODTECHDIV SWMUs 5, 25, 26, and 27 and to formulate a cost estimate for remediation, if necessary. The principal mission of NAVEODTECHDIV is to provide Explosive

Ordnance Disposal (EOD) technology and logistics management for the joint U. S. military services and to develop war essential elements of intelligence, equipment, and procedures to counter munitions, both domestic and foreign, as required to support the United States Department of Defense and the peacetime security needs of other agencies.

A major tenant organization of IHDIVNAVSURFWARCEN, the Naval School Explosive Ordnance Disposal (NAVSCOLEOD) conducted training exercises at Range 6, the IED, the IOD, and Area 8. Active military personnel were trained at these sites to perform Explosive Ordnance Disposal (EOD) operations. The NAVSCOLEOD is scheduled for relocation. IHDIVNAVSURFWARCEN is responsible for identifying and addressing any potential environmentally impacted sites caused by the NAVSCOLEOD.

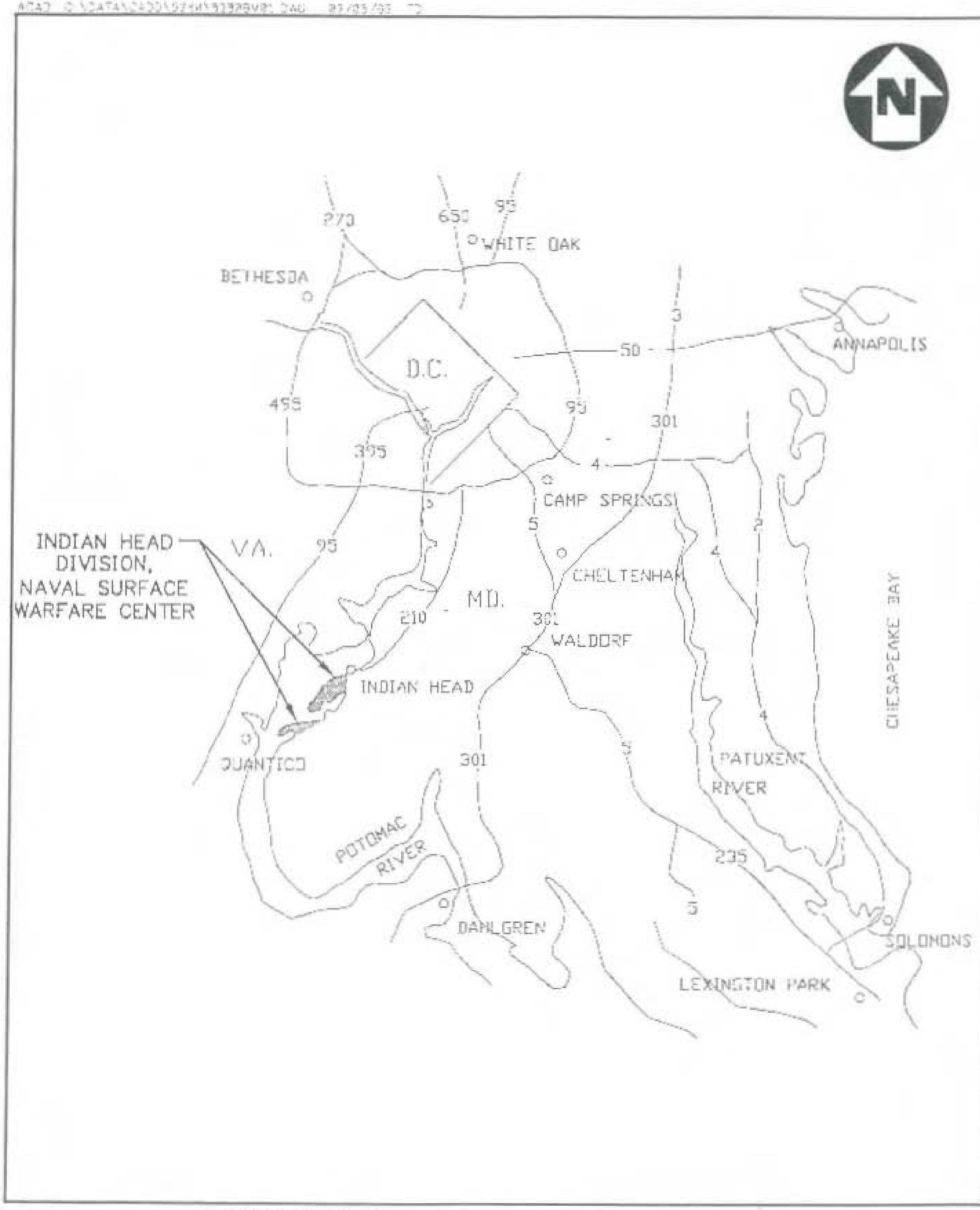
Environmental investigations are being conducted at Range 6, the IOD, the IED, and Area 8 because of the planned NAVSCOLEOD relocation and because Range 6 is included in a Resource Conservation And Recovery Act (RCRA) Corrective Action Permit (CAP) for the Stump Neck Annex. (The investigation is referred to as the Verification Investigation (VI) throughout this Report.) The permit (Corrective Action Permit Number MD 417 009 0001) was issued in January, 1991, by Region III of the United States Environmental Protection Agency (EPA). In response to the Corrective Action Permit, the Navy developed and submitted a Verification Investigation/RCRA Facility Investigation (VI/RFI) Work Plan (Ensafe, Allen, and Hoshall, July 1991). The specifications of the VI/RFI Work Plan were considered in the preparation of the VI Work Plan, which received conditional approval from EPA Region III on August 16, 1995. The IED, the IOD, and Area 8 have been identified for possible inclusion in the Corrective Action Permit.

1.2 ORGANIZATION OF THE VI REPORT

This VI Report is divided into seven major sections. This introduction is Section 1.0. A description of the field investigation activities and the risk assessment strategy used to evaluate the results of the field investigation results is presented in Section 2.0. Section 3.0 provides a general discussion of the characteristics of the study area. Sections 4.0, 5.0, 6.0, and 7.0 provide the following information for Range 6, the IED, the IOD, and Area 8, respectively:

- Site background and physical setting
- Site operations and history
- A discussion of the site-specific VI field investigation
- A discussion of site-specific geology and hydrogeology

- The results of the sampling and analysis of environmental media
- The results of qualitative and quantitative assessment of target analyte concentrations detected in the environmental media



VICINITY MAP
STUMP NECK ANNEX
NAVAL SURFACE WARFARE CENTER
INDIAN HEAD, MD

FIGURE 1-1

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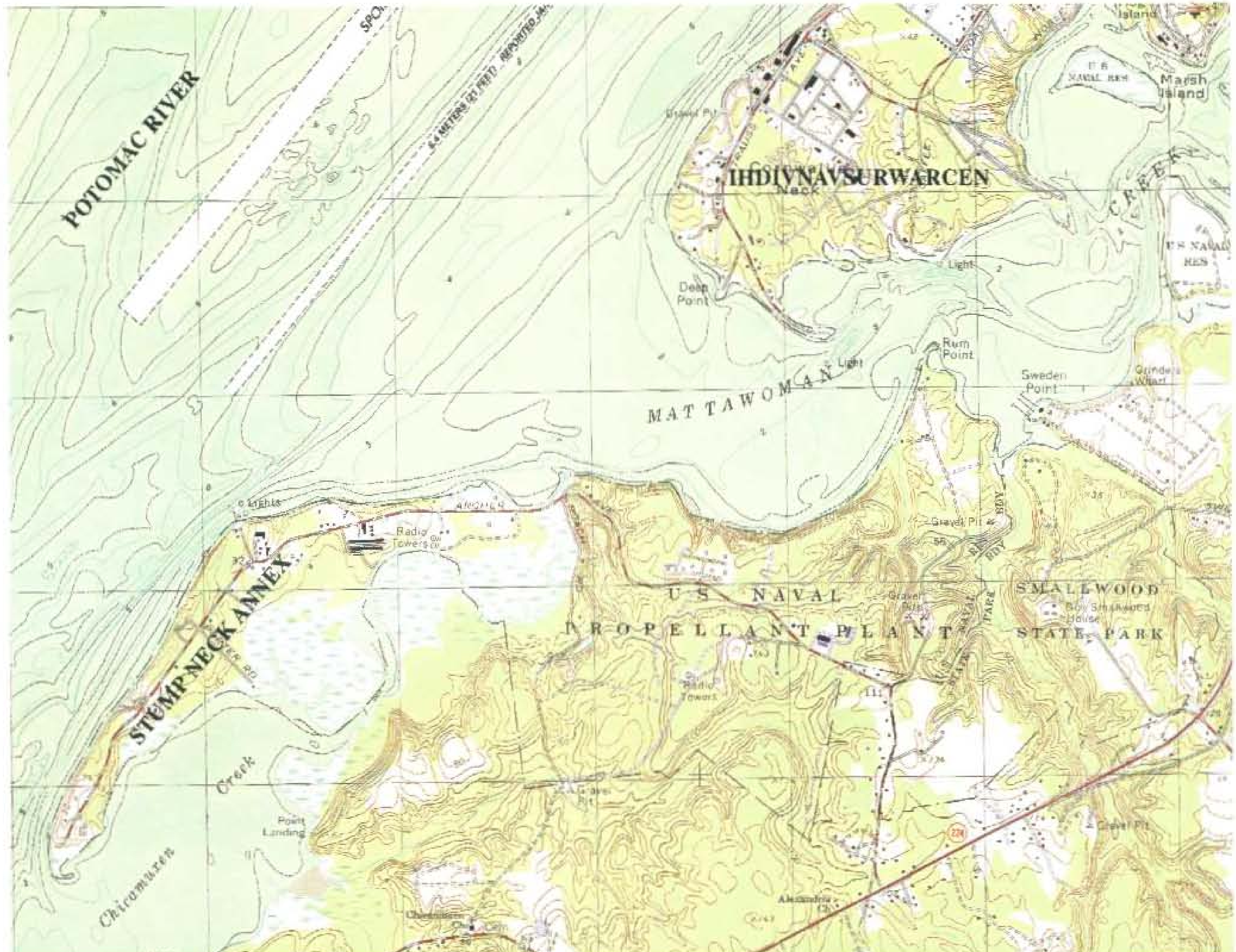

SOURCE: BASEMAP IS A PORTION OF THE USGS 7.5 MINUTES SERIES QUADRANGLE INDIANHEAD, MD-VA, 1966, PHOTOREVISED 1978.

LOCATION MAP STUMP NECK ANNEX
NAVAL SURFACE WARFARE CENTER, INDIAN HEAD, MD

0 2000 4000
SCALE IN FEET

FIGURE 1-2

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1-5

APPROXIMATE LOCATION OF RANGE 6
THE IED, THE IOD, AND AREA 8
STUMP NECK ANNEX
NAVAL SURFACE WARFARE CENTER

0 2000 4000

FIGURE 1-3

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DRAFT

2.0 STUDY AREA INVESTIGATION

2.1 FIELD SAMPLING ACTIVITIES CONDUCTED AT INDIAN HEAD

The following sections describe the Verification Investigation (VI) field sampling activities conducted between June 1995 and October 1995 at SWMUs 5, 25, 26, and 27.

The objectives of the data collection planned for Range 6, the IOD, the IED, and Area 8 were twofold:

- Determine if environmental contaminants were present at Range 6, the IOD, the IED, and Area 8 at concentrations exceeding chemical specific Applicable and Relevant or Appropriate Requirements (ARARs) or at concentrations of public or environmental health concern.
- Collect analytical data of a quality that will meet requirements established in the RCRA Corrective Action Permit for Stump Neck.

Unless otherwise noted, all field activities were carried out in accordance with the Halliburton NUS Verification Investigation Work Plan (Halliburton NUS, 1995). All samples were collected in accordance with the relevant Halliburton NUS Standard Operation Procedures (SOPs) included in the planning documents. Also, unless otherwise noted, all activities were conducted by Halliburton NUS. (The reader should note that Halliburton NUS is now known as Brown & Root Environmental.) A summary of the environmental samples submitted to a field-based laboratory for analysis is presented in Table 2-1.

2.1.1 Site Background Information Research

Because of limited documented information available regarding the operations conducted at each site, site background research was conducted. Brown & Root Environmental personnel interviewed military/civilian personnel during a site visit on June 20 and 21, 1995. The questionnaire used in the interview is provided in Appendix A

2.1.2 Field Test Kits

Field test-kit screening was used as part of the environmental investigations conducted at Range 6 and Area 8. Field test-screening is a cost and time-efficient means of gathering field chemistry data for large sites and/or sites where little information is presently available. The results of the field test-kit screening were used to assist in the placement of soil borings and groundwater monitoring wells at Range 6 and Area 8. The kits procured from D-tech Corporation target the following analytes:

- 2,4,6-Trinitrotoluene (TNT)
- Cyclotetramethylene tetranitramine (HMX)
- Cyclo-1,3,5-trimethylene-2,4,6-trinitramine (RDX)

Literature on the use and limitations of the field screening test kits is provided in Appendix B.

TNT, HMX, and RDX are among the explosives potentially used during the training exercises conducted at Range 6 and Area 8. They are the only explosives specifically identified in the Corrective Action Permit for Range 6 at Stump Neck. Risk-based concentrations (RBCs) established by Region III of the Environmental Protection Agency (EPA) are available for these explosives. These RBCs are available for water, assuming domestic consumption of a water resource, and for soils, assuming industrial or residential land use scenarios (A copy of the March 7, 1995 version of the EPA Region III Risk-Based Concentration Table is provided in Appendix C). Table 2-2 compares the available RBCs to detection limits achievable using the field screening test kits. The comparison indicates that the detection limits achievable by the field test kits are lower than or within the same order of magnitude as the RBCs.

2.1.2.1 Range 6 - Field Screening

The purpose of the field test-kit screening at Range 6 was to investigate the near-surface soils for the presence of TNT, HMX, and RDX. A site-specific sampling grid was established prior to the collection and screening of the near surface soils at Range 6. A 425-foot by 300-foot grid using 71-foot x 106-foot spacings between each location was staked to the south of Archer Avenue using labeled wooden hubs (see Figure 4-2). The grid was set up to encompass the area most intensively used during site activities. Prior to collecting the samples at each staked location, a preliminary sample set was collected and analyzed with the field test-kits at 6-inch intervals (0-6", 6-12", 12-18", and 18-24") from one of the grid locations (06-SS-13) to determine which soil depth interval demonstrated the highest soil contamination.

Samples from the remaining sample locations would be collected from the depth demonstrating the highest readings. The 6- to 12-inch-deep sample interval demonstrated the highest field test-kit readings (see Figure 4-2). The second highest readings came from the 0- to 6-inch interval. Therefore, all of the remaining near-surface soil samples were collected from a depth 0 to 12 inches at Range 6. In addition, three background samples were collected north of Archer Road and analyzed using the sample test-kit techniques. The results of the field test-kit samples (see Figure 4-2) were also used to locate monitoring well 5MW01. Field test-kit screening results were recorded on a sample log sheet that is provided in Appendix D.

2.1.2.2 Area 8 - Field Screening Samples

The field test-kit screening at Area 8 was used to determine the presence or absence of TNT, HMX, and RDX in surface water, soil, and sediment samples collected at water-shot and air shot locations. These locations were selected for screening based upon historic documentation available for Area 8 and based upon information received during interviews with personnel familiar with Area 8. The 25 most-used locations were sampled. A surface water and sediment sample was collected at the water-shot locations. Surface soil samples were collected at the point of detonation at the air-shot locations. The screening results were used to determine the locations of the three soil borings and two of the three monitoring wells drilled at the site (see Figure 7-3). It should be noted that the air-shot and water-shot locations shown on Figure 7-3 are best approximations based on conversations with Base personnel. The air-shot locations are at times set up in a different orientation. The results of the field test-kit screening were recorded on a sample log sheet that is provided in Appendix D and are displayed in Figure 7-3.

2.1.3 Surface Water and Sediment Samples

Surface water and sediment samples were collected at four Area 8 locations for fixed-base laboratory analysis. One surface water and sediment sample (S25-SW001, S25-SD001) was collected from water-shot location 7-B. A second surface water and sediment sample (S25-SW002, S25-SD002) was collected from water-shot location 23-B. These locations are considered by Base personnel to be the most used water-shot locations. A third surface water and sediment sample (S25-SW003, S25-SD003) was collected from Chicamuxen Creek adjacent to water-shot location 7-A. The fourth surface water and sediment sample (S25-SW004, S25-SD004) was a background sample collected from Chicamuxen Creek, upstream of all air-shot and water-shot locations (see Figure 7-1 for all surface water and sediment sample locations). Field test-kit analyses were also performed on surface water and sediment samples S25-

SW001, S25-SD001, S25-SW002, S25-SD002, S25-SW003, and S25-SD003 to allow a comparison of results provided by the fixed-base laboratory and the field test kits. All four surface water and sediment samples were analyzed for the parameters listed in Table 2-1.

Surface water and sediment characteristics were noted on the sample log sheets for each sample collected. All of the sediment samples were collected with a stainless-steel trowel from a depth of 0 to 6 inches below the bottom of the surface water. All of the surface water samples were collected with a stainless-steel beaker or by directly inserting the sample bottle into the surface water. A copy of each sample log sheet is provided in Appendix E.

2.1.4 Soil Boring/Monitoring Well Soil Samples

Fourteen soil samples were collected during the drilling of seven monitoring well borings, and fourteen soil samples were collected during the drilling of seven soil borings, for fixed-base laboratory analysis. One of the samples for each boring was collected at a depth of 0 to 2 feet below ground surface (i.e., the top soil boring interval). The second sample was collected just above the water table if groundwater was encountered between 0 to 15 feet. If groundwater was encountered below 15 feet, then the second sample was collected from 2 to 5 feet below the ground surface. The samples were collected using split-spoon sampling techniques. The soil borings were advanced using hollow-stem augers. Soil samples were collected using split-spoon sampling techniques, following American Society for Testing and Materials (ASTM) Method 1586 procedures.

A lithologic description was provided for each split-spoon sample, and a complete log of each boring was maintained. The boring logs are provided in Appendix F.

Two shallow soil samples (0-2 feet below surface) were collected at the IOD site using a hand auger.

2.1.5 Monitoring Well Construction

Seven groundwater monitoring wells were installed during the environmental investigations of Range 6 (SWMU 5), the IED (SWMU 26), and Area 8 (SWMU 25). As with the soil borings, hollow-stem auger drilling techniques were used as the method of drilling the monitoring well borings. The monitoring wells were installed as overburden wells. The wells were constructed of 2-inch inside-diameter (I.D.), NSFapproved Schedule 40, flush-joint, polyvinyl chloride (PVC) riser pipe and factory-slotted PVC well screen. All well screens were 10 feet in length, with 0.01-inch slot size.

The top of the screened interval was positioned at or approximately 1 foot above the stabilized water level. The wells were installed through the augers using the following methods. A silica sand pack (Nos. 20 to 30 U.S. Standard Sieve size) was installed into the boring annulus around the well screen as the augers were withdrawn from the boring. The sand pack was installed from the bottom of the hole to a level of approximately 1 to 2 feet above the top of the well screen. A bentonite pellet seal approximately 2 feet thick was installed above the sand pack and allowed to hydrate. The remainder of the annulus of the boring (from the seal to the ground surface) was then backfilled with a bentonite grout emplaced using a tremie pipe. The depths of the top of all backfill materials were constantly monitored during the well installation process by means of a weighted, stainless-steel or fiberglass tape.

A 6-inch-diameter protective steel casing equipped with a locking steel cap was installed around the wells. The protective casing was grouted a minimum of 3 feet into the ground. In addition, a concrete apron measuring 3 feet by 3 feet by 0.5 foot was centered around the casing of the well. The marker posts were positioned equidistant from one another and near the corners of the concrete apron. The locks supplied for each well were keyed alike. After installation, the ground surface and the top of the PVC riser pipe were surveyed to within 0.01-foot vertical accuracy. In addition, the wells were surveyed to a 0.1-foot horizontal accuracy.

A monitoring well construction diagram was completed for each well installed. Copies of the monitoring well construction forms are provided in Appendix F.

2.1.6 Well Development

Monitoring wells were developed after installation to remove fines from around the well screens, using a stainless-steel bailer. The temperature, pH, specific conductance, and turbidity of the purged water were measured during development. Wells were to be considered developed when these readings became stable and the purge water became visibly clear. Because of the low permeabilities of the screened formations, the monitoring wells were purged dry, allowed to recover at least 80 percent, then purged again, using the bailer to surge the well. This process was repeated several times. Because of the amount of fines present in the formation, it was not possible to develop the wells until the water was visibly clear. All information collected during well development was recorded in the field logbook.

2.1.7 Water-Level Measurements

One complete round of water levels was collected from all of the monitoring wells on October 17, 1995. Measurements were taken with an electronic water-level indicator (M-scope) using the top of the well casing as the reference point for determining depths to water. Water-level measurements were recorded to the nearest 0.01 foot in the field log book and on a groundwater-level measurement form (provided in Appendix G).

2.1.8 Groundwater Sampling

One round of groundwater samples was obtained from the seven newly installed groundwater monitoring wells. Before samples were obtained, water levels were measured and the wells were purged using a dedicated stainless-steel bailer. A minimum of three volumes of water was purged from monitoring well 25MW03 before sampling. The other six wells were purged dry before three volumes of water were evacuated. The water level in each well was allowed to recover a minimum 70 percent of the original level prior to sampling. Field measurements of pH, temperature, and specific conductance were taken for each well volume during purging. Dedicated stainless-steel bailers with polyethylene bailing line were used for sample collection. Groundwater samples were poured directly from the bailer into the appropriate sample bottles for analysis.

All pertinent field data were recorded using the appropriate sample log sheet and field log book. The sample log sheets are provided in Appendix E.

2.1.9 Aquifer Testing

Monitoring wells were used for aquifer testing to determine the hydraulic conductivity of the water-bearing zone penetrated by each well. In-situ hydraulic conductivity tests (slug tests) were performed at all seven monitoring wells.

Rising-head slug tests were performed at each of the newly installed monitoring wells. If the well screen was fully submerged, then a falling-head slug test was also performed. The rising-head slug tests were performed by lowering a solid slug of known volume below the water level within the well. After the water level restabilized, the slug was suddenly removed to create a drop of water level within the well. A 10-pounds-per-square-inch (psi) pressure transducer and a data logger were used to record the rate of water-level recovery. The data were analyzed using the Hvorslev method (Hvorslev, 1951). Falling-head slug tests were performed by rapidly lowering a slug of known volume into the well below the water surface, raising the water-level within the well. The subsequent rate of water level recovery back down to the original static water level (time versus recovery) was measured to determine hydraulic conductivity of the aquifer. Slug test calculations and data are located in Appendix G.

2.1.10 Surveying

All monitoring well and soil boring locations, as well as key test-kit screening locations, sediment sampling locations, and surface water sampling locations, were surveyed. Existing survey monuments and site grids within NAVEODTECHDIV were used as reference points. The horizontal locations of all points were surveyed to the nearest 0.1 foot. Vertical elevations were referenced to the 1929 North American Datum. For monitoring wells, the elevation was surveyed to the nearest 0.01 foot at each measuring point (top of well casing). Ground surface elevations were also surveyed to the nearest 0.01 foot.

2.1.11 Waste Handling

In all areas, drill cuttings, purge water, and development water were collected and containerized in Department of Transportation (DOT) approved (Specification 17C), 55-gallon drums at the site and stored at each site. All drums were sealed and labeled with drum contents, site number, boring/well number, date and the following statements: "Results Pending Analysis", "Investigative Derived Waste" as requested by Navy personnel.

Lined decontamination pads were constructed and used to collect the water from the steam cleaning of the drilling equipment. The water was periodically pumped out of the lined pad and into 55-gallon drums. The drums were stored at the decon pad and are labeled as mentioned in the preceding paragraph. The Navy took possession of the drums upon completion of the field effort.

2.1.12 Equipment Decontamination

All of the procedures for decontamination of equipment are referenced in the VI Work Plan (Halliburton NUS, 1995).

2.1.13 Sample Handling

All sample handling procedures are described in the VI Work Plan (Halliburton NUS, 1995).

2.1.14 Sample Custody

Sample custody was maintained and documented at all times. Chain-of-custody (COC) began with the collection of samples in the field. Section 5.3 of Halliburton NUS SOP SA-6.1, contained in Appendix H, provides a description of the COC procedure that was followed. The COC record forms are included in Appendix E.

Samples were packaged and shipped in accordance with Standard Operation Procedure SA-6.2, contained in Appendix H.

2.1.15 Quality Control Samples

In addition to regular calibration of field equipment and appropriate documentation, quality control (QC) samples were generated during environmental sampling activities. All of the QC samples collected are described in the VI Work Plan (Halliburton NUS, 1995).

Appendix E contains the quality control sample logsheets for the equipment blanks. Field duplicate sample logsheets are located in the associated Solid Waste Management Unit (SWMU) section.

2.2 RISK ASSESSMENT METHODOLOGY

Although the Verification Investigation of SWMUs 5, 25, 26, and 27 was designed primarily to determine the presence/absence of contamination, human and environmental health risk assessments have been incorporated into the VI report to assist the reader in his or her evaluation of target analyte concentrations detected in the environmental media sampled during the VI field activities. Although the risk assessment is primarily qualitative in nature (i.e., it relies on a comparison of site contaminant concentrations to standards, criteria, and risk-based concentrations.), a quantitative risk assessment is also presented to address the issue of cumulative risk and to allow a comparison of site risks to EPA risk benchmarks. This section presents the qualitative and quantitative risk assessment methodology used to evaluate the results of the analysis of environmental samples collected at Range 6, the IED, the IOD, and Area 8. The results of the risk assessments are presented on a SWMU specific basis in Section 4, 5, 6, and 7.

2.2.1 Qualitative Risk Assessment Methodology

As a first step in the risk assessment process, maximum contaminant concentrations detected at the four SWMUs under investigation were compared to the appropriate standards and criteria presented in Table 2-3 and to the EPA Region III Risk-Based Concentrations (RBCs) and Soil Screening Levels (SSLs) (for the evaluation/protection of groundwater and air quality) presented in Appendix C. Appendix C defines the EPA Region III RBCs and SSLs and presents the methodology used to derive the EPA Region III RBCs and SSLs. Qualitative risk assessment tables (i.e., comparison tables) were developed on a SWMU and media specific basis and are presented in Sections 4 through 7. Target analytes detected at concentrations exceeding the appropriate standards, criteria, or EPA Region III RBCs/SSLs and also exceeding background concentrations were selected as contaminants of potential concern (COPCs) and further evaluated using the quantitative risk assessment methodology presented in Section 2.2.2.

It should be noted that all environmental data evaluated in the qualitative and quantitative risk assessments were reviewed and validated per EPA Region III validation protocol. Environmental data "rejected" per that protocol have not been incorporated into the risk assessment.

2.2.2 Quantitative Risk Assessment Methodology

The following risk assessment elements were incorporated into the quantitative risk assessment of COPCs identified as a result of the qualitative risk assessment methodology presented in Section 2.2.1:

- Exposure assessment
- Toxicity assessment
- Risk characterization

These elements are defined in the following paragraphs.

2.2.2.1 Exposure Assessment

Assuming that COPCs are identified in an environmental media, an exposure assessment identifies the exposure mechanisms and pathways by which human receptors may contact COPCs. Importantly, the exposure assessment attempts to estimate the "dose" to which an individual may theoretically be exposed as a result of contact with COPCs in an environmental media. Current and anticipated land use scenarios dictate the human receptors potentially at risk. Although the EOD schools at NAVEODTECHDIV are scheduled for relocation, the quantitative risk assessment for the VI will be performed assuming future industrial (e.g., military) and residential land use scenarios. Based on discussion with Navy personnel the industrial (e.g., military) land use scenario is the anticipated future land use at the four Stump Neck SWMUs under investigation. The evaluation of a future residential land use scenario is included in the quantitative baseline risk assessment for purposes of completeness. It is not anticipated that any of the four sites will be used for residential purposes in the future.

The receptors of concern and exposure assumptions to be evaluated assuming future industrial or residential land use scenarios are presented in Table 2-4. This baseline risk assessment relies heavily on EPA Region III methodology presented in the EPA Region III Risk-Based Concentration Table, July-December 1995 memorandum (the EPA memorandum). Much of the exposure assessment methodology used is detailed in a copy of the memorandum included in Appendix C of this report and is not repeated in this section. The EPA memorandum presents methodology for the evaluation receptors exposed to soil and groundwater constituents via the ingestion and inhalation pathways. This risk assessment will also evaluate risks to receptors as a result of dermal contact with COPCs in the environmental media. As noted previously, the human receptors that will be evaluated and the exposure dose assumptions for the evaluation are presented in Table 2-4. Example exposure dose calculations are presented in Appendix K.

2.2.2.2 Toxicity Assessment

This section discusses the toxicity criteria that will be used to characterize the human health risk associated with exposure to COPCs detected in the environmental media sampled at SWMUs under investigation. Estimated human exposure doses resulting from potential human contact with contaminated environmental media will be evaluated using the Reference Doses and Carcinogenic Slope Factors presented in Table 2-5. The methodology for estimating exposure doses is presented in Table 2-4 and Appendix K.

The available toxicity criteria presented in Table 2-5 are summarized from IRIS (U.S. EPA, January 1996). Toxicity criteria available from EPA Region III Memorandum and the EPA Health Effects Assessment Summary Tables (HEAST) FY-1995 are presented when toxicity criteria are not available from IRIS.

2.2.2.2.1 Reference Doses

As defined in IRIS (the EPA Integrated Risk Information System), an RfD is an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime. RfDs are developed for chronic and/or subchronic human exposure to hazardous chemicals and are based on the assumption that thresholds exist for certain toxic effects. The RfD is usually expressed as an acceptable dose (mg) per unit body weight (kg) per unit time (day). The RfD is derived by dividing the no-observed-adverse-effect-level (NOAEL) or the lowest-observed-adverse-effect-level (LOAEL) by an uncertainty factor (UF) times a modifying factor. The use of uncertainty factors and modifying factors is discussed in IRIS and in the EPA, Office of Research and Development (ORD) Health Effects Assessment Summary Tables, FY-1994.

The uncertainty factor used in calculating the RfD reflects scientific judgement regarding the various types of data used to estimated RfD values. An uncertainty factor of 10 is usually used to account for variation in human sensitivity when extrapolating from valid human studies involving subchronic (for subchronic RfDs) or long-term (for chronic RfD) exposure of average, healthy subjects. An additional 10-fold factor is usually used for each of the following extrapolations: from long-term animal studies to the case of humans, from a LOAEL to a NOAEL, and from subchronic studies to a chronic RfD. An additional uncertainty or modifying factor, ranging from >0 to 10, is applied to reflect professional assessment of the uncertainties of the study and database not explicitly addressed by the above uncertainty factors (such as completeness of the overall data base). The default value for this modifying factor is 1.

2.2.2.2.2 Cancer Slope Factors

CSFs are used to estimate the lifetime probability (assumed 70-year lifespan) of human receptors contracting cancer as a result of exposure to known or suspected carcinogens. This factor is generally reported in units of $(mg/kg/day)^{-1}$ and is derived through assumed low-dosage responses determined from human or animal studies. Cancer risk and CSFs are most commonly estimated through the use of a linearized, multistage, mathematical extrapolation model applied to animal bioassay results. The value used in reporting the slope factor is the upper 95 percent confidence limit.

2.2.2.3 Risk Characterization

The risk characterization evaluates the potential for adverse health effects from exposure to COPC concentrations in environmental media by integrating information developed during the exposure and toxicity assessments.

<u>Methodology for Estimation of Carcinogenic Risks</u>

Carcinogenic risks can be estimated by combining information on the strength or potency of a known or suspected carcinogen (Carcinogenic Slope Factor, Table 2-5) with an estimate of the individual exposure doses of a chemical. Carcinogenic risk may be estimated as follows:

Risk = (CSF)(Dose)

Where

CSF = Carcinogenic Slope Factor (slope of the dose-response curve in $(mg/kg\text{-}day)^{-1}$ from Table 2-5).

Dose = Amount of a contaminant absorbed by a receptor in mg/kg-day.

The equation presented above, however, is valid only at risk levels less than or equal to 1×10^{-2}. When the risk estimate is expected to be greater than 1×10^{-2}, an alternate equation, such as the following one-hit equation may be used to estimate risk (U.S. EPA, 1989):

Risk = 1 - exp(-Dose x CSF)

The resultant risk value (e.g., 1×10^{-6} or a 1-in-1,000,000 chance) can be applied to a given population to determine the number of excess cases of cancer that could be expected to result from exposure (e.g., 1×10^{-6} is one additional case of cancer in 1,000,000 exposed persons).

The total risk for exposure to multiple compounds is presented as the summation of the risk for the individual contaminants. Risks can be calculated in this manner under the following assumptions:

- There are no antagonist/synergistic effects between chemicals.
- All chemicals produce the same result (cancer).
- Cancer risks from various exposure routes are additive, if the exposed populations are the same (U.S. EPA, 1989).

Methodology for Estimation of Noncarcinogenic Risks

Potential health risks resulting from exposure to non-carcinogenic compounds are estimated by comparing the maximum daily dose calculated for an exposure to an acceptable intake dose, such as a chronic or subchronic reference dose. If the ratio between an exposure dose and the RfD exceeds unity, there is a potential health risk associated with exposure to that chemical (U.S. EPA, 1989). The Dose/RfD ratio is not a mathematical prediction of the severity or probability of toxic effects; it is simply a numerical indicator of the potential for adverse effects. The ratio of the exposure dose to the Reference Dose is referred to as the Hazard Quotient (HQ). The summation of HQs for several compounds is referred to as the Hazard Index (HI).

Conservatively, a total HI for any exposure route is calculated by summing the Dose/RfD ratios (HQs) for the individual chemicals of concern (U.S. EPA, 1989). To provide a better indication of risks, Dose/RfD ratios should be summed according to the target organ affected. For example, the Dose/RfD ratios for those chemicals affecting the liver should be summed separately from those chemicals affecting the nervous system.

The target organ or toxicity endpoints of concern identified on Table 2-5 are those that were specified on IRIS (U.S. EPA, 1996) or the Health Effects Assessment Summary Tables (U.S. EPA, FY-1995) as the endpoint of concern for the Reference Dose. The HI and RfDs are subject to the uncertainties described in this section.

2.2.2.4 Ecological Risk Assessment Methodology

A comprehensive ecological risk assessment considering all exposure pathways and evaluating risks to specific species is not possible, nor appropriate, within the scope of this Verification Investigation Report.

Therefore, the screening level approach, based on the environmental effects quotient, will be used to conduct a general ecological risk assessment, as recommended by EPA Region III (USEPA Region III, 1994). At each sampling location, maximum concentrations of contaminants in a given medium will be compared to conservative ecotoxicological criteria. Where the ratio of the maximum contaminant concentration to the ecotoxicological criterion (the environmental effects quotient) is greater than one, a potential for ecological risk exists. For media where ecotoxicolical criteria are not readily available, a comparison to background concentrations will be made, if available, to determine whether there is any evidence of contamination that may pose an ecological risk. If neither background data nor criteria are available for a medium at a given location, the ecological risk from that medium will not be evaluated. Factors that may affect the potential ecological risks at a site will be briefly discussed.

TABLE 2-1A

SAMPLE SUMMARY FOR GROUNDWATER AND SURFACE WATER SAMPLES
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Sample Number	Appendix IX VOA[1]	Appendix IX SVOA[1]	Energetics[1]	TAL Metals and Cyanide[1]	Indicator Parameters[1]	TPH[2]	TCL PCBs[1]
5MW01	X	X	X	X	X		
FD09 (dup 5MW01)	X	X	X	X	X		
25MW01	X	X	X	X	X		
25MW02	X	X	X	X	X		
25MW03	X	X	X	X	X		
S25-SW001	X	X	X	X	X		
S25-SW002	X	X	X	X	X		
S25-SW003	X	X	X	X	X		
S25-SW004	X	X	X	X	X		
FD06 (dup SW001)	X	X	X	X	X		
26MW01	X	X	X	X	X	X	X
26MW02	X	X	X	X	X	X	X
26MW03	X	X	X	X	X	X	X
FD10 (dup 26MW01)						X	X

1 Refer to the analytical database in Appendix I for a listing of the parameters analyzed for under the appropriate fractions.
2 TPH - Total Petroleum Hydrocarbons.

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TABLE 2-1B

SAMPLE SUMMARY FOR SOIL AND SEDIMENT SAMPLES
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Sample Number	Appendix IX VOA[1]	Appendix IX SVOA[1]	Energetics[1]	TAL Metals and Cyanide[1]	Indicator Parameters[1]	TPH[2]	TCL PCBs[1]
S05-MW01-01	X	X	X	X	X		
S05-MW01-02	X	X	X	X	X		
FD03 (S05-MW01-01)			X	X	X		
FD04 (S05-MW-01-02)	X	X					
S25-SB01-001			X	X	X		
S25-SB01-002	X	X	X	X	X		
S25-SB02-001			X	X	X		
S25-SB02-002	X	X	X	X	X		
S25-SB03-001			X	X	X		
S25-SB03-002	X	X	X	X	X		
S25-MW01-01			X	X	X		
S25-MW01-02	X	X	X	X	X		
S25-MW02-001			X	X	X		
S25-MW02-002	X	X	X	X	X		
S25-MW03-001			X	X	X		
S25-MW03-002			X	X	X		

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TABLE 2-1B (Continued)
SAMPLE SUMMARY FOR SOIL AND SEDIMENT SAMPLES
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Sample Number	Appendix IX VOA[1]	Appendix IX SVOA[1]	Energetics[1]	TAL Metals and Cyanide[1]	Indicator Parameters[1]	TPH[2]	TCL PCBs[1]
FDO1 (dup MW01-001)			X	X	X		
FD02 (dup MW01-002)	X	X					
S25-SD001	X	X	X	X	X		
S25-SD002	X	X	X	X	X		
S25-SD003	X	X	X	X	X		
S25-SD004	X	X	X	X	X		
FD05 (dup SD001)	X	X	X	X	X		
S26-SB01-01	X	X	X	X	X	X	X
S26-SB01-02	X	X	X	X	X	X	X
S26-SB02-001	X	X	X	X	X	X	X
S26-SB02-002	X	X		X	X	X	X
S26-SB03-001	X	X	X	X	X	X	X
S26-SB03-002	X	X		X	X	X	X
S26-SB04-001	X	X	X	X	X	X	X
S26-SB04-002	X	X		X	X	X	X
S26-MW01-01	X	X		X	X	X	X
S26-MW01-02	X	X		X	X	X	X
S26-MW02-001	X	X		X	X	X	X

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TABLE 2-1B (Continued)
SAMPLE SUMMARY FOR SOIL AND SEDIMENT SAMPLES
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Sample Number	Appendix IX VOA[1]	Appendix IX SVOA[1]	Energetics[1]	TAL Metals and Cyanide[1]	Indicator Parameters[1]	TPH[2]	TCL PCBs[1]
S26-MW02-002	X	X		X	X	X	X
S26-MW03-001	X	X		X	X	X	X
S26-MW03-002	X	X		X	X	X	X
FD07 (dup S26-SB02-001)						X	X
FD08 (dup S26-SB04-001)	X	X	X	X	X	X	X
S27-SS-001	X	X	X	X	X		
S27-SS-002	X	X	X	X	X		

1 Refer to the analytical database in Appendix I for a listing of the parameters analyzed for under the appropriate fractions.
2 TPH - total petroleum hydrocarbons.

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TABLE 2-2

COMPARISON OF RISK BASED CONCENTRATIONS (RBCs) AND FIELD SCREENING DETECTION LIMITS VERIFICATION INVESTIGATION, THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL STUMP NECK ANNEX, INDIAN HEAD DIVISION INDIAN HEAD, MARYLAND

Compound	RBC[1] Groundwater (μg/L)	Groundwater Detection Limit (μg/L)	RBC[1] Soil (mg/Kg)	Soil Detection Limit (mg/Kg)
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	1800	150	3900	0.5
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	0.61	5	5.8	0.5
2,4,6-Trinitrotoluene	2.2	5	21	0.5

1 Risk-Based Concentration Table, January - June 1995 EPA Region III, March 17, 1995.

Values calculated assuming long term exposure to compounds in soil or groundwater. Exposure assumptions reflective of a residential land use scenario were used to calculate the RBCs presented.

TABLE 2-3

STANDARDS AND CRITERIA FOR CHEMICALS OF CONCERN
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Chemicals Of Concern	EPA SDWA Standards (µg/L)		EPA Drinking Water Health Advisories[1] (µg/L)	Federal Ambient Water Quality Criteria (µg/L)		Maryland State Drinking Water Standards[13] (µg/L)	Maryland State Surface Water Standards[14] (µg/L)		
	MCL[1] (Status)	MCLG[1] (Status)		Protection of Freshwater Aquatic Life[10]	Protection of Human Health -Consumption of Aquatic Life Only[10]		Protection of Freshwater Aquatic Life[15]	Protection of Human Health- Fish Consumption	Protection of Human Health - Drinking Water
Volatile Organics									
Acetone	--	--	--	--	--	--	--	--	--
Carbon disulfide	--	--	--	--	--	--	--	--	--
Chloroform	100[6] 80[7,8] (P)	0 (P)	100 (Long-term, 10-kg Child) (D)	A: 28,900 C: 1,240	470	100[13]	--	--	--
Methylene chloride	5 (F)	0 (F)	2,000 (10-day, 10-kg Child) (F)	--	1,600	5	--	--	--
4-Methyl-2-pentanone	--	--	--	--	--	--	--	--	--
Toluene	1,000 (F)	1,000 (F)	1,000 (Lifetime, 70-kg Adult) (F)	A: 17,500	200,000	1,000	--	--	--
Trichloroethene	5 (F)	0 (F)	-- (F)	A: 45,000 C: 21,900	81	5	--	5	807
Xylene (total)	10,000 (F)	10,000 (F)	10,000 (Lifetime, 70-kg Adult) (F)	--	--	10,000	--	--	--

TABLE 2-3 (Continued)
SAMPLE SUMMARY FOR GROUNDWATER AND SURFACE WATER SAMPLES
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Chemicals Of Concern	EPA SDWA Standards (µg/L)		EPA Drinking Water Health Advisories (µg/L)	Federal Ambient Water Quality Criteria (µg/L)		Maryland State Drinking Water Standards (µg/L)	Maryland State Surface Water Standards (µg/L)		
	MCL (Status)	MCLG (Status)		Protection of Freshwater Aquatic Life	Protection of Human Health -Consumption of Aquatic Life Only		Protection of Freshwater Aquatic Life	Protection of Human Health- Fish Consumption	Protection of Human Health - Drinking Water
Semivolatile Organics									
Benzo(a)pyrene	0.2 (F)	0 (F)	--	--	0.0311	0.2	--	--	--
Bis(2-ethylhexyl)phthalate	6 (F)	0 (F)	-- (D)	A: 940 C: 3	12,000	6	--	--	--
Di-n-butylphthalate	--	--	--	A: 940 C: 3	--	--	--	--	--
2,6-Dinitrotoluene	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	20 (Lifetime, 70-kg Adult) (F)	A: 2,300 C: 620	--	--	--	--	--
3-Nitroaniline	--	--	--	--	--	--	--	--	--
Phenanthrene	--	--	--	--	--	--	--	--	--
Energetics									
2-Amino-4,6-dinitrotoluene	--	--	--	--	--	--	--	--	--
4-Amino-2,6-dinitrotoluene	--	--	--	--	--	--	--	--	--
1,3-Dinitrobenzene	--	--	1 (Lifetime, 70 kg Adult) (F)	--	--	--	--	--	--
2,4-Dinitrotoluene	-- (L)	-- (L)	400 (One day, 10-kg Child) (F)	A: 330 C: 5.2	9.1	--	--	--	--

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TABLE 2-3 (Continued)
SAMPLE SUMMARY FOR GROUNDWATER AND SURFACE WATER SAMPLES
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Chemicals Of Concern	EPA SDWA Standards (µg/L)		EPA Drinking Water Health Advisories[1] (µg/L)	Federal Ambient Water Quality Criteria (µg/L)		Maryland State Drinking Water Standards[13] (µg/L)	Maryland State Surface Water Standards[14] (µg/L)		
	MCL[1] (Status)	MCLG[1] (Status)		Protection of Freshwater Aquatic Life[10]	Protection of Human Health -Consumption of Aquatic Life Only[10]		Protection of Freshwater Aquatic Life[15]	Protection of Human Health- Fish Consumption	Protection of Human Health - Drinking Water
HMX	--	--	400 (Lifetime, 70-kg Adult) (F)	--	--	--	--	--	--
Nitroguanidine	--	--	700 (Lifetime, 70-kg Adult) (F)	--	--	--	--	--	--
RDX	--	--	2 (Lifetime, 70-kg Adult) (F)	--	--	--	--	--	--
2,4,6-Trinitrotoluene	--	--	2 (Lifetime, 70-kg Adult) (F)	--	--	--	--	--	--
Metals									
Aluminum	50 to 200[5] (F)	-- (L)	-- (D)	--	--	--	--	--	--
Antimony	6 (F)	6 (F)	3 (Lifetime, 70-kg Adult) (F)	A: 9,000 C: 1,600	4,300	6	--	--	--
Arsenic	50[2]	(4)	-- (D)	A: 360[11] C: 190[11]	0.14	50	A: 360[16,22] C: 190[16,22]	--	50
Barium	2,000 (F)	2,000 (F)	2,000 (Lifetime, 70-kg Adult) (F)	--	--	2,000	--	--	1,000

TABLE 2-3 (Continued)
SAMPLE SUMMARY FOR GROUNDWATER AND SURFACE WATER SAMPLES
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Chemicals Of Concern	EPA SDWA Standards (µg/L)		EPA Drinking Water Health Advisories[1] (µg/L)	Federal Ambient Water Quality Criteria (µg/L)		Maryland State Drinking Water Standards[13] (µg/L)	Maryland State Surface Water Standards[14] (µg/L)		
	MCL[1] (Status)	MCLG[1] (Status)		Protection of Freshwater Aquatic Life[10]	Protection of Human Health -Consumption of Aquatic Life Only[10]		Protection of Freshwater Aquatic Life[15]	Protection of Human Health- Fish Consumption	Protection of Human Health - Drinking Water
Beryllium	(F)	4 (F)	4,000 (Long-term 10-kg Child) (D)	A: 130 C: 5.3	0.13	4	--	--	--
Cadmium	5 (F)	5 (F)	5 (Lifetime, 70-kg Adult) (F)	A: 3.9[11,12] C: 1.1[11,12]	170	5	A: 3.9[21,22] C: 1.1[21,22]	--	10[23]
Calcium	--	--	--	--	--	--	--	--	--
Chromium	100 (F)	100 (F)	100 (Lifetime, 70-kg Adult) (F)	A: 15[3,11] C: 11[3,11]	3,400 (4)	100	A: 15[3,17,22] C: 11[3,17,22]	3,433,000[18][21]	50
Cobalt	--	--	--	--	--	--	--	--	--
Copper	TT[5] (F)	1,300 (F)	--	A: 18[11,12] C: 12[11,12]	--	--	A: 18[21,22] C: 12[21,22]	--	--
Iron	300[6] (F)	--	--	A: 1,000	--	--	--	--	--
Lead	TT[8] (F)	0 (F)	--	A: 82[11,12] C: 3.2[11,12]	--	--	A: 82[21,22] C: 3.2[21,22]	--	50
Magnesium	--	--	--	--	--	--	--	--	--
Manganese	50[9] (F)	-- (L)	- (D)	--	--	--	--	--	--
Mercury	2 (F)	2 (F)	2 (Lifetime, 70-kg Adult) (F)	A: 2.4[11] C: 0.012[11]	0.15	--	A: 2.4[22] C: 0.012[22]	0.146	2

TABLE 2-3 (Continued)
SAMPLE SUMMARY FOR GROUNDWATER AND SURFACE WATER SAMPLES
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Chemicals Of Concern	EPA SDWA Standards (µg/L)		EPA Drinking Water Health Advisories[1] (µg/L)	Federal Ambient Water Quality Criteria (µg/L)		Maryland State Drinking Water Standards[13] (µg/L)	Maryland State Surface Water Standards[14] (µg/L)		
	MCL[1] (Status)	MCLG[1] (Status)		Protection of Freshwater Aquatic Life[10]	Protection of Human Health -Consumption of Aquatic Life Only[10]		Protection of Freshwater Aquatic Life[16]	Protection of Human Health- Fish Consumption	Protection of Human Health - Drinking Water
Nickel	100[8] (F)	100[8] (F)	100 (Lifetime, 70-kg Adult) (F)	A: 1,400[11,12] C: 160[11,12]	4,600	100	A: 1,400[21,22] C: 160[21,22]	100	--
Potassium	--	--	--	--	--	--	--	--	--
Selenium	50 (F)	50 (F)	--	A: 20[11] C: 5[11]	6,800	10	A: 20[22] C: 5.0[22]	--	10
Silver	100[8] (F)	--	100 (Lifetime, 70-kg Adult) (D)	A: 4.1[11,12] C: 0.12	65,000	500	A: 4.1[21,22] C: 0.12[21,22]	--	50
Sodium	--	--	-- (D)	--	--	--	--	--	--
Thallium	2 (F)	0.5 (F)	0.4 (Lifetime, 70-kg Adult) (F)	A: 1,400 C: 40	6.3	2	--	--	--
Tin	--	--	--	--	--	--	--	--	--
Vanadium	-- (L)	-- (L)	-- (D)	--	--	--	--	--	--
Zinc	5000[8] (F)	-- (L)	2,000 (Lifetime, 70-kg Adult) (F)	A: 120[11,12] C: 110[11,12]	--	--	A: 120[21,22] C: 110[21,22]	--	--
Total Cyanide	200 (P)	200 (P)	200 (Lifetime, 70 kg Adult)	A: 22.0 C: 5.2	--	200[23]	A: 22.0[19,20] C: 5.2[19,20]	--	--

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TABLE 2-3 (Continued)
SAMPLE SUMMARY FOR GROUNDWATER AND SURFACE WATER SAMPLES
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Chemicals Of Concern	EPA SDWA Standards (μg/L)		EPA Drinking Water Health Advisories[1] (μg/L)	Federal Ambient Water Quality Criteria (μg/L)		Maryland State Drinking Water Standards[13] (μg/L)	Maryland State Surface Water Standards[14] (μg/L)		
	MCL[1] (Status)	MCLG[1] (Status)		Protection of Freshwater Aquatic Life[10]	Protection of Human Health -Consumption of Aquatic Life Only[10]		Protection of Freshwater Aquatic Life[12]	Protection of Human Health- Fish Consumption	Protection of Human Health - Drinking Water
Indicator Parameters									
Ammonia	--	--	30,000 (Lifetime, 70-kg Adult) (D)	A: 15.7 C: 3.9	--	--	--	--	--
Nitrate + Nitrite (as N)	10,000 (F)	10,000 (F)	-- (F)	--	--	10,000	--	--	--
Sulfate	500,000 (P)	500,000 (P)	-- (D)	--	--	--	--	--	--

1 Obtained from Drinking Water Regulations and Health Advisories, U.S. EPA, Office of Water, May 1995.
2 Obtained from Origin of Human Health Criteria, U.S. EPA, Office of Water, June 1991.
3 Based on water quality criteria for hexavalent chromium. No water quality criteria established for total chromium based upon ingestion of water/aquatic organisms, ingestion of aquatic organisms only, or protection of freshwater aquatic life.
4 Under Review
5 Copper - action level - 1,300 μg/L.
Lead - action level - 15 μg/L.
6 Current MCL.
7 1994 Proposed rule for disinfectants and disinfection by-products.
8 Secondary MCL
9 Being remanded
10 Unless otherwise noted, Lowest Observed Effect Levels (LOEL) obtained from Quality Criteria for Water, 1986, U.S. EPA, Office of Water, May, 1986.
11 Criterion 6/15/90 table.
12 Criterion is based on a total hardness of 100 mg/L.
13 Obtained from Quality of Drinking Water, COMAR 25.04.01, January 1995.
14 Obtained from Water Quality, COMAR 26.08.02, January 1995.
15 Based on water quality criteria for total trihalomethanes.
16 Based on water quality criteria for trivalent arsenic.

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TABLE 2-3 (Continued)
SAMPLE SUMMARY FOR GROUNDWATER AND SURFACE WATER SAMPLES
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

17 Water quality criteria for the protection of freshwater aquatic life based on trivalent chromium are available in "Numerical Criteria for Toxic Substances in Surface Waters", COMAR 26.08.02.3-2, January 1996.
18 Criterion based on trivalent chromium.
19 For waters with some designated uses, acute and chronic criteria for cyanide of 31.3 µg/L and 7.3 µg/L, respectively, apply.
20 Criterion is based on free cyanide.
21 Criterion may be altered based on site specific data on pH and hardness.
22 Maryland Surface Water Standards for the protection of aquatic life for metals are based on measurements of dissolved metals or as biologically available equivalence.
D Draft
L Listed for regulation
P Proposed
F Final
TT Treatment Technique
A Acute - Criterion Maximum Concentration
C Chronic - Criterion Continuous Concentration

TABLE 2-4

EXPOSURE SCENARIOS FOR QUANTITATIVE RISK ASSESSMENT
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Utilization of Site and Adjoining Areas	Environmental Media	Route of Exposure	Example of Exposure	Exposure Model Assumptions	Comments/References
Groundwater underlying the SWMUs 5, 25, 26, & 27 is not currently used as a domestic water supply resource. For purposes of completeness, the baseline risk assessment will evaluate groundwater contaminant concentrations in the vicinity of the SWMUs.	Groundwater	Ingestion	Utilization of groundwater as a drinking water supply.	• IR - Adult - 2 L/day - Child - 1 L/day • EF - 350 days/year • ED - Adult - 30 years - Child - 6 years • BW - Adult - 70 kg - Child - 15 kg	• Exposure assumptions per EPA Region III guidance
		Dermal Contact	Use of groundwater supply for bathing (Contaminants in groundwater absorbed through the skin).	• SA - Adult - 20,000 cm^2 - Child - 7,200 cm^2 • Exposure Time (ET) - 0.2 hr/event • Event Frequency (EV) - 1 event/day • EF - 350 days/year • ED - Adult - 30 years - Child - 6 years • BW - Adult - 70 kg - Child - 15 kg	• Chemical absorption (i.e., permeability constants) will be chemical specific. • Exposure assumptions per EPA Region III guidance and federal EPA Dermal Guidance (EPA/600/8-91/011B).

TABLE 2-4 (Continued)
EXPOSURE SCENARIOS FOR QUANTITATIVE RISK ASSESSMENT
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Utilization of Site and Adjoining Areas	Environmental Media	Route of Exposure	Example of Exposure	Exposure Model Assumptions	Comments/References
	Contaminants volatized to air from groundwater.	Inhalation	Domestic use of groundwater supply (e.g., showering, laundry).	• Inhalation Rate (IR) - Adult - 20 m^3/day - Child - 12 m^3/day • EF - 350 days/year • BW - Adult - 70 kg - Child - 15 kg • ED - Adult - 30 years - Child - 6 years	• Exposure assumptions per EPA Region III guidance
SWMUs 5, 25, 26, and 27 are used for military (industrial) purposes. The reasonably anticipated future land use for the property is also industrial/military. However, for purposes of completeness, the baseline risk assessment will include an evaluation of soils assuming a residential land use scenario (The ingestion and dermal contact routes of exposure will be evaluated).	Soils	Ingestion	Incidental ingestion while eating or smoking.	• Soil intake rate (IR) - Typical adult worker - 100 mg/day - Adult resident - 100 mg/day - Child Resident - 200 mg/day • Exposure Frequency (EF) - Typical adult worker - 250 days/year - Adult/child resident - 350 days/year • Exposure Duration (ED) - Typical adult worker - 25 years - Adult/Child Resident - 30 years • Body Weight (BW) - Adult - 70 kg - Child - 15 kg • Fraction of Soil Ingested - Worker - 0.5 - Resident - 1.0	• Exposure assumptions per EPA Region III guidance

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TABLE 2-4 (Continued)
EXPOSURE SCENARIOS FOR QUANTITATIVE RISK ASSESSMENT
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Utilization of Site and Adjoining Areas	Environmental Media	Route of Exposure	Example of Exposure	Exposure Model Assumptions	Comments/References
(Continued)	Soils (Continued)	Dermal Contact	Dermal Contact with soils/dust while working.	• Skin Surface Area (SA) - Typical adult worker - 3,450cm^2 (1) - Adult resident - 5,000 cm^2 (1) - Child resident - 1,800 cm^2 • Adherence factor of soil to skin (AF) - 1.0 mg/cm^2-event • EF - Typical adult worker - 250 days/year - Adult/Child resident - 350 days/year • ED - Typical adult worker - 25 years - Adult/Child resident - 30 years • BW - Adult - 70 kg - Child - 15 kg	• Exposure assumptions per EPA Region III guidance except that the reference for the Skin Surface Area is Table 8-3 of the EPA guidance document EPA/600/8-91/011B (EPA, January 1992). Chemical absorption factors will be chemical specific.
		Inhalation(4)	Inhalation of volatile organics and particulates emitted from soils.	• Inhalation Rate (IR) - Typical adult worker - 20 m^3 • EF - Typical adult worker - 250 days/year • ED - Typical adult worker - 25 years • BW - Adult - 70 kg • Volatilization Factor - Chemical and site specific • Particulate Emission Factor - Chemical and site specific	• Exposure assumptions per EPA Region III guidance.

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TABLE 2-4 (Continued)
EXPOSURE SCENARIOS FOR QUANTITATIVE RISK ASSESSMENT
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Utilization of Site and Adjoining Areas	Environmental Media	Route of Exposure	Example of Exposure	Exposure Model Assumptions	Comments/References
Human receptors may occasionally contact surface waters/sediments during activites such as environmental sampling or hiking in the vicinity of surface water bodies. However, routing and extensive exposure to the surface water bodies at Area 8 is unlikely given the location and terrain at Area 8. However, routine and extensive exposure to the surface water bodies at Area 8 is unlikely given the location and terrain at Area 8.	Exposed Sediments	Ingestion	Incidental ingestion while eating or smoking.	• IR - Typical adult worker - 50 mg/day • EF - Typical adult worker - 24 days/year(2) • ED - Typical adult worker - 25 years • BW - Typical adult worker - 70 kg	• Exposure assumptions per EPA Region III guidance and based on professional judgement.
		Dermal Contact	Dermal contact while working.	• SA - Typical adult worker - 2,200 cm^2 (3) • Adherence factor of soil to skin (AF) - 1.0 mg/cm^2-event • EF - Typical adult worker - 24 days/year(3) • ED - Typical adult worker - 25 years • BW - Typical adult worker - 70 kg	• Exposure assumptions per EPA Region III guidance and professional judgement. Chemical absorption rates will be chemical specific.

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TABLE 2-4 (Continued)
EXPOSURE SCENARIOS FOR QUANTITATIVE RISK ASSESSMENT
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Utilization of Site and Adjoining Areas	Environmental Media	Route of Exposure	Example of Exposure	Exposure Model Assumptions	Comments/References
(Continued)	Surface Water	Dermal Contact	Dermal Contact while working.	• SA - Typical adult worker - 2,200 cm^2 [1] • ET - Typical adult worker - 1.0 hour/event (1 event/day) • EF - Typical adult worker - 24 days/year[2] • ED - Typical adult worker - 25 years • BW - Adult - 70 kg	• Exposure assumptions per EPA Region III guidance, and professional judgement. Chemical absorption (i.e., permeability constants) will be chemical specific.

(1) The skin surface area for the adult worker is the summation of the surface area for the head, upper arms, and hands (male receptor). Table 8-3, EPA guidance document EPA/600/8-91/011B (U.S. EPA, January 1992). The skin surface are for the resident is approximately 25 percent of the total body surface area.

(2) The exposure frequency for the adult assumes the receptor will contact surface waters/sediments two days per month.

(3) The hands and upper arms (2,200 cm^2) of workers periodically sampling surface water bodies may also be exposed to contaminants in surface water bodies. Table 8-4, EPA guidance document EPA/600/8-91/011B (U.S. EPA, January 1992). The exposure is anticipated to be very short in duration (1.0 hr), 24 days/year.

(4) The inhalation of VOCs/particulates from soils will only be evaluated if EPA Region III SSLs are exceeded.

TABLE 2-5

TOXICITY CRITERIA FOR CHEMICALS OF POTENTIAL CONCERN
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Chemical	Reference Dose		Target Organ for Noncarcinogenic Effects (Oral/Inhalation)	Cancer Slope Factor		U.S. EPA Weight of Evidence[b]
	Oral Route of Exposure (mg/kg/day) [UF][a]	Inhalation Route of Exposure (mg/kg/day) UF		Oral Route of Exposure $(mg/kg/day)^{-1}$	Inhalation Route of Exposure $(mg/kg/day)^{-1}$	
Volatile Organics						
Acetone	1.00E-1 (1000)	NA	Increased liver and kidney weights and nephrotoxicity/NA	NA	NA	NA
Carbon disulfide	1.00E-1 [100]	2.00E-1 [30]	Fetal toxicity and malformations/Peripheral nervous system dysfunction	NA	NA	NA
Chloroform	1.00E-2 (1000)	NA	Fatty cyst formation in liver/Peripheral nervous system dysfunction	6.10E-3	8.05E-2	B2
Methylene chloride	6.00E-2 [100]	8.57E-1 [100]	Liver toxicity/Liver toxicity	7.50E-3	1.64E-3	B2
4-Methyl-2-pentanone	8.00E-2 (3000)	2.29E-2 [1000]	Increased liver and kidney weights/Increased liver and kidney weights	NA	NA	NA
Toluene	2.00E-1 [1000]	1.14E-1 [300]	Changes in liver and kidney weights/Neurological effects	NA	NA	D
Trichloroethene	6.00E-3	NA	/NA	1.10E-2	6.00E-3	B2-value withdrawn from IRIS
Xylene (total)	2.00E+0 [100]	NA	Hyperactivity; decreased body weight, and increased mortality/NA	NA	NA	D
Semivolatile Organics						
Benzo(a)pyrene	4.00E-2	NA	NA	7.30E+00	6.10E+00	B2

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TABLE 2-5 (Continued)
TOXICITY CRITERIA FOR CHEMICALS OF POTENTIAL CONCERN
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Chemical	Reference Dose		Target Organ for Noncarcinogenic Effects (Oral/Inhalation)	Cancer Slope Factor		U.S. EPA Weight of Evidence[b]
	Oral Route of Exposure (mg/kg/day) [UF][a]	Inhalation Route of Exposure (mg/kg/day) UF		Oral Route of Exposure (mg/kg/day)$^{-1}$	Inhalation Route of Exposure (mg/kg/day)$^{-1}$	
Bis(2-ethylhexyl)phthalate	2.00E-2[a] [1000]	NA	Increased relative liver weight/NA	1.40E-2[a]	NA	B2
Di-n-butylphthalate	1.00E-1[a] [1000]	NA	Increased mortality/NA	NA	NA	D
2,6-Dinitrotoluene	1.00E-3[b] [3000]	NA	Mortality, neurotoxicity, Heinz bodies, and other effects/NA	NA	NA	B2[d]
Naphthalene	4.00E-2[b]	NA	NA	NA	NA	D
3-Nitroaniline	3.00E-3[c]	NA	NA	NA	NA	
Phenanthrene	4.00E-2[d]	NA[d]	NA	NA	NA	D
Energetics						
2-Amino-4,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA
4-Amino-2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA
1,3-Dinitrobenzene	1.00E-4[a] [3000]	NA	Increased splenic weight/NA	NA	NA	D
2,4-Dinitrotoluene	2.00E-3[a] [100]	NA	Neurotoxicity, Heinz bodies and biliary tract hyperplasia/NA	6.8E-1[a]	NA	B2[a]
HMX	5.00E-2[a] [1000]	NA	Hepatic lesions/NA	NA	NA	D
Nitroguanidine	1.00E-01[a] [3000]	NA	Reduced weight gain, maternal/fetal toxity, developmental toxicity/NA	NA	NA	D
RDX	3.00E-3[a]	NA	NA	1.10E-01[a]	NA	NA
2,4,6-Trinitrotoluene	5.00E-4[a] [1000]	NA	Liver/NA	3.00E-2[a]	NA	C

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TABLE 2-5 (Continued)
TOXICITY CRITERIA FOR CHEMICALS OF POTENTIAL CONCERN
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Chemical	Reference Dose		Target Organ for Noncarcinogenic Effects (Oral/Inhalation)	Cancer Slope Factor		U.S. EPA Weight of Evidence[b]
	Oral Route of Exposure (mg/kg/day) [UF][a]	Inhalation Route of Exposure (mg/kg/day) UF		Oral Route of Exposure (mg/kg/day)$^{-1}$	Inhalation Route of Exposure (mg/kg/day)$^{-1}$	
Inorganics						
Aluminum	1.00E+0	NA	NA	NA	NA	NA
Antimony	4.00E-4 [1000]	NA	Longevity, blood glucose, and cholesterol/NA	NA	NA	D
Arsenic	3.00E-4 [3]	NA	Hyperpigmentation, keratosis, and possible vascular complications/NA	1.50E+0	1.51E+1	A
Barium	7.00E-2 [3]	1.43E-4	Increased blood pressure/NA	NA	NA	D
Beryllium	5.00E-3 [100]	NA	No adverse effects/NA	4.30E+0	8.40-E+0	B2
Cadmium	water; 5.00E-4 [10] food; 1.00E-3 [10]	NA	Significant proteinuria/NA	NA	6.30E+0	B1
Calcium	NA	NA	NA	NA	NA	NA
Chromium (III)	1.00E+0 [100]	5.71E-7	No observed effects/NA	NA	NA	C
Chromium (VI)	5.00E-3 [500]	NA	No observed effects/NA	NA	4.20E+1	A
Cobalt	6.00E-2	NA	/NA	NA	NA	NA
Copper	3.71E-2	NA	Gastro-intestinal irritation/NA	NA	NA	D
Iron	NA	NA	NA	NA	NA	NA

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TABLE 2-5 (Continued)
TOXICITY CRITERIA FOR CHEMICALS OF POTENTIAL CONCERN
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Chemical	Reference Dose		Target Organ for Noncarcinogenic Effects (Oral/Inhalation)	Cancer Slope Factor		U.S. EPA Weight of Evidence[illegible]
	Oral Route of Exposure (mg/kg/day) [UF][illegible]	Inhalation Route of Exposure (mg/kg/day) UF		Oral Route of Exposure $(mg/kg/day)^{-1}$	Inhalation Route of Exposure $(mg/kg/day)^{-1}$	
Lead	NA	NA	NA	NA	NA	B2
Magnesium	NA	NA	NA	NA	NA	NA
Manganese	water; 5.00E-3[illegible] [1] food, 1.40E-1[illegible] [1]	1.43E-5[illegible] [1000]	Central Nervous System effects/Central Nervous System effects	NA	NA	D
Mercury	3.00E-4[illegible] [1000]	8.57E-5[illegible] [30]	Kidney effects/Hand tremor, memory disturbance, and autonomic dysfunction	NA	NA	D
Nickel	2.00E-2[illegible] [300]	NA	Decreased body and organ weights/NA	NA	NA	D
Potassium	NA	NA	NA	NA	NA	NA
Selenium	5.00E-3[illegible] [3]	NA	Lowered hemoglobin, skin lesions and central nervous system abnormalities	NA	NA	D
Silver	5.00E-3[illegible] [3]	NA	Argyria skin pigmentation/NA	NA	NA	D
Sodium	NA	NA	NA	NA	NA	NA
Thallium	7.00E-5[illegible]	NA	NA	NA	NA	NA
Tin	6.00E-01[illegible] [100]	NA	NA	NA	NA	NA
Vanadium	7.00E-3[illegible] [100]	NA	NA	NA	NA	D
Zinc	3.00E-1[illegible] [3]	NA	Decrease in erythrocyte superoxide dismutase/NA	NA	NA	D

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TABLE 2-5 (Continued)
TOXICITY CRITERIA FOR CHEMICALS OF POTENTIAL CONCERN
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Chemical	Reference Dose		Target Organ for Noncarcinogenic Effects (Oral/Inhalation)	Cancer Slope Factor		U.S. EPA Weight of Evidence[b]
	Oral Route of Exposure (mg/kg/day) [UF][a]	Inhalation Route of Exposure (mg/kg/day) UF		Oral Route of Exposure $(mg/kg/day)^{-1}$	Inhalation Route of Exposure $(mg/kg/day)^{-1}$	
Cyanide (free)	2.00E-2[c]	8.57E-4[g,h]	Kidney and thyroid effects/NA	NA	NA	NA
Indicator Parameters						
Nitrate	1.60E+00[c] [1]	NA	Methemoglobinemia/NA	NA	NA	NA

(a) [UF] Uncertainty Factor
(b) U.S. EPA Carcinogen Classification:
Group A: Human Carcinogen (sufficient evidence of carcinogenicity in humans).
Group B: Probable Human Carcinogen (B1-limited evidence of carcinogenicity in humans; B2-sufficient evidence of carcinogenicity in animals with inadequate or lack of evidence in humans).
Group C: Possible Human Carcinogen (limited evidence of carcinogenicity in animals and inadequate or lack of human data).
Group D: Not Classifiable as to Human Carcinogenicity (inadequate or no evidence).
Group E: Evidence of Noncarcinogenicity for Humans (no evidence of carcinogenicity in adequate studies).
(c) Dose-response parameter obtained from the U.S. EPA Integrated Risk Information System (IRIS).
(d) Toxicity criteria as presented in the U.S. EPA Region III Risk-Based Concentration Table dated March 7, 1995. The RfD for naphthalene is used to evaluate those PAHs which do not have an EPA derived RfD.
(e) Cancer slope factor based on the CSF for benzo(a)pyrene (IRIS) and the relative potency factors (RPF) presented in the "Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons", EPA/600/R-93/089.
(f) U.S. EPA Environmental Criteria Assessment Office, Cincinnati
(g) U.S. EPA Health Effects Assessment Summary Tables, FY 1994
(h) Hydrogen cyanide Reference dose value was used for inhalation.
(i) Currently under review by an EPA workgroup.
(j) Classification based on results of studies of 2,4-Dinitrotoluene/2,6 Dinitrotoluene mixtures

NA Information not available.

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3.0 PHYSICAL CHARACTERISTICS OF THE STUDY AREA

The following sections describe the physical characteristics of the study area, including physiography, climate, surface drainage, soils, and regional geology and hydrogeology.

3.1 PHYSIOGRAPHY

The Naval Surface Warfare Center is located on two peninsulas, approximately 3,500 acres in area, which are both located on the eastern shore of the Potomac River. The northern and larger peninsula is designated the IHDIVNAVSURFWARCEN. The southern, and smaller peninsula, is designated as Naval Ordnance Station, Stump Neck Annex. The NAVEODTECHDIV, a tenant activity at IHDIVNAVSURFWARCEN, is located on the Stump Neck peninsula and is approximately 1,100 acres in area. The scope of this investigation pertains to the Stump Neck peninsula.

The southwestern portion of the Stump Neck peninsula is bounded by Chicamuxen Creek, the northern area by the Potomac River, and the northeastern area by Mattawoman Creek. The Stump Neck peninsula has a flat to slightly rolling topography. Most of the land adjacent to Chicamuxen and Mattawoman Creeks is wetlands with slopes of three percent or less. The inland portion of the peninsula has slopes of five percent or more in many places. Elevations at the Stump Neck peninsula range from mean sea level to 143 feet above mean sea level (ft MSL). Elevations along the creek boundaries are generally 30 ft MSL with the exception of a few bluffs along Mattawoman Creek that are 50 to 60 ft MSL.

3.2 CLIMATE

The climate at the facility is a temperate, continental type that is influenced by the facility's proximity to the Chesapeake Bay and the Potomac River. The region experiences well-defined seasons with warm summers and cold, wet winters. The average summer high and winter low temperatures are 89° and 21°F, respectively (Ensafe, Allen and Hoshall, July 1991).

The mean annual precipitation for Charles County, Maryland, is 47 inches (Ensafe, Allen and Hoshall, July 1991). The mean annual frozen precipitation is 19 inches. The average wind speeds are 9 miles per hour, and the prevailing wind direction is northwest, becoming more southerly during the summer months.

3.3 SURFACE DRAINAGE

Surface waters for Area 8, the IOD, and IED drain to marsh and wetland areas and then into Chicamuxen Creek, or directly into the creek. Approximately half of the surface water flow at Range 6 is toward Chicamuxen Creek, and remaining drainage is toward the Potomac River.

3.4 GEOLOGY

The Indian Head and Stump Neck peninsulas lie within the Atlantic Coastal Plain physiographic province. The general topography of the area consists of rolling terrain, marshlands, swamps, and the shoreline of the Potomac River, Mattawoman Creek, and Chicamuxen Creek. The geology of the area consists of 500 to 600 feet of unconsolidated fluvial and marine deposits overlying much older, Precambrian, igneous and metamorphic bedrock. The unconsolidated sediments strike northeast and dip to the southeast at approximately 50 feet per mile.

Unconsolidated deposits underlying the site are of the Potomac Group, which consists of (in descending order) the Patapsco, Arundel, and Patuxent Formations. The Patapsco Formation, which is the focus of this investigation, is a sequence of gently dipping, unconsolidated layers of clay, silt, sand, and gravel deposits. The average thickness of the Patapsco Formation is approximately 200 to 300 feet (Tech International, 1988; Aware, 1982).

In some areas on the Indian Head and Stump Neck peninsulas, the Upper Potomac Group sediments were eroded by the ancestral Potomac River system, which deposited paleochannel and fluvial (river) sediments on top of the Potomac Group. Along the eastern side of the Indian Head peninsula, these Quaternary age fluvial sediments extend to approximately 75 feet below sea level (Hiortdahl, 1990). In other areas, the Potomac Group is overlain by younger sedimentary layers, which may include the Aquia Greensand, the Columbia Formation, and other deposits. On Stump Neck, the paleo-channel deposits average from about 80 feet to 100 feet deep.

The Patapsco Formation is underlain by the Patuxent and Arundel Formations, which consist of clays and sandy to silty clays with occasional, thin sand layers. The thin sand units within the otherwise clay dominated formation are not laterally continuous and generally pinch out within 2 miles or less (Tech International, 1988). The combined average thickness of the Patuxent and Arundel Formations in the vicinity of Indian Head is approximately 300 feet.

3.5 HYDROGEOLOGY

The Potomac Group aquifer system is the major confined aquifer for the area around Indian Head and Stump Neck, Maryland. Localized shallow aquifers (e.g., water-table aquifers) may exist in the Quaternary fluvial sediments that overlie the Potomac Group, but in this area these aquifers are not used for potable water (Hiortdahl, 1990). The current field investigation is limited to the water-table aquifer. The sediments comprising the water-table aquifer at the study area consist of a silty sand with clay, components which result in a low permeability.

The Potomac Group aquifer system contains several confined aquifers within the Patapsco, Patuxent, and Arundal Formations (Figure 3-1). These confined aquifers consist of saturated, poorly consolidated sand and gravel deposits that generally range from 1 to 20 feet in thickness (Hiortdahl, 1990). These water-bearing units are interbedded with fine-grained units that confine and isolate the sand units.

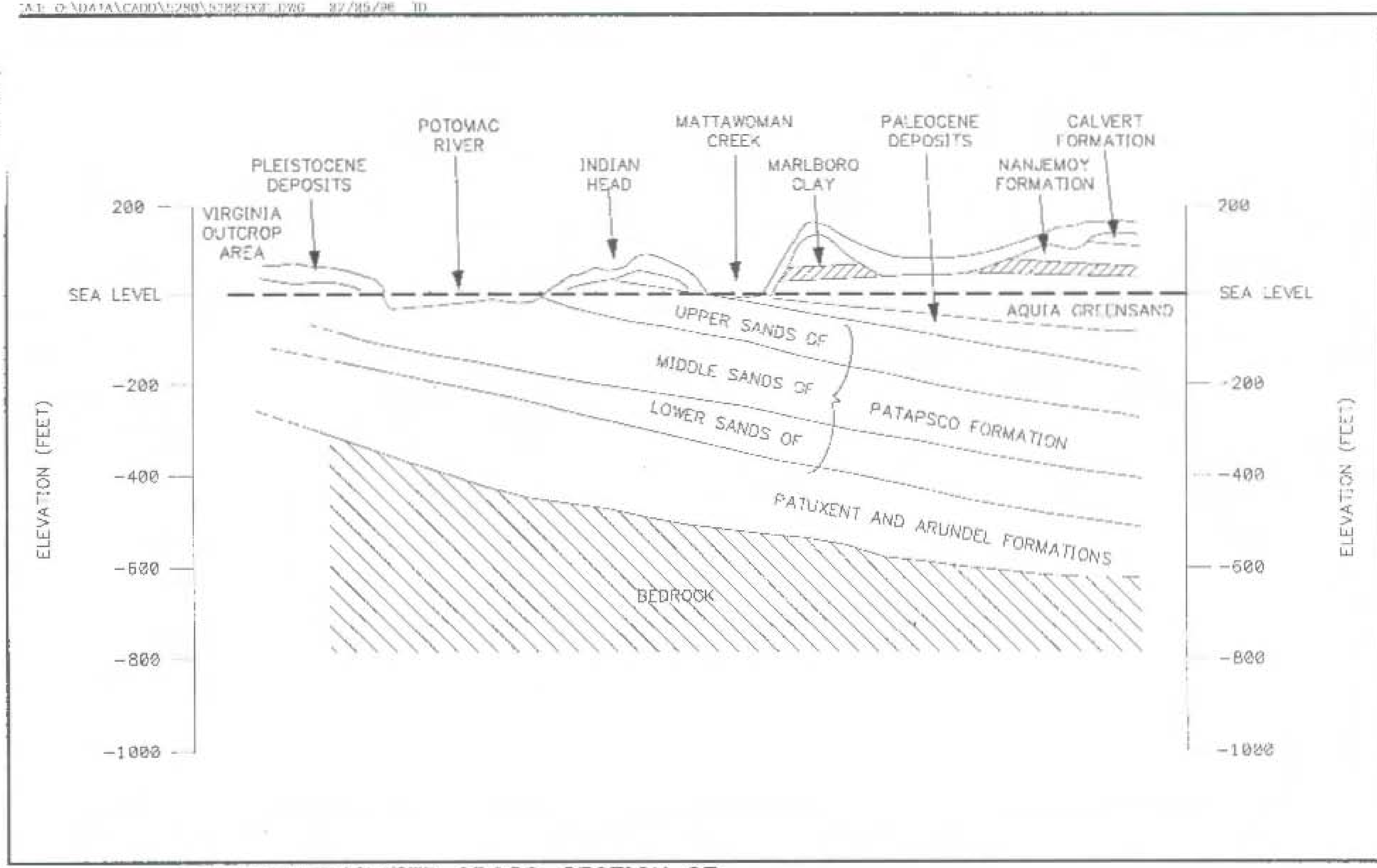
The Potomac Group produces water of good quality, and has supplied all of the groundwater withdrawn from production wells in the Indian Head and Stump Neck area. Three zones within this formation have been encountered which contain significant permeable units: the Upper Sand, Middle Sand, and Lower Sand zones. The Lower Sand zone generally yields the most water and is encountered between 200 and 300 feet below MSL (Greenhorn and O'Mara, 1990).

The transmissivity of the Lower Sand zone at the Indian Head area ranges from 270 ft^2/day to 535 ft^2/day, with the combined transmissivity of the entire Patapsco Formation estimated at 1,070 ft^2/day. The clay-rich aquitards of this formation have very low vertical hydraulic conductivities, in the range of 1.73×10^{-3} ft/day to 1.73×10^{-5} ft/day (Tech International, 1988). Coefficients of storage for the Patapsco Formation range from 0.0004 to 0.0002. The average well yield for wells in this area is approximately 250 gallons per minute (gpm) (Greenhorn and O'Mara, 1990).

The deeper Patuxent Formation contains mostly clay-rich units. The main base production wells tap the permeable sand layers, which are interbedded with these units. The sand units are not laterally continuous, and most wells within the overlying Patapsco Formation yield sufficient water.

The IHDIVNAVSURFWARCEN is the largest water user in the Indian Head region, with 15 production wells which together pump more than 1.3 million gallons per day (gpd) from the Patapsco Formation. Thirteen of the fifteen production wells are located on the Indian Head peninsula, and the remaining two are located on the Stump Neck Peninsula. Eight of the production wells are screened exclusively in the Lower Sand zone, with seven wells screened in the Upper and Middle Sand zones as well as the Lower Sand zone. The screened interval extends into the Patuxent Formation at some locations. Extensive pumping has occurred at these wells for several decades, and potentiometric water levels around the Indian Head peninsula for the deep aquifer system have declined more than 85 feet over the last 80 to 90 years because of pumping (Tech International, 1988; Aware, 1982).

Figure 3-1 (8.5 x 11)



GENERAILIZED CROSS-SECTION OF
STUMP NECK ANNEX
NAVAL SURFACE WARFARE CENTER
INDIAN HEAD, MARYLAND

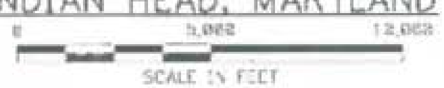


FIGURE 3-1

Brown & Root Environmental

4.0 Range 6 (SWMU 5)

4.1 SITE BACKGROUND AND PHYSICAL SETTING

Range 6 is an inactive training area located at the end of Archer Avenue, on a point of land extending into the Potomac River and Chicamuxen Creek. Water surrounds the site on three sides, the Potomac River to the north and west and the Chicamuxen Creek to the east. Archer Avenue, an asphalt road, bisects the site. Access to Range 6 is controlled by fencing and a gate located on Archer Avenue. The site lies completely within the 100-year flood plain and is approximately 11 acres in size. Range 6 is sparsely vegetated and surrounded by wetlands. The terrain is generally flat to gently sloping toward the surrounding water bodies. The location and general features of Range 6 are displayed in Figure 4-1.

4.2 SITE OPERATIONS AND HISTORY

Range 6 consists of five ranges historically used for open detonation training. Range 6 was identified in the Notice of Decision for RCRA Corrective Action Permit EPA I.D. No. MD 417 009 0001 (January 24, 1991, through January 23, 2001) as Solid Waste Management Unit number five (SWMU 5).

The Range 6 training ranges operated from the early 1950s until early in 1988. The frequency of training exercises at this site depended on the number of recruits (students) requiring training at any one given time. It is estimated that the training ranges were used weekly. The following chemicals and materials are among those used at Range 6:

- Trinitrotoluene
- RDX
- Composition C-4
- Composition C-3
- Nitric acid
- Nitrocellulose
- Blasting caps
- HBX
- PETN
- COMPD
- TH3 (Thermite)
- Sulfuric acid
- Nitroquanidine
- H6 shot
- Single base, double base, multibase propellants

Small amounts (less than 2 to 3 pounds) of explosives were used during the training exercises conducted at Range 6. Based on this estimate, approximately 100 pounds of ordnance were used each year. Most of the actual detonation work during the training exercises occurred within the sparsely vegetated lowland area to the south of Archer Avenue. However, other related training activities, such as acid trepanning, occurred to the north of Archer Avenue. Acid trepanning involved the application of strong acids (nitric or sulfuric acid) to the protective hull of an ordnance to access and subsequently extract (via steaming) and detonate an explosive device. Based on personnel interviews, a burn pit and heavily used demolition area may have existed at Range 6 as shown on Figure 4-1. Waste materials at Range 6 are also likely to include small quantities of shrapnel and castings from the detonation of explosives.

The Range 6 training ranges are currently inactive, and there is minimal visual evidence of their actual location and size. (Five small white wooden placards [numbered 1 through 5] were noted at Range 6 during the site visit (June 20 - 21, 1995) and the field sampling event. These placards may indicate the approximate locations of the 5 test ranges.) It is unlikely that Range 6 will ever be used for training purposes again. The unit has been phased out since this portion of the Explosive Ordnance Disposal School (EODS) relocated to Florida in 1988.

Background documents available for the Stump Neck Annex indicate that in 1956/1957, approximately 1500 to 2000 pounds of arsenic powder, contained in plastic bags, were buried in a pit located within Range 6 and measuring 40 feet deep and 6 feet in diameter. (It should be noted that this information is suspect because a 40-foot deep hole would be at least 25 feet below the water table.) The Indian Head Base drawing (Dwg. No. 15455-A) indicates that Range 6/SWMU 5 is only 300 feet by 300 feet in size and does not indicate the location of the arsenic pit. Two possible locations for the arsenic pit have been indicated on Figure 4-1. One location was noted on Figure 10 of Revision No. 0 of the Ensafe/Allen & Hoshall Work Plan dated July 17, 1991. The second location was identified during the June 20/21, 1995 interviews. The information regarding the existence and location of an arsenic pit at Range 6 is tentative and difficult to verify. It should be noted that investigation of the arsenic disposal pit was not part of the scope of work for this VI.

4.3 PREVIOUS INVESTIGATIONS

Prior to the field activities conducted for this VI, no environmental sampling or analysis had been performed at Range 6.

4.4 VI FIELD INVESTIGATION

This section discusses the field activities that occurred at Range 6 (SWMU 5) during the VI field investigation conducted September/October 1995.

4.4.1 Field Screening Samples

As detailed in Section 2.1.2, field test-kit screening was conducted at Range 6 to investigate the near-surface soils for the presence of TNT, HMX, and RDX. The results of these tests were used to locate soil boring (later converted to monitoring well) 5MW01.

A total of 24 surface soil samples were collected at Range 6 and analyzed by field test-kit screening (see Section 2.1.2.1). In addition, three background surface soil samples were collected for field test-kit screening. The locations of all samples collected and the results of the field test-kit screening are displayed on Figure 4-2. One sample (06-SS-19) had to be diluted because a high concentration of TNT. The sample contained a nitroglycerine-type odor as observed by the Brown & Root Environmental Unexploded Ordnance (UXO) specialist. Monitoring well 5MW01 was installed at this location.

4.4.2 Soil Investigation

For purposes of characterizing soil contamination at Range 6, one soil boring (5MW01) was drilled at the site. The location was determined based on the results of the field test-kit analyses. In addition, the Brown & Root Environmental UXO specialist indicated that the boring location had potential for contamination based on past activities at the site. (The Brown & Root Environmental UXO specialist assigned to the project had previously trained at Range 6 during his tenure in the military.) Two soil samples were collected from boring 5MW01. The first sample was collected from the 0- to 2- foot interval. The second soil sample was collected at the soil interval just above the water table (4 to 6 feet below ground surface). The samples were analyzed for the parameters listed in Table 2-1. A "nitroglycerine-type odor" was reported by the B&R Environmental UXO specialist. The soil boring was converted to monitoring well 5MW01.

4.4.3 Groundwater Investigation

One monitoring well (5MW01) was installed and sampled at the site to determine whether groundwater contamination was present in the shallow water table aquifer at Range 6 (see Figure 4-2). The sample was analyzed for the parameters listed in Table 2-1.

As summarized in the following table, groundwater-level measurement was recorded at the well on October 17, 1995:

Well Name	Elevation of Measuring Point (ft. MSL)	Depth to Groundwater (ft.)	Groundwater Elevation (ft. MSL)
5MW01	10.02	8.51	1.51

Both rising-head and falling-head slug tests were performed at monitoring well 5MW01 to determine the permeability characteristics of the aquifer. The results of the aquifer testing are presented in Section 4.6.

4.5 SITE CHARACTERISTICS

This section discusses the site-specific geology and hydrogeology of Range 6.

4.5.1 Geology and Soils

Surface and subsurface soil conditions at the site were investigated through the drilling/logging of one soil boring. The boring is located within the source area of the site. Because of the shallow depth to the surficial aquifer at the site, the boring was completed at a depth of 18 feet.

The lithology encountered at the ground surface to a depth of approximately 4 feet below the ground surface consisted of silty sand with gravel. The soil is most likely reworked, noncompacted, natural material (fill). The fill material is underlain by silty sand with clay approximately 3 feet thick, which grades into silty clay (which also is approximately 3 feet thick). Silty sand with gravel was encountered below the silty clay and was present to the termination depth of the boring.

4.5.2 Hydrogeology

Hydrogeological conditions at Range 6 have been interpreted from data obtained during the field investigation activities. In addition, physical features such as the ground surface topography (as shown on Figure 4-1), and the proximity to Chicamuxen Creek and the Potomac River were considered in making generalized interpretations regarding groundwater flow directions.

At monitoring well 5MW01, the site is characterized by a shallow groundwater table (approximately 8 feet below ground surface), contained within a silty sand with clay aquifer. The presence of significant amounts of fine sediments resulted in a high turbidity in well 5MW01. Recharge of the shallow aquifer is likely to occur primarily through infiltration of precipitation.

There is only one monitoring well located at Range 6, thus the groundwater flow direction could not be determined by groundwater-level measurements. The groundwater flow direction is interpreted based on the topographical features at Range 6. Range 6 is surrounded by the Potomac River to the west and Chicamuxen Creek to the east. The topography at Range 6 is lower than the topography north of the site. Groundwater is expected to mimic the surface topography and flow to the south, southeast, and southwest toward either the Potomac River or Chicamuxen Creek.

Both rising-head and falling-head slug tests were performed at monitoring well 5MW01 to determine the permeability characteristics of the aquifer. The average hydraulic conductivity for the site was calculated to be approximately 0.27 ft/day (9.6×10^{-5} cm/sec).

4.6 NATURE AND EXTENT OF CONTAMINATION

This section presents the results of the sampling and analysis of environmental samples collected at Range 6 as described in Sections 4.4.2 and 4.4.3. All samples collected were analyzed according to the methods specified in the Verification Investigation Work Plan (HALLIBURTON NUS, September 1995). Samples were analyzed by GP Environmental Services, Inc. Analytical results are presented in Appendix I.

All data generated were validated according to EPA National and Region III guidelines. The data validation was performed by Brown & Root Environmental validation chemists, who routinely validate data from numerous laboratories producing data under the EPA Contract Laboratory Program (CLP). Data validation memoranda are presented in Appendix J. A copy of the complete data validation packages is available to the Navy and the U.S. EPA Region III upon request.

4.6.1 Soils

The analytical results for soil samples collected at Range 6 (S05-MW01-01, S05-MW01-02) and analyzed by GP Environmental Services are presented in Table 4-1. Field screening results are compared to fixed-based lab results (i.e., GP Environmental Services results) in Table 4-2.

Although more than 100 target analytes were included in the organic analyses performed by GP Environmental Services, positive detections were reported for only nine (9) organic compounds. The following volatile and semivolatile organics were detected in the soil samples collected at Range 6:

- 4-Methyl-2-pentanone (maximum concentration [C_{max}] = 1.5 μg/kg)
- Chloroform (C_{max} = 3.5 μg/kg)
- Toluene (C_{max} = 1.3 μg/kg)
- 2,4-Dinitrotoluene (C_{max} = 518 μg/kg)
- Di-n-butyl phthalate (C_{max} = 740 μg/kg)

The volatile organic concentrations detected do not exceed 10 μg/kg and may be reflective of low-level laboratory contamination. However, it should be noted that the detections were not qualified as possible "blank contamination" during the data validation process. 2,4-Dinitrotoluene is an energetic compound that is also analyzed in the semivolatile organic suite of compounds listed under SW-846 Method 8270. Di-n-butyl phthalate is a plasticizer and a common laboratory contaminant. It may be present in soils as a result of the widespread use of plastics in the products produced and used in our industrialized society (including, possibly, the outer hulls of explosive devices). The following energetics (i.e., target organic analytes for SW-846 Method 8330) were also detected:

- 2,4,6-Trinitrotoluene (TNT) (C_{max} = 28,400 μg/kg)
- 2-Amino-4,6-dinitrotoluene (C_{max} = 560 μg/kg)
- HMX (C_{max} = 597 μg/kg)
- RDX (C_{max} = 3380 μg/kg)

Given the past activities at Range 6, these parameters are all site-related contaminants.

The data presented in Table 4-1 suggest that the concentrations of most volatile organic and energetic compounds detected in the Range 6 soil samples do not differ significantly with depth. However, the concentrations of TNT, 2,4-dinitrotoluene, and di-n-butyl phthalate detected in the surface soil sample do exceed those concentrations reported for the subsurface soil sample by approximately an order of magnitude. The data further suggest that there is a reasonable correlation between the fixed-based laboratory and field screening data, and that a contamination "hot-spot" exists in the vicinity of monitoring well location MW-05 (Figure 4-2 and Table 4-2). Based on the results of the field screening data (Figure 4-2), energetics such as TNT and RDX may not be present above 2 mg/kg in the soils outside this "hot-spot" area.

Several inorganic parameters were detected in the Range 6 soil samples. Because site-specific background data are not available for Range 6 soils, inorganic concentrations detected in the site soil samples were compared to the background data available for SWMU 26 (the IED). Data for sample S05-MW01-01 (Range 6 surface soil sample) were compared to data for sample S26-MW03-001 (background surface soil sample). Data for sample S05-MW01-02 (Range 6 subsurface soil sample) were compared to data available for sample S26-MW03-002 (background subsurface soil sample). Based on the comparison, antimony, arsenic, cadmium, copper, calcium, lead, nickel, mercury, selenium, silver, and zinc were detected above background. However, in many cases, the exceedances of background are best described as marginal (i.e., similar to or within two times the background concentration) and are probably not reflective of environmental contamination. Only copper (five to ten times background) and lead (approximately five times background) were detected at concentrations greater than five times background. In general, the inorganic concentrations reported for the subsurface soil sample were slightly higher than those reported for the surface soil sample.

4.6.2 Groundwater

The results of the sampling and analysis of groundwater samples collected at Range 6 are presented in Table 4-3. The following semivolatile organic compounds and energetics were detected in the sample (and/or duplicate sample) collected from monitoring well S5-MW01:

- 2,4-Dinitrotoluene (C_{max} = 17.3 μg/L)
- 2,6-Dinitrotoluene (C_{max} = 2.5 μg/L)
- 3-Nitroaniline (C_{max} = 7.3 μg/L)
- Bis(2-ethylhexyl)phthalate (C_{max} = 1.8 μg/L)

- 1,3-Dinitrobenzene (C_{max} = 4.5 μg/L)
- 2-Amino-4,6-dinitrotoluene (C_{max} = 4700 μg/L)
- 2,4,6-Trinitrotoluene [TNT] (C_{max} = 242 μg/L)
- Nitroguanidine (C_{max} = 50.2 μg/L)
- RDX (C_{max} = 658 μg/L)

Based on the historical information reported for Range 6, all of these constituents are energetic compounds or the potential residue of the detonation of explosives. Four of these organics were also detected in soil samples collected at Range 6. TNT, RDX, and 1,3-dinitrobenzene were detected in the groundwater samples at concentrations exceeding EPA Region III Risk-Based Concentrations (RBCs).

As summarized in Table 4-3, several metals (e.g., chromium) and other inorganics (e.g., ammonia) were detected in the groundwater samples collected from S5-MW01. Because site-specific background data are not available for Range 6, inorganic concentrations detected in S5-MW01 were compared to inorganics data available for the upgradient monitoring wells at SWMU 25 (25MW03) and SWMU 26 (26MW03).

Calcium, chromium, cobalt, copper, lead, magnesium, manganese, potassium, and sodium concentrations detected in the unfiltered Range 6 groundwater samples exceed those reported in the unfiltered background sample from S26MW03. However, in many cases, the differences are marginal (i.e., less than a factor of 2) and may be attributable, in part, to the turbidity of the samples. With the exception of sodium, none of the inorganics detected in the unfiltered samples from the Range 6 monitoring well exceed those reported for upgradient well 25MW03.

Inorganics concentrations reported in the filtered Range 6 groundwater samples are generally similar to or lower than those reported in the unfiltered samples. However, barium, calcium, cobalt, iron, magnesium, manganese, mercury, potassium, sodium, thallium, and zinc concentrations detected in the filtered Range 6 groundwater samples exceed those reported in the filtered background sample from 26MW03. Calcium, cobalt, iron, magnesium, manganese, mercury, potassium, sodium, and zinc concentrations detected in the filtered Range 6 groundwater samples exceed those reported for the filtered background sample from 25MW03. Calcium, iron, magnesium, manganese, potassium, and sodium concentrations in the Range 6 groundwater samples were greater than two to five times those concentrations reported for the upgradient wells at SWMUs 25 or 26.

With the exception of the unfiltered lead and filtered thallium results, metals concentrations detected in well S5-MW01 do not exceed federal SDWA primary (i.e., health-based) MCLs or action levels. (The unfiltered lead concentrations (C_{max} = 27.3 μg/L) exceeded an action level of 15 μg/L; the filtered thallium concentration (C_{max} = 2.6 μg/L) exceeds the primary MCL (2 μg/L)). Unfiltered aluminum, unfiltered and filtered iron, and unfiltered and filtered manganese concentrations exceed available federal SDWA secondary (aesthetic-based) MCLs.

Ammonia, sulfate, TKN, and TOX results reported for the Range 6 groundwater samples also exceed those reported in the SWMU 26 background groundwater samples from SWMU 25 or SWMU26.

4.7 QUALITATIVE HUMAN HEALTH RISK ASSESSMENT FOR RANGE 6

A qualitative risk assessment of constituent concentrations detected in Range 6 soil samples is presented in Table 4-4. 2,4-dinitrotoluene was detected at a maximum concentration exceeding the EPA Region III SSL for the protection of groundwater. However, it should be noted that the constituent was not detected in Range 6 groundwater samples at concentrations exceeding available MCLs or EPA Region III RBCs for tap water. 2,4,6-Trinitrotoluene, arsenic, and beryllium were detected at maximum concentrations exceeding the EPA Region III RBC for ingestion of soil assuming a residential land use scenario. (Based on data available for Area 8/the IED, arsenic and beryllium concentrations at Range 6 appear to reflect background.) No target analytes were reported at concentrations exceeding EPA Region III RBCs for soil assuming an industrial land use scenario.

Table 4-5 presents the results of the qualitative human health assessment of constituents detected in groundwater samples collected in Range 6 groundwater. The following organics and inorganics were detected at concentrations exceeding EPA Region III RBCs for tap water:

- 1,3-Dinitrobenzene
- 2,4,6-Trinitrotoluene (TNT)
- RDX
- Iron
- Manganese
- Ammonia

Aluminum, iron, lead, manganese, and thallium were also detected at concentrations exceeding federal or state SDWA primary or secondary MCLs or Action Levels or EPA Health Advisories. In some cases (e.g., lead, thallium), the exceedances were marginal (i.e., less than a factor of 2 times a criteria or standard). All of these constituents and 2,4-dinitrotoluene, a noncarcinogenic constituent detected at a concentration greater than one tenth the EPA Region III RBC, will be further evaluated in the following quantitative risk assessment.

4.8 QUANTITATIVE HUMAN HEALTH RISK ASSESSMENT FOR RANGE 6

A quantitative risk assessment of TNT concentrations in the Range 6 soil samples was performed as detailed in the risk assessment spreadsheets included in Appendix I and summarized in Table 4-6. Excess lifetime cancer risks estimated assuming residential and industrial land use scenarios were 2.7×10^{-6} and 6.6×10^{-7}, respectively. As a point of reference, the 10^{-4} to 10^{-6} cancer risk range is often evaluated in the development of regulatory standards and criteria and in determining the need for remediation at sites of environmental concern. As summarized in Table 4-6, the hazard quotient for TNT marginally exceeds unity (i.e., the HQ is less than 2) when the residential land use scenario is evaluated and a child is the receptor of concern. Adverse noncarcinogenic health effects are possible when hazard quotients/hazard indices exceed unity. However, it should be noted that the concentration evaluated in the risk assessment (C = 28.4 mg/kg) is the maximum detected concentration reported for the Range 6 soils. The evaluation of the adult receptor in either the residential or industrial land use scenario does not result in a hazard index exceeding unity. An evaluation of average contaminant concentrations would not have yielded a hazard quotient exceeding unity for any of the receptors evaluated.

Table 4-6 also includes the results of the quantitative risk assessment of COPC concentrations in groundwater. Cancer risk estimates based on maximum COPC concentrations in groundwater exceed the 10^{-4} to 10^{-6} cancer risk range often used in determining the need for remediation at sites of environmental concern. The majority of the risk is attributable to TNT. Additionally, hazard indices exceed unity; consequently, there is a potential for adverse noncarcinogenic health effects under the conditions established for the exposure assessment. TNT, 1,3-dinitrobenzene, RDX, and manganese are the principal contributors to noncarcinogenic risk. It should be noted that the groundwater at Range 6 is not currently used as a domestic water resource and is unlikely to be used as a resource at some time in the future. The risks presented in Table 4-6 are hypothetical and assume a future residential land use scenario. Based on discussions with Base personnel, this is a very unlikely future land use scenario.

4.9 ECOLOGICAL RISK ASSESSMENT FOR RANGE 6

Various organic contaminants were detected in the surface soils at Range 6, with explosives and related chemicals generally present at the greatest concentrations. Numerous metals, which may be present naturally in soils as well as due to anthropogenic contamination, were also detected. (Data on metal concentrations in the soil at background locations are not available for this location.) Various wildlife species have the potential for exposure to chemical contaminants present in the soil, for example, through incidental ingestion accompanying feeding, burrowing, and/or grooming behavior. However, soil screening concentrations designed to be protective of wildlife are not generally available. Based on the VI sampling (i.e., specifically, the field screen sampling), significant soil contamination at Range 6 may be limited to relatively small "hot spot" areas. Thus, the potential for adverse effects is likely to be limited.

Ecological receptors would generally not be exposed to contaminants present in groundwater. However, the groundwater will eventually discharge into surface waters inhabited by aquatic organisms, specifically, Chicamuxen Creek or the Potomac River. Thus, the EPA's chronic Ambient Water Quality Criteria (AWQC), which are designed to be protective of freshwater aquatic life under a long-term exposure, were used as conservative benchmarks in a qualitative assessment of future risks to aquatic organisms from contaminants in groundwater. The maximum measurement of each chemical detected in the groundwater was divided by the AWQC to obtain the environmental effects quotient (EEQ) (see Table 4-7). EEQs greater than 1 indicate potential ecological risk.

Most of the organic contaminants detected in the groundwater at this site, primarily explosives and related chemicals, do not have AWQC or similar criteria, and thus the ecological risks posed by these chemicals could not be evaluated. However, EEQs calculated for 2,4,6-trinitrotoluene and 2,4-dinitrotoluene were slightly greater than 1; therefore these chemicals pose a potential ecological risk. Among the inorganic chemicals detected, chromium, copper, lead, and mercury had maximum EEQs greater than 1; thus these chemicals may also pose a potential ecological risk.

Several factors may lessen the potential ecological risk due to these contaminants, however. The exceedances of chromium, copper, and lead were from unfiltered samples, with much lower concentrations measured in filtered samples. This suggests a large fraction of these metals present in the groundwater were associated with particulates. Metals associated with particulates would not be expected to be mobile in groundwater and thus may not reach surface waters. In addition, it is generally believed that the dissolved fraction of metal more closely approximates the bioavailable fraction of metal in the water column than does "total" metal measurements from unfiltered samples. The Maryland Water Quality Standards for protection of aquatic life are based on dissolved metals to reflect this belief. However, the exceedence of the CAWQC for mercury occurred in the filtered sample, and thus presumably this mercury is potentially bioavailable. The risk posed by chromium in the groundwater is probably overestimated, as the CAWQC for chromium is based on hexavalent chromium, whereas total chromium (hexavalent + trivalent) was measured in the groundwater samples.

In addition, chemical concentrations in groundwater may decrease as the groundwater moves through the soil due, for instance, to adsorption of contaminants to soils. Contaminants present in the groundwater would also likely be significantly diluted upon discharge to surface water. Thus, groundwater chemical concentrations may not represent the chemical concentrations that would be encountered by ecological receptors present in the surface waters receiving the groundwater discharge.

TABLE 4-1

CONTAMINANT OCCURRENCE AND DISTRIBUTION
RANGE 6 - SOIL SAMPLES
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Parameter	Monitoring Well Soil Samples	
	S05-MW01-01[1,2]	S05-MW01-02[1,3]
VOLATILE ORGANICS (μg/kg)		
4-Methyl-2-pentanone	1.5^{J}	$1.7^{U}/1.7^{UJ}$
Chloroform	2.5^{J}	$1.1^{J}/3.5^{J}$
Toluene	0.30	$0.31^{U}/1.3^{J}$
SEMIVOLATILE ORGANICS (μg/kg)		
2,4-Dinitrotoluene	518	$25.4^{U}/24.5^{U}$
di-n-Butylphthalate	740	$69.2^{R}/59.6^{U}$
ENERGETICS (μg/kg)		
2,4,6-Trinitrotoluene	1560/28400	1430
2-Amino-4,6-dinitrotoluene	$488^{J}/403^{J}$	560^{J}
HMX	597/516	511
RDX	3380/1610	3350
INORGANICS (mg/kg)		
Aluminum	6290/5880	6130
Antimony	$0.19^{UL}/0.23^{L}$	0.59^{L}
Arsenic	2.8/2.9	3.8
Barium	26.4/20.2	30.3
Beryllium	0.25/0.19	0.29
Cadmium	$0.96^{L}/1.4$	1.1
Calcium	$87.5^{R}/78.4^{R}$	126^{K}
Chromium	12.6/13.3	14.7
Cobalt	3.6/3.3	5.4
Copper	54.3/41.3	37.9
Iron	$14300^{J}/14400^{J}$	12900^{J}
Lead	$30.3^{L}/25.2^{L}$	38.9^{L}

TABLE 4-1 (Continued)
CONTAMINANT OCCURRENCE AND DISTRIBUTION
RANGE 6 - SOIL SAMPLES
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Parameter	Monitoring Well Soil Samples	
	S05-MW01-01[1,2]	S05-MW01-02[1,3]
Magnesium	**323/281**	**377**
Manganese	**82.6/89.9**	**97.4**
Mercury	**$0.14^{L}/0.13^{L}$**	**0.14^{L}**
Nickel	**$4.9^{J}/6.2^{J}$**	**8.2**
Potassium	**311/257**	**307**
Selenium	$0.17^{U}/0.16^{U}$	**0.17^{K}**
Silver	**0.27/0.22**	**0.22**
Vanadium	**17.9/19.2**	**17.7**
Zinc	**32.6/39.7**	**32.7**
INDICATOR PARAMETERS		
Ammonia (mg/kg)	**$16.1^{L}/21.6^{L}$**	**23.1^{L}**
Nitrate+Nitrite (mg/kg)	**3.8/3.0**	**3.0**
Percent Solids (%)	**90.8/91.5**	88.2/91.6
Total Organic Carbon (mg/kg)	**1400/2770**	**2540**

NOTE: **All positive detections have been bolded.**

1 Duplicate samples taken from this location.
2 Sample depth is 0 to 2 feet.
3 Sample depth is just above groundwater (4 to 6 feet).

B Positive result qualified as a result of method or field quality control blank contamination. Compound is not considered to be present in sample.
J Positive detection is qualified as an estimate.
K Positive detection is qualified as biased high.
L Positive result is qualified as biased low.
U Analyte not detected. Reported result is the detection limit.
UJ Analyte not detected. Reported result is the estimated detection limit.
UL Nondetect of analyte considered biased low.

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TABLE 4-2

COMPARISON OF FIXED-BASED LAB AND FIELD SCREENING RESULTS
RANGE 6 - SOIL SAMPLES
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Parameter	Fixed-Based Lab Result[1]	Field Screening Result[2]
TNT (mg/kg)	1.6/28.4	> 6 mg/kg
RDX	1.6/3.4	4.5 mg/kg

1 Fixed-based laboratory results for soil samples from 5MW01.
2 Results available for field screening sampling locations 06SS13 and 06SS19 which are in the vicinity of 5MW01.

TABLE 4-3

CONTAMINANT OCCURRENCE AND DISTRIBUTION
RANGE 6 - GROUNDWATER SAMPLES
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Parameter[1]		Monitoring Well
		5MW01[2]
VOLATILE ORGANICS		
NOT DETECTED		
SEMIVOLATILE ORGANICS (μg/L)		
2,4-Dinitrotoluene[3]		6.0/6.7
2,6-Dinitrotoluene		1.4^{U}/2.5
3-Nitroaniline		6.6^{J}/7.3^{J}
Bis(2-ethylhexyl)phthalate		1.8^{J}/1.6^{J}
ENERGETICS (μg/L)		
1,3-Dinitrobenzene		4.4^{J}/4.5^{J}
2-Amino-4,6-dinitrotoluene		4230^{J}/4700^{J}
2,4-Dintrotoluene[3]		17.3^{J}/16.2^{J}
2,4,6-Trinitrotoluene		242^{J}/173^{J}
Nitroguanidine (NQ)		42.1/50.2
RDX		658^{J}/426^{J}
INORGANICS (μg/L)		
Aluminum	U	7980^{J}/12600^{J}
	F	110^{UL}/110^{UL}
Barium	U	98.1/131
	F	43.7/42.0
Calcium	U	9830^{K}/10400
	F	10200/10600
Chromium	U	16.0^{L}/29.6
	F	10.0^{UL}/10.0^{UL}
Cobalt	U	28.1/31.8
	F	22.2/18.7

TABLE 4-3 (Continued)
CONTAMINANT OCCURENCE AND DISTRIBUTION
RANGE 6 - GROUNDWATER SAMPLES
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Parameter[1]		Monitoring Well 5MW01[2]
Copper	U	32.9/40.8
	F	$15.0^{U}/15.0^{U}$
Iron	U	19600/29000
	F	6900/6320
Lead	U	27.3/19.1
	F	$0.6^{U}/0.6^{U}$
Magnesium	U	$8930^{K}/9700^{K}$
	F	$9930^{K}/9840^{K}$
Manganese	U	1360/1400
	F	1600/1610
Mercury	U	$0.29^{B}/0.34^{B}$
	F	$0.10^{U}/0.12$
Potassium	U	3990/4110
	F	3760/3870
Sodium	U	18600/18700
	F	20100/20700
Thallium	U	$2.5^{UJ}/2.5^{UJ}$
	F	$2.5^{U}/2.6^{K}$
Vanadium	U	25.8/43.8
	F	$22.0^{U}/22.0^{U}$
Zinc	U	$79.8/64.4^{B}$
	F	18.5/19.2

INDICATOR PARAMETERS

Ammonia (mg/L)	1.9/1.8
Nitrate + Nitrite (mg/L)	$0.05^{UL}/0.05^{UL}$
Sulfate (mg/L)	$38.5^{L}/38.5^{L}$
Total Kjedahl Nitrogen (mg/L)	$2.2^{L}/1.9^{L}$
Total Organic Carbon (mg/L)	5.6/4.2
Total Organic Halides (µg/L)	$43.0^{L}/23.8^{L}$
Total Phosphorus (mg/L)	0.37/0.12

TABLE 4-3 (Continued)
CONTAMINANT OCCURENCE AND DISTRIBUTION
RANGE 6 - GROUNDWATER SAMPLES
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

NOTE: All positive detections have been bolded.

1 U - Unfiltered sample
F - Filtered sample

2 Duplicate samples taken from this location.
3 Analytical results for 2,4-Dinitrotoluene are available from analyses for energetics and from analyses for semivolatile organics.

B Positive result qualified as a result of method or field quality control blank contamination. Compound is not considered to be present in sample.
J Positive detection is qualified as an estimate.
K Positive detection is qualified as biased high.
L Positive result is qualified as biased low
U Analyte not detected. Reported result is the detection limit.
UJ Analyte not detected. Reported result is the estimated detection limit.
UL Nondetect of analyte considered biased low.

TABLE 4-4

RANGE 6 SOIL - QUALITATIVE RISK ASSESSMENT
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Chemical (a)	Frequency of Detection (b)	Range of Detection (mg/kg)	Location of Maximum	Risk-Based Action Levels (mg/kg) (c)				Background Concentration (mg/kg)	Maryland Background Concentration (e) (mg/kg)
				Soil Ingestion		Soil Screening Levels			
				Industrial	Residential	Air	Groundwater		
Volatiles									
4-Methyl-2-pentanone	1/3	0.0015	S05-MW01-01	NA	NA	NA	NA	ND	NA
Chloroform	3/3	.0011 - 0.003	05-MW01-02d	940	100	0.2	0.3	ND	NA
Toluene	2/3	.0003 - 0.001	05-MW01-02d	410000	16000	520	5	ND	NA
Semivolatiles									
2,4-Dinitrotoluene	1/3	0.518	S05-MW01-01	4100	160	120	0.2	ND	NA
Di-n-butylphthalate	1/3	0.74	S05-MW01-01	200000	7800	100	120	ND	NA
Energetics									
2,4,6-Trinitrotoluene	3/3	1.43 - 28.4	05-MW01-01d	190	21	NA	NA	ND	NA
2-Amino-4,6-dinitrotoluene	3/3	0.403 - 0.560	S05-MW01-02	NA	NA	NA	NA	ND	NA
HMX	3/3	0.511 - 0.597	S05-MW01-01	100000	3900	NA	NA	ND	NA
RDX	3/3	1.61 - 3.38	S05-MW01-01	52	5.8	NA	NA	ND	NA
Inorganics									
Aluminum	3/3	5880 - 6290	S05-MW01-01	1000000	78000	NA	NA	3070 - 12700	<20000
Antimony	2/3	0.23 - 0.59	S05-MW01-02	820	31	NA	NA	ND	<1
Arsenic	3/3	2.8 - 3.8	S05-MW01-02	3.8	0.43	380	15	1.9 - 3.7	2-6
Barium	3/3	20.2 - 30.3	S05-MW01-02	140000	5500	350000	32	9.1 - 84.8	300
Beryllium	3/3	0.18 - 0.29	S05-MW01-02	1.3	0.15	690	180	0.14 - 0.61	<1
Cadmium	3/3	0.96 - 1.4	05-MW01-01d	1000	39	920	6	ND	ND
Calcium	1/3	126	S05-MW01-02	NA	NA	NA	NA	50.7 - 409	<2300
Chromium	3/3	12.6 - 14.7	S05-MW01-02	1000000 (III) 10000 (VI)	78000 (III) 390 (VI)	140 (VI)	19 (VI)	8.5 - 20.8	<20
Cobalt	3/3	3.3 - 5.4	S05-MW01-02	120000	4700	NA	NA	3.3 - 15	<3
Copper	3/3	37.9 - 54.3	S05-MW01-01	82000	3100	NA	NA	2.5 - 5.2	<10

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TABLE 4-4 (Continued)
RANGE 6 SOIL - QUALITATIVE RISK ASSESSMENT
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Chemical (a)	Frequency of Detection (b)	Range of Detection (mg/kg)	Location of Maximum	Risk-Based Action Levels (mg/kg) (c)				Background Concentration (mg/kg)	Maryland Background Concentration (e) (mg/kg)
				Soil Ingestion		Soil Screening Levels			
				Industrial	Residential	Air	Groundwater		
Inorganics (Continued)									
Iron	3/3	12900 - 14400	05-MW01-01d	610000	23000	NA	NA	7930 - 25300	<10000
Lead	3/3	25.2 - 38.9	S05-MW01-02	NA	NA	NA	NA	3.1 - 10.0	15
Magnesium	3/3	281-377	S05-MW01-02	NA	NA	NA	NA	215 - 1090	1500
Manganese	3/3	82.6-97.4	S05-MW01-02	10000	390	NA	NA	50.1 - 882	<150
Mercury	3/3	0.13 - 0.14	05-MW01-01/0	610	23	7	3	0.07	0.051 - 0.13
Nickel	3/3	4.9 - 8.2	S05-MW01-02	41000	1600	6900	21	7.3 - 10.5	<5
Potassium	3/3	257 - 311	S05-MW01-01	NA	NA	NA	NA	221 - 783	<11000
Selenium	1/3	0.17	S05-MW01-02	10000	390	NA	3	0.17	0.3
Silver	3/3	0.22 - 0.27	S05-MW01-01	10000	390	NA	NA	ND	ND
Vanadium	3/3	17.7 - 19.2	05-MW01-01d	14000	550	NA	NA	9.8 - 38.7	<20
Zinc	3/3	32.8 - 39.7	05-MW01-01d	610000	23000	NA	42000	11.3 - 30.8	<28
Indicator Parameters									
Ammonia	3/3	16.1 - 23.1	S05-MW01-02	NA	NA	NA	NA	7.8 - 49.9	NA
Nitrate + Nitrite	3/3	3.0 - 3.8	S05-MW01-01	1E6/2E5	30000/780	NA	NA	1.9	NA
Total Organic Carbon	3/3	1400 - 2770	05-MW01-01d	NA	NA	NA	NA	1290 - 5020	NA

TABLE 4-4 (Continued)
RANGE 6 SOIL - QUALITATIVE RISK ASSESSMENT
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

NA - Not Available.

ND - Not Detected.

(a) Chemical name displayed in bold font exceeds action level.

(b) Samples S05-MW01-01, S05-MW01-02, S05-MW01-02dup (for volatile and semivolatile analysis), and S05-MW01-01dup (for energetic, inorganic and indicator parameter analysis) were utilized in this statistical evaluation.

(c) Source: Risk-Based Concentration Table, July - December 1995, USEPA, October 20, 1995.

(d) Samples S26-MW03-001, S26-MW03-002, S25 MW03-001, and S25-MW03-002 were utilized in developing the range.

(e) Source: Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States, USGS Professional Paper 1270, 1984. Data for Maryland utilized.

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TABLE 4-5

ROUND 6 GROUNDWATER - QUALITATIVE RISK ASSESSMENT
VERIFICATION INVESTIGATION
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Chemical (a)	Frequency of Detection (b)	Range of Detection (ug/L)	Location of Maximum	Risk-Based Action Level for Tap Water (c) (ug/L)	Federal Maximum Contaminant Level (MCL) (d) (ug/L)	Maryland State Drinking Water Standard (d) (ug/L)	USEPA Health Advisories (d) (ug/L)	Background Concentration (e) (ug/L)
Semivolatile Organics								
2,4-Dinitrotoluene (f)	2/2	6.0 - 5.7	5MW01dup	73	NA	NA	400	ND
2,6-Dinitrotoluene	1/2	2.5	5MW01dup	37	NA	NA	NA	ND
3-Nitroanaline	2/2	6.6 - 7.3	5MW01dup	110	NA	NA	NA	ND
Bis(2-ethylhexyl)phthalate	2/2	1.6 - 1.8	5MW01	4.8	NA	6	NA	3.3
Energetics								
1,3-Dinitrobenzene	2/2	4.4 - 4.5	5MW01dup	3.7	NA	NA	1	ND
2-Amino-4,6-dinitrotoluene	2/2	4230 - 4700	5MW01dup	NA	NA	NA	NA	ND
2,4-Dinitrotoluene (f)	2/2	16.2 - 17.3	5MW01	73	NA	NA	400	ND
2,4,6-Trinitrotoluene	2/2	173 - 242	5MW01	2.2	NA	NA	2	ND
Nitroguanidine	2/2	42.1 - 50.2	5MW01	3700	NA	NA	700	ND
RDX	2/2	426 - 658	5MW01	0.61	NA	NA	2	ND
Inorganics								
Aluminum unfiltered	2/2	7980 - 12600	5MW01dup	37000	**50 TO 200**	NA	NA	11100 - 73400
Barium unfiltered (filtered)	2/2 (2/2)	98.1 - 131 (42.0 - 43.7)	5MW01dup (5MW01)	2600	2000	2000	2000	140 - 688 (51.2)
Calcium unfiltered (filtered)	2/2 (2/2)	9830 - 10400 (10200 - 10600)	5MW01dup (5MW01dup)	NA	NA	NA	NA	3580 - 40300 (1980 - 9650)
Chromium unfiltered	2/2	16.0 - 29.6	5MW01dup	37000 (III) 180 (	100	100	100	14.8 - 191
Cobalt unfiltered (filtered)	2/2 (2/2)	28.1 - 31.8 (18.7 - 22.2)	5MW01dup (5MW01)	2200	NA	NA	NA	15.6 - 169 (ND)
Copper unfiltered	2/2	32.9 - 40.8	5MW01dup	1500	1300 (g)	NA	NA	16.3 - 166

TABLE 4-5 (Continued)
ROUND 6 GROUNDWATER - QUALITATIVE RISK ASSESSMENT
VERIFICATION INVESTIGATION
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Chemical (a)	Frequency of Detection (b)	Range of Detection (ug/L)	Location of Maximum	Risk-Based Action Level for Tap Water (c) (ug/L)	Federal Maximum Contaminant Level (MCL) (d) (ug/L)	Maryland State Drinking Water Standard (d) (ug/L)	USEPA Health Advisories (d) (ug/L)	Background Concentration (e) (ug/L)
Inorganics (Continued)								
Iron unfiltered (filtered)	2/2 (2/2)	19600 - 20000 (6320 - 6900)	5MW01dup (5MW01)	11000	300	NA	NA	22100 - 252000 (ND)
Lead unfiltered	2/2	19.1 - 27.3	5MW01	NA	15(g)	NA	NA	51
Magnesium unfiltered (filtered)	2/2 (2/2)	8930 - 9700 (9840 - 9930)	5MW01dup (5MW01)	NA	NA	NA	NA	2920 - 16800 (1092 - 3610)
Manganese unfiltered (filtered)	2/2 (2/2)	1360 - 1400 (1600 - 1610)	5MW01dup (5MW01dup)	180	50	NA	NA	328 - 2290 (106 - 288)
Mercury (filtered)	(1/2)	(0.12)	(5MW01dup)	11	2	NA	2	ND
Potassium unfiltered (filtered)	2/2 (2/2)	3990 - 4110 (3760 - 3870)	5MW01dup (5MW01dup)	NA	NA	NA	NA	3640 - 8430 (1040 - 3440)
Sodium unfiltered (filtered)	2/2 (2/2)	18600 - 18700 (20100 - 20700)	5MW01dup (5MW01dup)	NA	NA	NA	NA	6840 - 9120 (8790 - 10900)
Thallium (filtered)	(1/2)	(2.6)	(5MW01dup)	NA	2	2	0.4	(ND)
Vanadium unfiltered	2/2	25.8 - 43.8	5MW01dup	260	NA	NA	NA	37.4 - 281
Zinc unfiltered (filtered)	1/2 (2/2)	79.8 (18.5 - 19.2)	5MW01 (5MW01dup)	11000	5000	NA	2000	483 (ND)
Indicator Parameters								
Ammonia	2/2	1800 - 1900	5MW01	1000	NA	NA	30000	410 - 600
Sulfate	2/2	38500	5MW01/dup	NA	500000	NA	NA	1600 - 8000
TKN	2/2	1900 - 2200	5MW01	NA	NA	NA	NA	430 - 600
TOC	2/2	4200 - 5600	5MW01dup	NA	NA	NA	NA	4300
TOX	2/2	23.8 - 43.0	5MW01	NA	NA	NA	NA	11.8 - 13.6
Total Phosphorus	2/2	120 - 370	5MW01	NA	NA	NA	NA	210 - 1500

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TABLE 4-5 (Continued)
ROUND 6 GROUNDWATER - QUALITATIVE RISK ASSESSMENT
VERIFICATION INVESTIGATION
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

NA - Not Available.

ND - Not Detected.

(a) Chemicals displayed in bold font exceed action levels.

(b) Samples 5MW01 and 5MW01dup were utilized in this statistical evaluation.

(c) Source: Risk-Based Concentration Table, July -December, 1995, USEPA, October 20, 1995.

(d) Taken from Table 2-3, Standards and Criteria for Chemicals of Concern.

(e) Samples 25MW03 and 26MW03 were utilized in developing background range.

(f) Analytical results for 2,4-Dinitrotoluene are available from analyses for energetics and from analyses for semivolatile organics.

(g) The actual MCLs for these compounds are treatment techniques, the values displayed are action levels.

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TABLE 4-6

SUMMARY OF RISK ASSESSMENT RESULTS FOR RANGE 6 - GROUNDWATER AND SOIL
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Area of Concern	Media of Concern	Exposure Route	Hazard Index	Parameters with Hazard Index > 1	Cancer Risk Estimates	Parameters with Cancer Risk Estimates > 10^{-4}	Parameters with Cancer Risk Estimates > 10^{-6}
Range 6	Soil (Industrial Scenario)	Ingestion	2.78E-2	--	1.49E-7	--	--
		Dermal Contact	9.59E-2	--	5.14E-7	--	--
		Totals	1.24E-1	--	6.63E-7	--	--
	Soil (Residential Scenario)	Ingestion	7.26E-1	--	1.33E-6	--	--
		Dermal Contact	3.27E-1	--	1.42E-6	--	--
		Totals	1.05E+0	--	2.75E-6	--	--
	Groundwater (Residential Scenario)	Ingestion	3.32E+1 (3.30E+1)	1,3-Dinitrobenzene 2,4,6-Trinitrotoluene RDX Manganese Manganese (filtered) Thallium (filtered)	1.36E-3 (1.36E-3)	2,4-Dinitrotoluene 2,4,6-Trinitrotoluene RDX	--
		Dermal Contact	2.88E+0 (2.87E+0)	2,4,6-Trinitrotoluene	3.06E-4 (3.06E-4)	RDX	--
		Inhalation	--	Ammonia	0.00E+0 (0.00E+0)	--	--
		Totals	3.61E+1 (3.59E+1)	--	1.67E-3 (1.67E-3)	--	--

-- None found

TABLE 4-7

ENVIRONMENTAL EFFECTS QUOTIENTS
RANGE 6 GROUNDWATER
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Parameter	Maximum Concentration	Chronic Ambient Water Quality Criterion[1]	Environmental Effects Quotient
SEMIVOLATILE ORGANICS (µg/L)			
2,6-Dinitrotoluene	2.5	NA	NA
3-Nitroaniline	7.3[J]	NA	NA
Bis(2-ethylhexyl)phthalate	1.8[J]	3	0.6
ENERGETICS (µg/L)			
1,3-Dinitrobenzene	4.5[J]	NA	NA
2-Amino-4,6-dinitrotoluene	4700[J]	NA	NA
2,4-Dinitrotoluene	17.3[J]	5.2	1.3
2,4,6-Trinitrotoluene	242[J]	130[2]	1.9
Nitroguanidine	50.2	NA	NA
RDX	658[J]	NA	NA
INORGANICS (µg/L)			
Aluminum	12600 (U)	NA	NA
Barium	131 (U)	NA	NA
Calcium	10600 (F)	NA	NA
Chromium	29.6 (U)	11[3]	2.7
Cobalt	31.8 (U)	NA	NA
Copper	40.8 (U)	12[4,5]	3.4
Iron	29000 (U)	NA	NA
Lead	27.3 (U)	3.2[4,5]	8.5
Magnesium	9840 (F)	NA	NA

TABLE 4-7 (Continued)
ENVIRONMENTAL EFFECTS QUOTIENTS
RANGE 6 GROUNDWATER
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

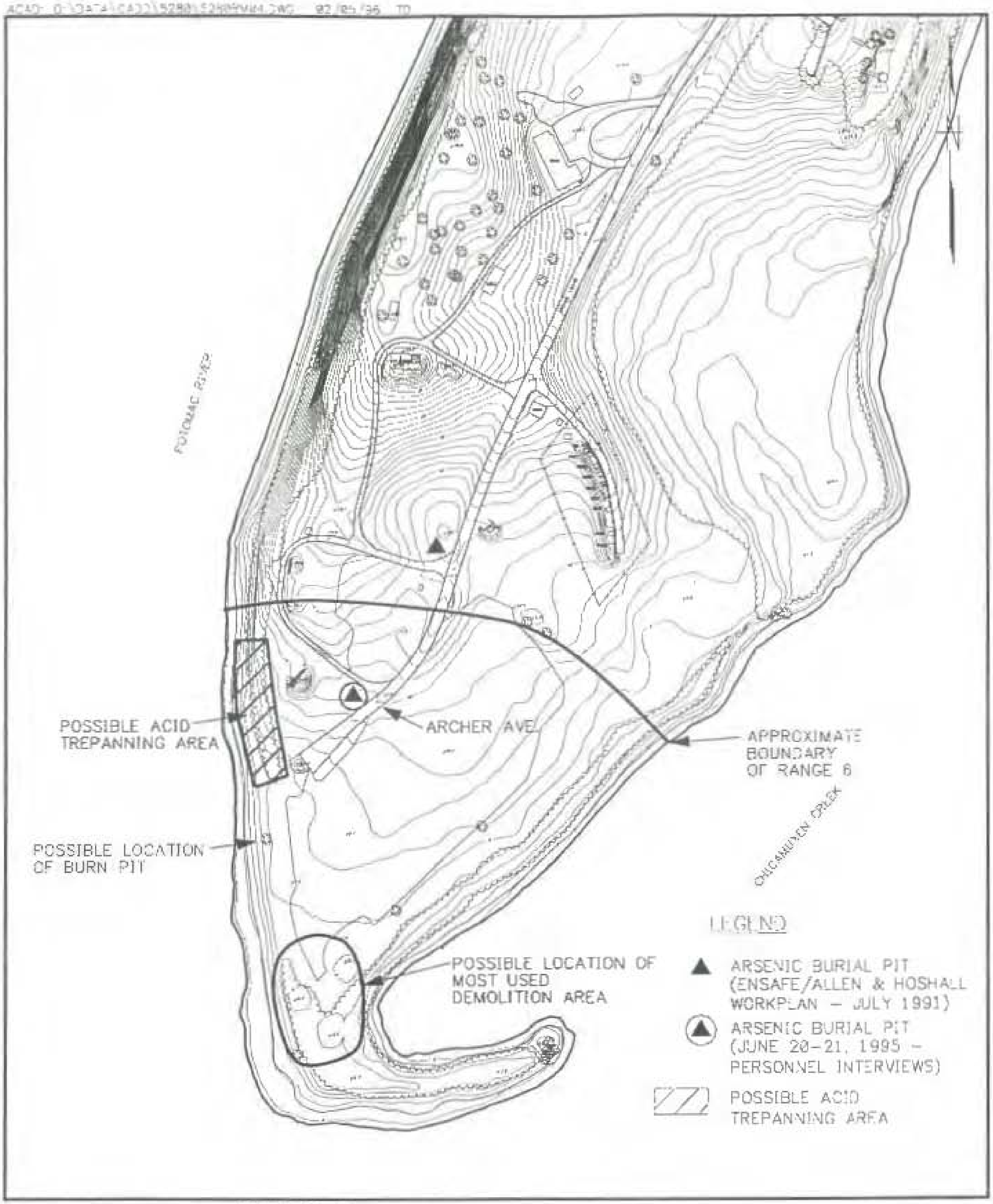
Parameter	Maximum Concentration	Chronic Ambient Water Quality Criterion(1)	Environmental Effects Quotient
Manganese	1610 (F)	NA	NA
Mercury	0.12 (F)	0.012(4)	10
Potassium	4110 (U)	NA	NA
Sodium	20700 (F)	NA	NA
Thallium	2.6K (F)	40	0.07
Vanadium	43.8 (U)	NA	NA
Zinc	79.8 (U)	110(4,5)	0.7
Ammonia (mg/L)	1.9	3.9	0.5

U - Unfiltered sample
F - Filtered sample

J Positive detection is qualified as an estimate.
K Positive detection is qualified as biased low.
(1) Unless otherwise noted, Lowest Observed Effect Levels (LOEL) obtained from Quality Criteria for Water, 1986, U.S. EPA, May 1986.
(2) Criterion is chronic water quality criterion calculated as per EPA methods in Talmage and Opresko, 1995.
(3) Criterion for chromium based on hexavalent chromium. No chronic ambient water quality criterion for the protection of freshwater aquatic life established for total chromium.
(4) Criterion 6/15/90 table.
(5) Criterion is based on a total hardness of 100 mg/L.

TABLE 4-7 (Continued)
ENVIRONMENTAL EFFECTS QUOTIENTS
RANGE 6 GROUNDWATER
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Figure 4-1 (8.5 x 11)



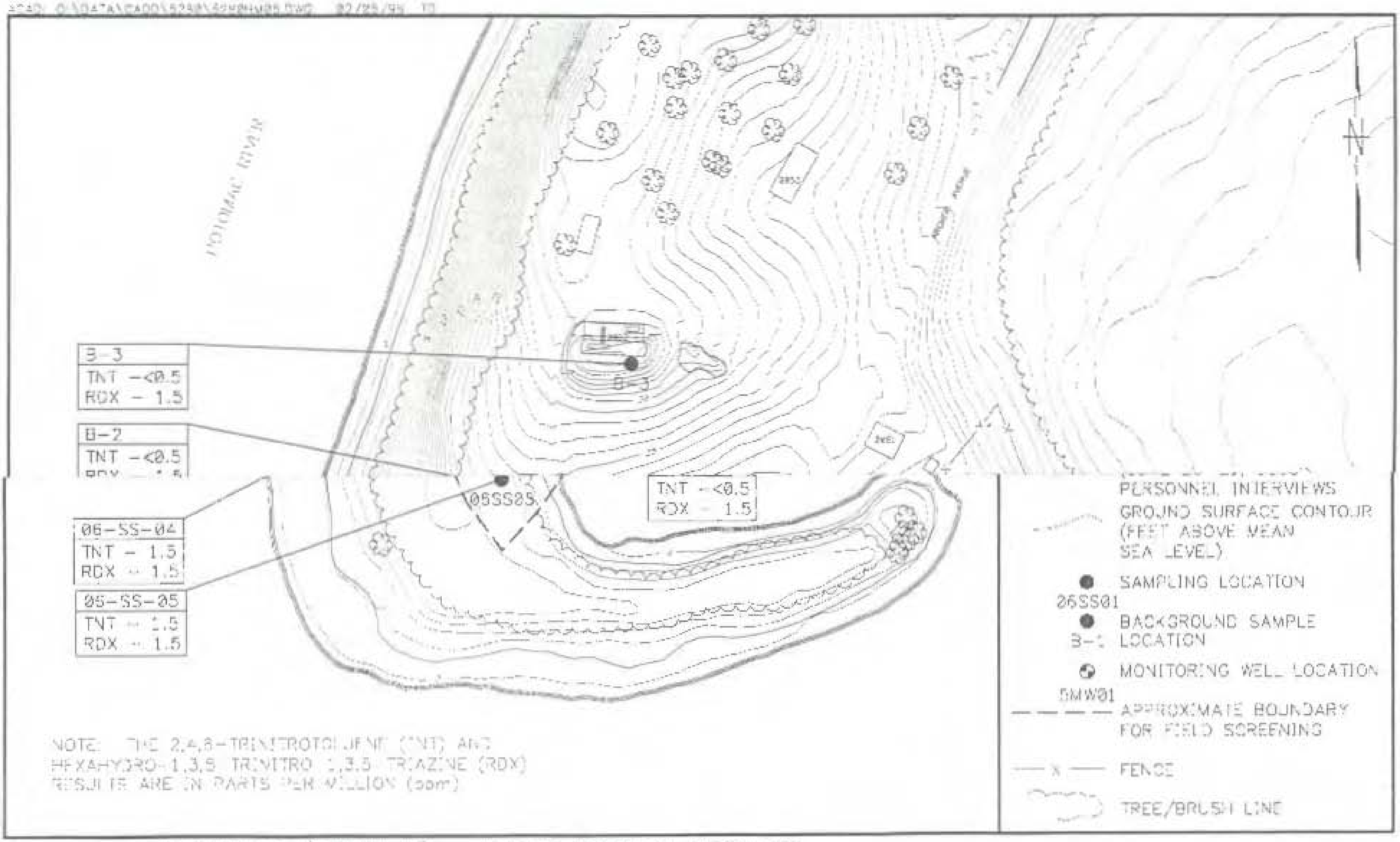
RANGE 6
STUMP NECK ANNEX
NAVAL SURFACE WARFARE CENTER
INDIAN HEAD, MD

0 200 400

FIGURE 4-1

Brown & Root Environmental

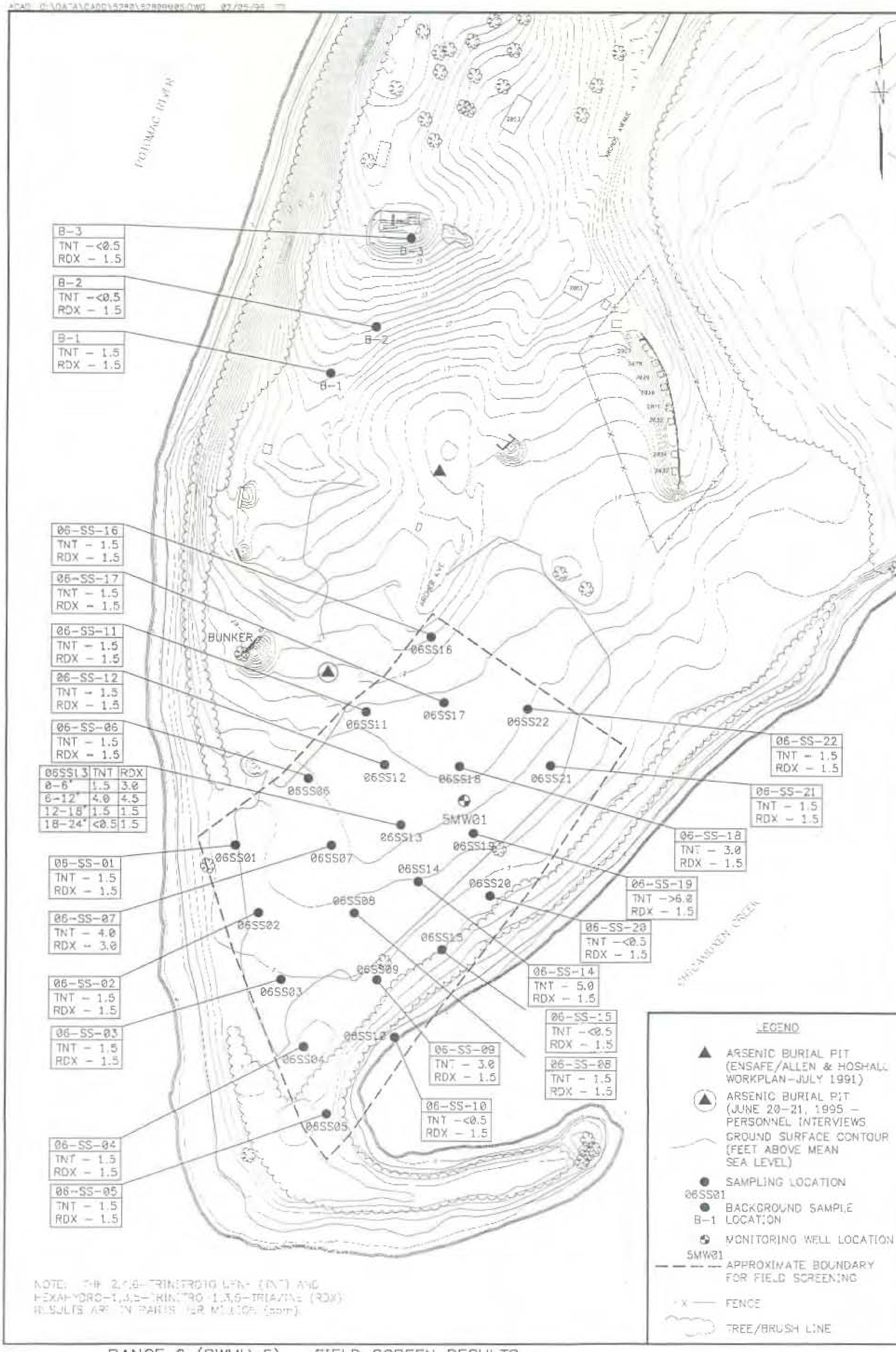
CTO 222



RANGE 6 (SWMU 5) - FIELD SCREEN RESULTS
STUMP NECK ANNEX
NAVAL SURFACE WARFARE CENTER
INDIAN HEAD, MD

FIGURE 4-2

Brown & Root Environmental



RANGE 6 (SWMU 5) - FIELD SCREEN RESULTS
STUMP NECK ANNEX
NAVAL SURFACE WARFARE CENTER
INDIAN HEAD, MD

0 100 200

FIGURE 4-2

Brown & Root Environmental

5.0 The Improvised Explosive Devices (IED) Site (SWMU 26)

5.1 SITE BACKGROUND AND PHYSICAL SETTING

The IED is located south of Archer Avenue in the vicinity of Buildings 2119, 2118, and 2090. The site encompasses 51.42 acres; however, most training exercises occurred in an area approximately 300 feet by 300 feet. This area is often referred to as the VIP demonstration area. Important features of the IED are the incendiary demonstration area, a demonstration area located in front of Structure 2158 (the bleachers), Building 2118 (used for mixing chemicals), and the detonation demonstration area. Access to the site is controlled by fencing and a gate located on Archer Avenue. No wetlands exist in the immediate vicinity of the site. The location and general features of the IED are displayed in Figure 5-1.

5.2 SITE OPERATIONS AND HISTORY

The IED is used to test and demonstrate the explosive potential of chemical mixtures. The site was first used in November of 1957 and is still an active training/demonstration area. Activities at the site are performed year round, and it is estimated that approximately 10 pounds (net explosive weight) of ordnance are used in this area each year. The following chemicals/explosives are among those used at the IED training area:

- Sulfuric acid
- Potassium chloride
- Potassium permanganate
- Sodium chloride
- Gasoline
- Aluminum powder
- Nitric acid
- Glycerin
- Detonation cord
- Black powder
- Red phosphorus
- Sodium peroxide
- Hydrogen peroxide
- Magnesium powder
- Calcium hypochlorite
- Potassium nitrate
- Ammonium nitrate
- Ferrous oxide

Molotov cocktails were also used during some of the training demonstrations. This information is based on historical records maintained by the Explosive Safety Officer, which are considered accurate and complete dating back to January 1990 (Indian Head Naval Surface Warfare Center, February 1995).

5.3 PREVIOUS INVESTIGATIONS

Prior to the field activities conducted for this VI, no environmental sampling or analysis had been performed at the IED Site.

5.4 FIELD INVESTIGATION

This section describes the field activities that took place at the IED Site (SWMU 26) during the VI field investigation conducted September/October 1995.

5.4.1 Soil Investigation

Soil samples were collected at the IED to determine if contaminated soils are present at suspected demonstration/test areas (Figure 5-1). At each soil boring or monitoring well installed, samples were obtained for chemical analysis from the 0- to 2- foot depth interval and from the soil interval immediately above the water table. Analytical results from these samples are presented and discussed in Section 5.6.

For purposes of investigating potential soil contamination at the incendiary demonstration area, two soil borings were drilled and sampled. The first boring (S26-SB04) was drilled within the source area. The second boring (S26-MW02) was drilled immediately downgradient of the source area. Visual observations and Photoionization detector (PID) readings of the site soils did not identify any apparent contamination. Soil boring S26-MW02 was converted to monitoring well 26MW02.

For purposes of investigating the potential soil contamination at the detonation demonstration area, two soil borings were drilled and sampled at the site. The first boring (S26-SB01) was drilled within the source area. The second boring (S26-MW01) was drilled immediately downgradient of the source area. Visual observations of the site soils did not identify any apparent contamination. There were some elevated PID readings (up to 150 ppm) in the soil, however, the soil did not appear to be stained or visually contaminated. Soil boring S26-MW01 was converted to monitoring well 26MW01.

For purposes of investigating potential soil contamination at Building 2118 (which was used for mixing chemicals), one soil boring (S26-SB03) was drilled and sampled near the effluent end of a French drain that exits the southern edge of the building. Visual observations and PID readings of the site soils did not identify any apparent contamination.

For purposes of characterizing soil contamination at the area in front of Structure 2158 (the bleachers), one soil boring (S26-SB02) was drilled and sampled. Base personnel identified the location as being the most likely spot for the mixing and burning activities conducted for classes which sat on the bleachers. Visual observations and PID readings of the site soils did not identify any apparent contamination.

For purposes of characterizing the background soil conditions at the site, one soil boring (S26-MW03) was drilled and sampled at a location upgradient of the site. The soil boring was converted to monitoring well 26MW03.

5.4.2 Groundwater Investigation

Three monitoring wells (26MW01, 26MW02, 26MW03) were installed and sampled at the site to determine whether groundwater contamination was present in the shallow water table aquifer (see Figure 5-1). The samples were analyzed for the parameters listed in Table 2-1.

One round of synoptic groundwater-level measurements was obtained from the three wells on October 17, 1995, to determine the groundwater flow direction across the site. The groundwater elevations are shown in the following table:

Well Name	Elevation of Measuring Point (ft. MSL)	Depth to Groundwater (ft.)	Groundwater Elevation (ft. MSL)
26MW01	10.55	8.93	1.62
26MW02	29.14	14.54	14.6
26MW03	34.04	12.44	21.60

A rising-head slug test was performed at each of the monitoring wells to determine the permeability characteristics of the aquifer. The results of the aquifer testing are presented in Section 5.5.

5.5 SITE CHARACTERISTICS

This section discusses the site-specific geology and hydrogeology of the IED.

5.5.1 Geology and Soils

Surface and subsurface soil was classified in the field for the four soil borings and three monitoring well borings drilled at the site. The information was used to classify the site geologic conditions. Figure 5-1 shows the location of the monitoring wells and soil borings, as well as a cross-section that was developed from data collected during the current investigation. Cross-section A-A' is shown in Figure 5-2.

Fill material consisting of silty sand with gravel was encountered at the ground surface, and ranged from 1 to 2 feet in thickness. As depicted on the cross-section, the fill is underlain primarily by silty sand with clay. The relative amounts of sand, silt, and clay vary across the site. As depicted on the cross-section, the lithology encountered at 26MW02 consisted of silty clay with only trace amounts of sand.

5.5.2 Hydrogeology

Hydrogeological conditions at IED have been interpreted from data obtained during the field investigation activities. In addition, physical features, such as the ground surface topography (as shown on Figure 5-1), were considered when making generalized interpretations regarding the groundwater flow direction.

The site is characterized by a shallow groundwater table (approximately 10 feet below ground surface), contained within a silty sand with clay aquifer. The presence of significant amounts of fine sediments resulted in a high turbidity in monitoring wells 26MW01, 26MW02, and 26MW03. Recharge of the shallow aquifer is likely to occur primarily through infiltration of precipitation

Because the three monitoring wells are located in a relatively straight line, a potentiometric surface map at the IED site was not generated. However, based on the groundwater-level measurements and the topographical features at IED, the generalized groundwater flow direction could be determined. Groundwater flows in a southeasterly direction across the site. Based on a linear measurement from monitoring well 26MW01 to 26MW03, the groundwater gradient was calculated to be approximately 0.034. Since it cannot be determined whether these three wells are directly aligned with the groundwater flow direction, it can only be assumed that the flow gradient is 0.034 or higher.

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A rising-head slug test was performed at each of the monitoring wells to determine the permeability characteristics of the aquifer. As shown on the following table, the average hydraulic conductivity was calculated to be approximately 0.85 ft/day (2.99×10^{-4} cm/sec).

SUMMARY OF SLUG TEST DATA

Well Number	Rising-Head Slug Test (cm/sec)
26MW01	1.61×10^{-3}
26MW02	1.95×10^{-5}
26MW03	8.57×10^{-4}
	2.99×10^{-4}

Assuming an effective aquifer porosity of 30 percent, and using the calculated potentiometric surface gradient of 0.034 ft/ft, the average groundwater velocity is calculated to be at least 35 feet per year. Hydraulic conductivity test data plots and calculations based on the slug tests are included in Appendix G.

5.6 NATURE AND EXTENT OF CONTAMINATION

This section presents the results of the analysis of environmental samples collected at the IED site, as described in Sections 5.4.1 and 5.4.2. All samples collected were analyzed according to the methods specified in the Verification Investigation Work Plan (HALLIBURTON NUS, September 1995). Samples were analyzed by GP Environmental Services, Inc. Analytical results are presented in Appendix I.

All data generated were validated according to EPA National and Region III guidelines. The data validation was performed by Brown & Root Environmental validation chemists, who routinely validate data from numerous laboratories producing data under the EPA CLP. Data validation memoranda are presented in Appendix J. A copy of the complete data validation packages is available to the Navy and the U.S. EPA Region III upon request.

5.6.1 Soils

The results of the analysis of soil samples collected at SWMU 26 (the IED) are presented in Table 5-1. Surface and subsurface soil samples were collected in four areas of concern:

1. the incendiary demonstration area (SB04 and MW02)
2. the detonation demonstration area (SB01 and MW01)
3. the French Drain system in the vicinity of Building 2118 (SB03)
4. and the area in front of bleachers (SB02)

Background/upgradient soil samples were collected during the installation of MW03, located upgradient of all areas under investigation.

Although more than 100 target analytes were included in the organic analyses performed by GP Environmental Services, positive detections were reported for the following organic compounds only:

- Toluene (C_{max} = 33.7 μg/kg)
- Methylene chloride (C_{max} = 172 μg/kg)
- Chloroform (C_{max} = 5.0 μg/kg)
- Carbon disulfide (C_{max} = 1.25 μg/kg)
- Bis (2-ethyl hexyl) phthalate (C_{max} = 46.8 μg/kg)

No organics were detected in the surface or subsurface soil samples collected during the installation of the upgradient monitoring well or in the soil boring samples collected from French drain area in the vicinity of Building 2118. Toluene, carbon disulfide, chloroform, and methylene chloride were detected in the soil samples collected at the detonation demonstration area. Chloroform and bis (2-ethyl hexyl) phthalate were detected in the soil samples collected in the incendiary demonstration area. Methylene chloride was detected in the soil boring samples collected from the area in front of the bleachers. However, the organic concentrations detected in any of these areas are similar to blank contamination "action levels" calculated and applied to other volatile organic data collected for the IED. Organic concentrations did not vary significantly with depth PCBs and energetic compounds were not detected at the IED.

Inorganic concentrations in shallow soil samples (collected from 0 to 2 feet below ground surface) and in the subsurface samples (collected just above the water table) were compared to concentrations in the background samples collected during the installation of monitoring well S26-MW03. With the exception of barium, beryllium, cobalt, magnesium, potassium, selenium, thallium, vanadium, tin, and cyanide, inorganic target analyte concentrations in the incendiary demonstration area soils were detected at concentrations two times or greater than those reported for the background soil samples. However, with the exception of silver and arsenic, inorganic concentrations were not detected at concentrations greater than five times background. (Silver was detected in S26-SB04-001 at 10 times background and arsenic was detected in S26-MW02-002 at five times background.) Inorganic concentrations at the incendiary demonstration area did not differ significantly between shallow and subsurface samples. Inorganic concentrations were generally higher in the downgradient location (MW02) than the source area location (SB04). Ammonia, nitrate, TOC, and TPH were also detected above background.

Calcium, copper, mercury, nickel, sodium, and silver were the only metals detected in the soil samples collected in the detonation demonstration area at concentrations twice (or more) those reported for the background soil samples. Concentrations of calcium and copper in S26-SB01-01 were more than 10 times background, and the concentration of nickel in S26-SB01-01 was more than 5 times background. Inorganic concentrations did not significantly differ between shallow and subsurface samples. Although concentrations were generally similar, higher concentrations were detected in the source area location (SB01) than the downgradient location (MW01). TPH was detected in S26-SB01-01 (30.9 mg/kg); however, the concentration was below that reported for background (39.1 mg/kg).

Lead, sodium, and zinc were the only inorganic target analytes detected in soil samples at Building 2118 at concentrations two times or greater than those reported for the background soil samples. Only lead in S26-SB03-001 (95.7 mg/kg) was detected at a concentration five times background. Inorganic concentrations were generally higher in the shallow sample than the subsurface sample. Ammonia and nitrate were also detected above background.

Antimony and sodium were the only inorganic target analytes detected in soil samples from S26-SB02-002 (the area in front of the bleachers) at concentrations exceeding twice those reported for the background soils. Inorganic concentrations in the subsurface soil sample were generally similar to or higher than those reported for the shallow sample. Ammonia in S26-SB02-002 and TPH in S26-SB02-001 were detected above background.

5.6.2 Groundwater

The results of the analysis of groundwater samples collected at the IED are presented in Table 5-2.

Chloroform was detected in the upgradient well, 26MW03, at 3.1 μg/L. Volatile organic compounds were not detected in the site monitoring wells 26MW01 or 26MW02. Semivolatile organic and energetic target analytes were not detected in any of the groundwater samples collected at the IED.

Arsenic, calcium, cobalt, magnesium, manganese, and sodium concentrations reported for unfiltered groundwater samples collected from one or both of the site monitoring wells exceed those available for the background monitoring well. However, the concentrations of these inorganic analytes were generally less than two times those reported as background concentrations. Only manganese and sodium were detected at concentrations greater than two times background (three and five times greater, respectively).

Metals concentrations detected in the filtered groundwater samples are generally similar to or less than those reported for the unfiltered groundwater samples. Arsenic, barium, calcium, cobalt, iron, magnesium, manganese, potassium, sodium, and zinc concentrations detected in the filtered groundwater samples at the IED exceed those reported in the filtered background samples. However, as summarized in Table 5-2, only iron and manganese were detected at concentrations greater than five times background (6 and 10 times greater, respectively).

Inorganics were not detected in the IED groundwater samples at concentrations exceeding federal primary (health-based) MCLs. However, unfiltered aluminum, unfiltered and filtered iron, and unfiltered and filtered manganese concentrations exceeded secondary (aesthetic-based) MCLs. Maximum concentrations of aluminum and iron in the unfiltered samples were detected in the upgradient groundwater monitoring well.

5.7 QUALITATIVE HUMAN HEALTH RISK ASSESSMENT FOR THE IED

Table 5-3 presents the results of the qualitative human health risk assessment of target analyte concentrations detected in the soil samples collected at the IED. Organic concentrations detected in IED soil samples do not exceed the EPA Region III RBCs for soil ingestion or SSLs derived to the protection of air quality. Methylene chloride was the only organic detected at concentrations exceeding the EPA Region III SSLs for the protection of groundwater. However, it should be noted that methylene chloride was not detected in the groundwater samples collected at the site. As noted previously, the methylene chloride concentrations detected are similar to blank contamination "action levels" calculated and applied to other environmental samples collected during the VI. Thus, the methylene chloride concentrations reported may not be indicative of actual site-related contamination.

Arsenic, barium, beryllium, iron, manganese, and nickel were detected in the IED soil samples at concentrations exceeding EPA Region III RBCs for soil ingestion or SSLs for the protection of groundwater. The barium and beryllium concentrations reported are similar to those reported for background. Neither of these metals will be further evaluated in the risk assessment. Arsenic, iron, lead, manganese, and nickel are selected as COPCs and will be further evaluated in the following quantitative risk assessment.

As presented in Table 5-4, arsenic and manganese were the only target analytes noted in the IED groundwater samples at concentrations exceeding federal or state drinking water standards, health advisories, or EPA Region III RBCs for tap water and background concentration. (It should be noted that arsenic was not detected at concentrations exceeding federal or state MCLs.) Both parameters are selected as COPCs and will be further evaluated in the following quantitative risk assessment.

5.8 QUANTITATIVE HUMAN HEALTH RISK ASSESSMENT FOR THE IED

A quantitative risk assessment was performed for the constituents detected in IED soils and groundwater, as detailed in the risk assessment spreadsheets included in Appendix I and summarized in Table 5-5.

Although arsenic is present in all the IED areas investigated, including the upgradient (background) area, cancer risk estimates developed for the concentrations detected in the IED soils do not exceed the 10^{-4} to 10^{-6} cancer risk range often evaluated in the development of regulatory standards and criteria and in determining the need for remediation at sites of environmental concern. The hazard quotient calculated based on iron concentrations in soils collected in the incendiary demonstration area exceed 1 (but are less than 10) when the residential land use scenario is evaluated. However, it should be noted that the hazard index developed for background iron concentrations also exceeds 1 when the residential land use scenario is evaluated. Hazard indices do not exceed unity when the industrial land use scenario is evaluated. With the exception of one iron detection in the incendiary demonstration area, iron concentrations in the IED soils are similar or lower than those noted in soils collected during the installation of the upgradient monitoring well.

Arsenic and manganese were the only COPCs selected for the IED groundwater. Although arsenic was present in both the unfiltered and filtered groundwater samples, cancer risk estimates calculated based on the concentrations detected do not exceed the 10^{-4} to 10^{-6} cancer risk range. It should also be noted that the arsenic concentrations reported for the IED groundwater samples do not exceed the current primary SDWA MCL (50 μg/L) and are similar to those reported for the upgradient well at Area 8. Hazard indices developed for manganese concentrations detected in the unfiltered and filtered groundwater samples exceed unity; consequently, there is a potential for adverse noncarcinogenic health effects under the conditions established for the exposure assessment. However, it should be note that hazard quotients developed for the manganese concentrations detected in the upgradient monitoring well at Area 8 would also exceed unity. Manganese concentrations the IED groundwater are similar to those reported for samples collected from the upgradient monitoring well at Area 8.

5.9 ECOLOGICAL RISK ASSESSMENT FOR THE IED

Various wildlife species have the potential for exposure to chemical contaminants present in the soil, for example through incidental ingestion accompanying feeding, burrowing, and/or grooming behavior. However, soil screening concentrations designed to be protective of wildlife are not generally available. Thus, the ecological risk due to chemicals in the soil cannot be assessed. At the IED site, however, the general lack of large differences between inorganic chemical concentrations in surface soil samples from the upgradient (background) soil samples and those taken from the various sites where explosives-related activities took place suggests that significant soil contamination (and its associated risk) from inorganic chemicals is not likely present at this site. Measurements of organic contaminants in soils from the various sites also were similar to those from the background location, with the exception of toluene and methylene chloride at the detonation demonstration area. Assuming the organics detected are not simply laboratory artifacts, any potential ecological risk from surface soil contamination is likely to be due to these chemicals. However, the sporadic, low-level concentrations detected in the VI samples suggest the potential for adverse effects is likely to be limited.

Ecological receptors would generally not be exposed to contaminants present in groundwater. However, the groundwater will eventually discharge into surface waters inhabited by aquatic organisms. Thus, the EPA's chronic Ambient Water Quality Criteria (CAWQC), which are designed to be protective of freshwater aquatic life under a long-term exposure, can be used as benchmarks in a qualitative assessment of risks to aquatic organisms from contaminants in groundwater. The environmental effects quotient (EEQ) for chloroform (see Table 5-6), the sole organic contaminant detected in the groundwater, was well below 1.

However, the evaluation of chromium and copper resulted in EEQs slightly in excess of 1. Two of the three metals measurements that yielded EEQs exceeding 1 were from the upgradient well (S26-MWO3).

Several factors lessen the potential risk resulting from these metals. All of the exceedances were from unfiltered samples, rather than filtered samples, a fact which suggests that many of the metals present in the groundwater are associated with particulates. Metals associated with particulates would not be expected to be mobile in groundwater. In addition, it is generally believed that the dissolved fraction more closely approximates the bioavailable concentration of metal in the water column. The Maryland Water Quality Standards for protection of aquatic life are based on dissolved metals to reflect this belief. In addition, metal concentrations in groundwater may decrease as groundwater moves through the soil due to the adsorption of metals to soils. Finally, metals in groundwater would likely be significantly diluted upon discharge to surface water. For chromium, an additional factor is the fact that the criterion is based on hexavalent chromium, whereas total chromium (hexavalent + trivalent) was measured in the groundwater samples.

TABLE 5-1

CONTAMINANT OCCURRENCE AND DISTRIBUTION
IMPROVISED EXPLOSIVE DEVICES (IED) SITE - SOIL SAMPLES
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Parameter	S26-SB01-01[1]	S26-SB01-02[2]	S26-MW01-01[1]	S26-MW01-02[2]	S26-SB02-001[1,4]	S26-SB02-002[2]	S26-SB03-001[1]	S26-SB03-002[3]	S26-SB04-001[1,4]	S26-SB04-002[6]	S26-MW02-001[1]	S26-MW02-002[6]	S26-MW03-001[1]	S26-MW03-002[7]
	Detonation Demonstration Area-Source		Detonation Demonstration Area - Downgradient		Area in Front of Bleachers		French Drain from Building 2118		Incendiary Demonstration Area - Source		Incendiary Demonstration Area - Downgradient		Upgradient IED Site	
VOLATILE ORGANICS (μg/kg)														
Carbon disulfide	1.4^{UJ}	1.3^{UJ}	1.2^{J}	1.4^{U}	1.4^{UJ}	1.4^{UJ}	1.3^{U}	1.4^{U}	1.4^{U}/1.3^{U}	1.4^{U}	1.4^{U}	1.4^{U}	1.3^{UJ}	1.4^{U}
Chloroform	0.43^{UJ}	0.42^{UJ}	5.0^{J}	3.0^{J}	0.45^{UJ}	0.45^{UJ}	0.41^{U}	0.45^{UJ}	4.1/3.9	3.4	0.45^{UJ}	0.45^{U}	0.42^{UJ}	0.44^{U}
Methylene chloride	171^{J}	172^{J}	122^{B}	73.5^{B}	15.7^{J}	3.8^{J}	13.8^{B}	20.6^{B}	174^{B}/165^{B}	208^{B}	13.4^{B}	16.0^{B}	14.3^{B}	8.3^{B}
Toluene	33.7^{J}	27.0^{J}	2.1^{J}	0.33^{U}	0.33^{UJ}	0.33^{UJ}	0.30^{U}	0.33^{U}	1.3^{B}/1.2^{B}	0.33^{U}	0.33^{U}	0.33^{U}	1.9^{B}	0.32^{U}
SEMIVOLATILE ORGANICS (μg/kg)														
Bis(2-ethylhexyl)phthalate	74.8^{U}	72.3^{U}	74.2^{U}	77.4^{U}	78.7^{U}	78.1^{U}	72.3^{UJ}	78.7^{UJ}	74.2^{UJ}/72.9^{UJ}	78.1^{UJ}	46.8^{J}	78.7^{UJ}	72.9^{UJ}	76.8^{UJ}
PCBs														
NOT DETECTED														
ENERGETICS														
NOT DETECTED														
INORGANICS (mg/kg)														
Aluminum	6640	2450	10600	7520	12500	11100	9970^{J}	3730^{J}	5540^{J}/5180^{J}	10400^{J}	10200^{J}	8330^{J}	12700^{J}	8250^{J}

TABLE 5-1 (Continued)
CONTAMINANT OCCURRENCE AND DISTRIBUTION
IMPROVISED EXPLOSIVE DEVICES (IED) SITE - SOIL SAMPLES
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Parameter	S26-SB01-01[1]	S26-SB01-02[2]	S26-MW01-01[1]	S26-MW01-02[3]	S26-SB02-001[1,4]	S26-SB02-002[2]	S26-SB03-001[1]	S26-SB03-002[5]	S26-SB04-001[1,4]	S26-SB04-002[6]	S26-MW02-001[1]	S26-MW02-002[6]	S26-MW03-001[1]	S26-MW03-002[7]
	Detonation Demonstration Area-Source		Detonation Demonstration Area - Downgradient		Area in Front of Bleachers		French Drain from Building 2118		Incendiary Demonstration Area - Source		Incendiary Demonstration Area - Downgradient		Upgradient IED Site	
Antimony	0.20[UL]	0.19[UL]	0.20[UL]	0.20[UL]	0.21[UL]	0.45[L]	0.19[UL]	0.21[UL]	0.20[UL]/0.19[UL]	0.21[UL]	0.20[UL]	0.21[UL]	0.19[UL]	0.21[UL]
Arsenic	4.3	1.3[K]	4.5	2.5[K]	3.1[L]	2.2[L]	4.7[J]	3.5[J]	4.3/4.0	1.3	5.3[L]	15.9[L]	3.3[J]	1.9[J]
Barium	30.3	14.7	52.0	37.3	42.9	76.5	61.5	16.3	46.2/48.8	31.4	63.9	40.6	84.8	39.8
Beryllium	0.34	0.23	0.4[J]	0.33[L]	0.46	0.70	0.49[L]	0.13	0.44/0.42	0.30	0.51[L]	0.55[L]	0.61[L]	0.43[L]
Cadmium	0.58[UL]	0.56[UL]	0.57[U]	0.60[U]	0.61[UL]	0.60[UL]	0.56[U]	0.61[U]	0.57[UL]/0.57[UL]	0.60[UL]	1.2	0.61[U]	0.57[U]	0.59[J]
Calcium	9350	219[K]	53.1[K]	56.2[K]	316[K]	245[K]	438	44.9	1110[J]/1010[J]	90.3[B]	382	84.0	409	50.7
Chromium	11.8[J]	12.2[J]	14.4	10.2	15.7	13.9	16.1	6.1	14.6/9.7	18.0	47.2	33.9	20.8	13.4
Cobalt	9.2	5.1	5.7	4.5	3.3	8.6	11.6	1.7[J]	13.4/14.3	2.2	20.5	3.5	15.0	8.4
Copper	56.6	5.5[J]	7.7[L]	4.8[L]	7.5	8.4	5.5[L]	3.3	4.5[L]/4.3[L]	8.7	12.7[J]	8.6[L]	4.4[L]	5.2[L]
Iron	15500[J]	7850[J]	17800[J]	15800[J]	33100	11200	17800[J]	5840[J]	12300/9900	13700	83900[J]	13400[J]	25300[J]	20300[J]
Lead	9.3[L]	4.6[J]	9.8[J]	6.6[L]	11.0[J]	10.5[J]	95.7[J]	5.5[J]	10.0/10.2	7.4	33.8[J]	10.3[J]	9.9[J]	5.4[J]
Magnesium	1210	380[K]	1600	926	807[K]	1920	1040[J]	336[J]	477[J]/461[J]	881[J]	665[J]	1210[J]	1090[J]	746[J]
Manganese	100[J]	76.1[J]	83.4	45.8	30.7	70.9	265[J]	14.0[J]	1240[J]/985[J]	20.3	1130[J]	27.7[J]	882[J]	98.8[J]
Mercury	0.16[J]	0.05[UL]	0.05[UL]	0.06[UL]	0.09[J]	0.06[UL]	0.10	0.08[U]	0.05[U]/0.06[B]	0.06[B]	0.20	0.09	0.07	0.06[U]
Nickel	55.0	4.5[K]	4.4[K]	4.9[K]	7.6[J]	16.6	8.5	2.8	15.6/14.1	5.9[J]	49.7	10.6	10.5	8.0
Potassium	535	451	636	578	658	1130	1050	442	369/363	1020	696	845	783	385

TABLE 5-1 (Continued)
CONTAMINANT OCCURRENCE AND DISTRIBUTION
IMPROVISED EXPLOSIVE DEVICES (IED) SITE - SOIL SAMPLES
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Parameter	S26-SB01-01[1]	S26-SB01-02[2]	S26-MW01-01[1]	S26-MW01-02[1]	S26-SB02-001[1,4]	S26-SB02-002[2]	S26-SB03-001[1]	S26-SB03-002[1]	S26-SB04-001[1,4]	S26-SB04-002[2]	S26-MW02-001[1]	S26-MW02-002[2]	S26-MW03-001[1]	S26-MW03-002[2]
	Detonation Demonstration Area-Source		Detonation Demonstration Area - Downgradient		Area in Front of Bleachers		French Drain from Building 2118		Incendiary Demonstration Area - Source		Incendiary Demonstration Area - Downgradient		Upgradient IED Site	
Selenium	0.17^{U}	0.17^{U}	0.20	0.18^{U}	0.30^{B}	0.18^{U}	0.19^{B}	0.18^{U}	$0.17^{U}/0.21^{L}$	0.19	0.43^{B}	0.49^{B}	0.17^{U}	0.18^{U}
Silver	0.23	0.11^{U}	0.11^{U}	0.12^{U}	0.12^{U}	0.12^{U}	0.11^{U}	0.12^{U}	3.0/2.2	0.12^{U}	0.12^{U}	0.12^{U}	0.11^{U}	0.12^{U}
Sodium	84.3^{B}	103^{B}	116^{B}	155^{B}	41.5	182	44.3	28.1	$20.7^{U}/20.4^{U}$	34.8	21.7^{U}	34.8	20.3^{U}	21.4^{U}
Tin	4.7^{UL}	4.5^{UL}	3.9^{UL}	4.0^{UJ}	4.9^{UL}	4.8^{UJ}	4.5^{UJ}	4.9^{UJ}	$4.6^{UJ}/4.5^{UJ}$	4.8^{UJ}	15.3^{J}	4.9^{UJ}	4.5^{UJ}	4.8^{UJ}
Vanadium	15.8	11.5	22.5	14.6	26.9	17.4	26.7	12.4^{B}	15.6/15.7	19.6	23.7	18.1	38.7	23.9
Zinc	28.0	9.7	23.9	18.9	28.6	47.3	66.2^{J}	8.0^{J}	19.3/19.7	16.3	137^{J}	36.2^{J}	30.8^{J}	24.2^{J}
Total Cyanide	1.2^{U}	1.1^{U}	1.1^{U}	1.2^{U}	1.2^{U}	1.3	1.1^{U}	1.2^{U}	$1.2^{U}/1.1^{U}$	1.2^{U}	1.2^{U}	1.2^{U}	1.1^{U}	1.2^{U}

INDICATOR PARAMTERS

Parameter	S26-SB01-01	S26-SB01-02	S26-MW01-01	S26-MW01-02	S26-SB02-001	S26-SB02-002	S26-SB03-001	S26-SB03-002	S26-SB04-001	S26-SB04-002	S26-MW02-001	S26-MW02-002	S26-MW03-001	S26-MW03-002
Ammonia (mg/kg)	16.2^{J}	10.6^{UL}	10.0^{UL}	9.6^{UL}	22.0^{J}	16.4^{L}	70.6	25.7	53.3/51.7	11.4	141	32.8	49.9	9.5
Nitrate+Nitrite (mg/kg)	0.743^{U}	0.527^{U}	0.66^{U}	0.68^{U}	0.75^{UJ}	0.67^{UJ}	3.0	2.6^{L}	$2.3^{L}/1.9^{L}$	2.6^{L}	5.3	2.0^{U}	1.5^{U}	2.5^{U}
Percent Solids (%)	86	89	87.3	83.7	82.1/80.8	82.7	89.5	81.8	87.1/86.4	82.9	82.0	82.0	88.5	84.1
Total Organic Carbon (mg/kg)	848	658	554	373	3170	929	2380	495	3850/3320	849	6970	1940	5020	1290
Total Petroleum Hydrocarbons (mg/kg)	30.9	28.1^{U}	28.6^{U}	29.9^{U}	$34.4/30.9^{U}$	30.2^{U}	27.9^{UL}	30.6^{UL}	$48.5/28.3^{U}$	30.2^{U}	30.1^{UL}	30.5^{UL}	33.7^{L}	39.1^{L}

019530/P

TABLE 5-1 (Continued)
CONTAMINANT OCCURRENCE AND DISTRIBUTION
IMPROVISED EXPLOSIVE DEVICES (IED) SITE - SOIL SAMPLES
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

NOTE: All positive detections have been bolded.

1 Sample depth is 0 to 2 feet
2 Sample depth is just above groundwater (6 to 12 feet)
3 Sample depth is just above groundwater (4 to 6 feet).
4 Duplicate samples taken from this location.
5 Sample depth is just above groundwater (8 to 10 feet).
6 Sample depth is just above groundwater (10 to 12 feet).
7 Sample depth is just above groundwater (6 to 9 feet)

B Positive result qualified as a result of method or field quality control blank contamination. Compound is not considered to be present in sample.
J Positive detection is qualified as an estimate.
K Positive detection is qualified as biased high.
L Positive result is qualified as biased low
U Analyte not detected. Reported result is the detection limit.
UJ Analyte not detected. Reported result is the estimated detection limit.
UL Nondetect of analyte considered biased low.

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TABLE 5-2

CONTAMINANT OCCURRENCE AND DISTRIBUTION
IMPROVISED EXPLOSIVE DEVICES (IED) SITE - GROUNDWATER SAMPLES
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Parameter[1]		26MW01[2]	26MW02	26MW03
		Detonation Demonstration Area - Downgradient	Incendiary Demonstration Area - Downgradient	Upgradient IED Site
VOLATILE ORGANICS (μg/L)				
Chloroform		0.18^{U}	0.18^{UJ}	**3.1**
SEMIVOLATILE ORGANICS				
NOT DETECTED				
PCBs				
NOT DETECTED				
ENERGETICS				
NOT DETECTED				
INORGANICS (μg/L)				
Aluminum	U F	**1790^{J}** 110^{UL}	**5660^{J}** 110^{UL}	**11100^{J}** 110^{UL}
Arsenic	U F	**2.1^{L}** 1.9^{U}	1.9^{UL} **2.0**	1.9^{UL} 1.9^{U}
Barium	U F	**89.6** **68.8**	**89.7** **23.6**	**140** 14.0^{U}
Calcium	U F	**4830^{K}** **5200^{K}**	**5180^{K}** **5010^{K}**	**3580^{K}** **1980^{K}**
Chromium	U F	10.0^{UL} 10.0^{UL}	10.0^{UL} 10.0^{UL}	**14.8^{L}** 10^{U}
Cobalt	U F	**17.6** **22.0**	**17.8** **16.2**	**15.6** 14.0^{U}
Copper	U F	15.0^{U} 15.0^{U}	**15.4** 15.0^{U}	**16.3** 15.0^{U}
Iron	U F	**6120** 47.0^{U}	**14200** **305**	**22100** 47.0^{U}
Magnesium	U F	**4000^{K}** **4270^{K}**	**3810^{K}** **3440^{K}**	**2920^{K}** **892^{K}**
Manganese	U F	**297** **340**	**1090** **1160**	**328** **106**
Potassium	U F	**2010** **2020**	**2240** **1800**	**3640** **1040**

TABLE 5-2 (Continued)
CONTAMINANT OCCURRENCE AND DISTRIBUTION
IMPROVISED EXPLOSIVE DEVICES (IED) SITE - GROUNDWATER SAMPLES
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Parameter[1]		26MW01[2]	26MW02	26MW03
		Detonation Demonstration Area - Downgradient	Incendiary Demonstration Area - Downgradient	Upgradient IED Site
Sodium	U	**46200**	**10800**	**9120**
	F	**48400**	**11600**	**10900**
Vanadium	U	22.0[U]	**28.4**	**37.4**
	F	22.0[U]	22.0[U]	22.0[U]
Zinc	U	37.0[B]	74.6[B]	70.1[B]
	F	**28.8**	**36.7**	8.0[U]
INDICATOR PARAMETERS				
Ammonia (mg/L)		**0.22**	**0.21**	**0.60**
Nitrate + Nitrite (mg/L)		**0.09**[L]	**1.7**[L]	**0.73**[L]
Sulfate (mg/L)		**6.9**[L]	**6.9**[L]	**1.6**[L]
Total Kjedahl Nitrogen (mg/L)		**0.24**[L]	**0.22**[L]	**0.60**[L]
Total Organic Carbon (mg/L)		**3.7**	1.0[U]	**4.3**
Total Organic Halides (μg/L)		**22.0**[L]	10.0[UJ]	**11.8**[L]
Total Petroleum Hydrocarbons (mg/L)		0.53[U]/0.55[U]	0.57[U]	0.52[U]
Total Phosphorus (mg/L)		**0.08**	**0.03**	**0.21**

NOTE: **All positive detections have been bolded.**

1 U - Unfiltered sample
F - Filtered sample
2 Duplicate samples taken at this site (total petroleum hydrocarbons only).

B Positive result qualified as a result of method or field quality control blank contamination. Compound is not considered to be present in sample.
J Positive detection is qualified as an estimate.
K Positive detection is qualified as biased high.
L Positive result is qualified as biased low.
U Analyte not detected. Reported result is the detection limit.
UJ Analyte not detected. Reported result is the estimated detection limit.
UL Nondetect of analyte considered biased low.
UR Nondetected result considered to be unreliable.

TABLE 5-3

IED SOIL - QUALITATIVE RISK ASSESSMENT
VERIFICATION INVESTIGATION
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Chemical (a)	Frequency of Detection (b)	Range of Detection (mg/kg)	Location of Maximum	Risk-Based Action Levels (mg/kg) (c)				Background Concentration (S26-MW03-001/002) (mg/kg)	Maryland Background Concentration (d) (mg/kg)
				Soil Ingestion		Soil Screening Levels			
				Industrial	Residential	Air	Groundwater		
Volatile Organics									
Carbon disulfide	1/15	0.0012	S26-MW01-01	200000	7800	11	14	ND	NA
Chloroform	5/15	0.003 - 0.005	S26-MW01-01	940	100	0.2	0.3	ND	NA
Methylene chloride	4/15	0.0038 - 0.172	S26-SB01-02	760	85	7	0.01	ND	NA
Toluene	3/15	0021 - 0.033	S26-SB01-01	410000	16000	520	5	ND	NA
Semivolatile Organics									
Bis(2-ethylhexyl)phthalate	1/15	0.0468	26-MW02-00	410	46	210	11	ND	NA
Inorganics									
Aluminum	15/15	2450 - 12700	26-MW03-00	1000000	78000	NA	NA	12700/8250	<20000
Antimony	1/15	0.45	S26-SB02-002	820	31	NA	NA	ND	<1
Arsenic	15/15	1.3 - 15.9	26-MW02-00	3.8	0.43	380	15	3.3/1.9	2-6
Barium	15/15	14.7 - 84.8	26-MW03-00	140000	5500	350000	32	84.8/39.8	300
Beryllium	15/15	0.13 - 0.70	S26-SB02-002	1.3	0.15	690	180	0.61/0.43	<1
Cadmium	1/15	1.2	26-MW02-00	1000	39	920	6	ND	ND
Calcium	14/15	44.9 - 9350	S26-SB01-01	NA	NA	NA	NA	409/50.7	<2300
Chromium	15/15	6.1 - 47.2	26-MW02-00	1000000 (III) 10000 (VI)	78000 (III) 390 (VI)	140 (VI)	19 (VI)	20.8/13.4	<20
Cobalt	14/15	2.2 - 20.5	26-MW02-00	120000	4700	NA	NA	15.0/8.4	<3
Copper	15/15	3.3 - 56.6	S26-SB01-01	82000	3100	NA	NA	4.4/5.2	<10
Iron	15/15	5840 - 83900	26-MW02-00	610000	23000	NA	NA	25300/20300	<10000
Lead	15/15	4.6 - 95.7	S26-SB03-001	NA	NA	NA	NA	9.9/5.4	15
Magnesium	15/15	336 - 1920	S26-SB02-002	NA	NA	NA	NA	1090/746	1500

TABLE 5-3 (Continued)
IED SOIL - QUALITATIVE RISK ASSESSMENT
VERIFICATION INVESTIGATION
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Chemical (a)	Frequency of Detection (b)	Range of Detection (mg/kg)	Location of Maximum	Risk-Based Action Levels (mg/kg) (c)				Background Concentration (S26-MW03-001/002) (mg/kg)	Maryland Background Concentration (d) (mg/kg)
				Soil Ingestion		Soil Screening Levels			
				Industrial	Residential	Air	Groundwater		
Inorganics (Continued)									
Manganese	15/15	14 - 1240	S26-SB04-001	10000	**390**	NA	NA	882/98.8	<150
Mercury	6/15	0.07 - 0.20	26-MW02-00	610	23	7	3	0.07/ND	0.051-0.13
Nickel	15/15	2.8 - 55.0	S26-SB01-01	41000	1600	6900	**21**	10.5/8.0	<5
Potassium	15/15	363 - 1130	S26-SB02-002	NA	NA	NA	NA	783/385	<11000
Selenium	3/15	0.19 - 0.21	26-SB04-001d	10000	390	NA	3	ND	0.3
Silver	3/15	0.23 - 3.0	S26-SB04-001	10000	390	NA	NA	ND	ND
Sodium	6/15	28.1 - 182	S26-SB02-002	NA	NA	NA	NA	ND	5000
Tin	1/15	15.3	26-MW02-00	1000000	47000	NA	NA	ND	1
Vanadium	14/15	11.5 - 38.7	26-MW03-00	14000	550	NA	NA	38.7/23.9	<20
Zinc	15/16	8.0 - 137	26-MW02-00	610000	23000	NA	42000	30.8/24.2	<28
Total Cyanide	1/15	1.3	S26-SB02-002	41000	1600	NA	NA	ND	NA
Indicator Parameters									
Ammonia	12/15	9.5 - 141	26-MW02-00	NA	NA	NA	NA	49.9/9.5	NA
Nitrate/Nitrite	5/15	1.9 - 5.3	26-MW02-00	1E6/2E5	13000/7800	NA	NA	ND	NA
Total Organic Carbon	15/15	373 - 8970	26-MW02-00	NA	NA	NA	NA	5020/1290	NA
Total Petroleum Hydrocarb	5/16	30.9 - 48.5	S26-SB04-001	NA	NA	NA	NA	33.7/39.1	NA

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TABLE 5-3 (Continued)
IED SOIL - QUALITATIVE RISK ASSESSMENT
VERIFICATION INVESTIGATION
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

NA - Not Available.

ND - Not Detected.

(a) Chemical name displayed in bold font exceeds action level.

(b) Samples S26-SB01-01, S26-SB01-02, S26-SB02-001, S26-SB02-001dup (TPH only), S26-SB02-002, S26-SB03-001, S26-SB03-002, S26-SB04-001, S26-SB04-001dup, S26-SB04-002, S26-MW01-01, S26-MW01-02, S26-MW02-001, S26-MW02-002, S26-MW03-001, and S26-MW03-002 were utilized in this statistical evaluation.

(c) Source: Risk-Based Concentration Table, July - December 1995, USEPA, October 20, 1995.

(d) Source: Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States, USGS Professional Paper 1270, 1984.

TABLE 5-4

IED GROUNDWATER - QUALITATIVE RISK ASSESSMENT
VERIFICATION INVESTIGATION
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Chemical (a)	Frequency of Detection (b)	Range of Detection (ug/L)	Location of Maximum	Risk-Based Action Level for Tap Water (c) (ug/L)	Federal Maximum Contaminant Level (MCL) (d) (ug/L)	Maryland State Drinking Water Standard (d) (ug/L)	USEPA Health Advisories (d) (ug/L)	Background Concentration (26MW03) (ug/L)
Volatile Organics								
Chloroform	1/3	3.1	26MW03	0.15	100/80 (THM)	100 (THM)	100	3.1
Inorganics								
Aluminum unfiltered	3/3	5660 - 111000	26MW03	37000	**50 TO 200**	NA	NA	11100
Arsenic unfiltered **(filtered)**	1/3 (1/3)	2.1 (2.0)	26MW01 (26MW02)	0.038	**50**	50	NA	ND (ND)
Barium unfiltered (filtered)	3/3 (2/3)	89.6 - 140 (23.6 - 68.8)	26MW03 (26MW01)	2600	2000	2000	2000	140 (MD)
Calcium unfiltered (filtered)	3/3 (3/3)	3580 - 5180 (1980 - 5200)	26MW02 (26MW01)	NA	NA	NA	NA	3580 -1980
Chromium unfiltered	1/3	14.8	26MW03	37000 (III) 180 (VI)	100	100	100	14.8
Cobalt unfiltered (filtered)	3/3 (2/3)	15.6 - 17.8 (16.2 - 22.0)	26MW02 (26MW01)	2200	NA	NA	NA	15.6 (ND)
Copper unfiltered	2/3	15.4 - 16.3	26MW03	1500	1300 (e)	NA	NA	16.3
Iron unfiltered **(filtered)**	3/3 (1/3)	6120 - 22100 (305)	26MW03 (26MW02)	11000	300	NA	NA	22100 (ND)
Magnesium unfiltered (filtered)	3/3 (3/3)	2920 - 4000 (892 - 4270)	26MW01 (26MW01)	NA	NA	NA	NA	2920 -892
Manganese unfiltered **(filtered)**	3/3 (3/3)	297 - 1090 (106 - 1160)	26MW02 (26MW02)	180	50	NA	NA	328 (106)
Potassium unfiltered (filtered)	3/3 (3/3)	2010 - 3640 (1040 - 2020)	26MW03 (26MW01)	NA	NA	NA	NA	3640 (1040)

TABLE 5-4 (Continued)
IED GROUNDWATER - QUALITATIVE RISK ASSESSMENT
VERIFICATION INVESTIGATION
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Chemical (a)	Frequency of Detection (b)	Range of Detection (ug/L)	Location of Maximum	Risk-Based Action Level for Tap Water (c) (ug/L)	Federal Maximum Contaminant Level (MCL) (d) (ug/L)	Maryland State Drinking Water Standard (d) (ug/L)	USEPA Health Advisories (d) (ug/L)	Background Concentration (26MW03) (ug/L)
Inorganics (Continued)								
Sodium unfiltered (filtered)	3/3 (3/3)	9120 - 46200 (10900 - 48400)	26MW01 (26MW01)	NA	NA	NA	NA	9120 (10900)
Vanadium unfiltered	2/3	28.4 - 37.4	26MW03	260	NA	NA	NA	37.4
Zinc (filtered)	(2/3)	(28.8 - 36.7)	(26MW02)	11000	5000	NA	NA	(ND)
Indicator Parameters								
Ammonia	3/3	210 - 600	26MW03	1000	NA	NA	30000	600
Nitrate + Nitrite	3/3	90 - 1700	26MW02	58000/3700	10000	10000	NA	730
Sulfate	3/3	1600 - 6900	26MW01/02	NA	500000	NA	NA	1600
TKN	3/3	220 - 600	26MW03	NA	NA	NA	NA	600
TOC	2/3	3700 - 4300	26MW03	NA	NA	NA	NA	4300
TOX	2/3	11.8 - 22.0	26MW01	NA	NA	NA	NA	11.8
Total Phosphorus	3/3	30 - 210	26MW03	NA	NA	NA	NA	210

NA - Not Available.
ND - Not Detected.
(a) Chemicals displayed in bold font exceed action levels.
(b) Samples 26MW01, 26MW02, and 26MW03 were utilized in this statistical evaluation.
(c) Source: Risk-Based Concentration Table, July - December 1995, USEPA, October 20, 1995.
(d) Taken from Table 2-3, Standards and Criteria for Chemicals of Concern.
(e) The actual MCLs for these compounds are treatment techniques, the values displayed are action levels.

TABLE 5-5
SUMMARY OF RISK ASSESSMENT RESULTS FOR IED - GROUNDWATER AND SOIL
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Area of Concern	Media of Concern	Exposure Route	Hazard Index	Parameters with Hazard Index > 1	Cancer Risk Estimates	Parameters with Cancer Risk Estimates > 10^{-4}	Parameters with Cancer Risk Estimates > 10^{-5}
IED --French Drain	Soil (Industrial Scenario)	Ingestion	1.83E-02	--	1.23E-6	--	--
		Dermal Contact	1.60E-02	--	8.67E-8	--	--
		Totals	3.43E-02	--	1.32E-6	--	--
	Soil (Residential Scenario)	Ingestion	4.80E-01	--	1.10E-5	--	Arsenic
		Dermal Contact	5.44E-02	--	2.40E-7	--	--
		Totals	5.34E-01	--	1.12E-5	--	--
IED -- Incendiary Demonstration Area	Soil (Industrial Scenario)	Ingestion	1.68E-01	--	4.17E-6	--	--
		Dermal Contact	2.01E-01	--	2.93E-7	--	--
		Totals	3.69E-01	--	4.46E-6	--	--
	Soil (Residential Scenario)	Ingestion	4.40E-00	Iron	3.73E-5	--	Arsenic
		Dermal Contact	6.87E-01	--	8.11E-7	--	
		Totals	5.09E-00	--	3.81E-5	--	

TABLE 5-5 (Continued)
SUMMARY OF RISK ASSESSMENT RESULTS FOR IED - GROUNDWATER AND SOIL
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Area of Concern	Media of Concern	Exposure Route	Hazard Index	Parameters with Hazard Index > 1	Cancer Risk Estimates	Parameters with Cancer Risk Estimates > 10^{-4}	Parameters with Cancer Risk Estimates > 10^{-5}
IED -- Detonation Demonstration Area	Soil (Industrial Scenario)	Ingestion	2.18E-02	--	1.18E-6	--	--
		Dermal Contact	1.99E-02	--	8.30E-8	--	--
		Totals	4.17E-02	--	1.26E-6	--	--
	Soil (Residential Scenario)	Ingestion	5.71E-01	--	1.06E-5	--	Arsenic
		Dermal Contact	6.79E-02	--	2.30E-7	--	--
		Totals	6.39E-01	--	1.08E-5	--	--
IED -- Background	Soil (Industrial Scenario)	Ingestion	5.00E-02	--	8.65E-7	--	--
		Dermal Contact	6.46E-02	--	6.09E-8	--	--
		Totals	1.15E-01	--	9.26E-7	--	--
	Soil (Residential Scenario)	Ingestion	1.31E+00	Iron	7.75E-6	--	--
		Dermal Contact	2.20E-01	--	1.68E-7	--	--
		Totals	1.53E+00	--	7.92E-6	--	--

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TABLE 5-5 (Continued)
SUMMARY OF RISK ASSESSMENT RESULTS FOR IED - GROUNDWATER AND SOIL
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Area of Concern	Media of Concern	Exposure Route	Hazard Index	Parameters with Hazard Index > 1	Cancer Risk Estimates	Parameters with Cancer Risk Estimates > 10^{-4}	Parameters with Cancer Risk Estimates > 10^{-5}
IED	Groundwater (Residential Scenario)	Ingestion	6.16E+00 (6.54E+00)	Manganese	4.70E-5 (4.48E-5)	--	Arsenic
		Dermal Contact	3.86E-01 (4.11E-01)	--	8.39E-8 (7.99E-8)	--	--
		Inhalation	0.00E+00 (0.00E+00)		0.00E+0 (0.00E+0)		
		Totals	6.55E+00 (6.95E+00)	--	4.71E-5 (4.49E-5)	--	Arsenic (filtered)

-- None found

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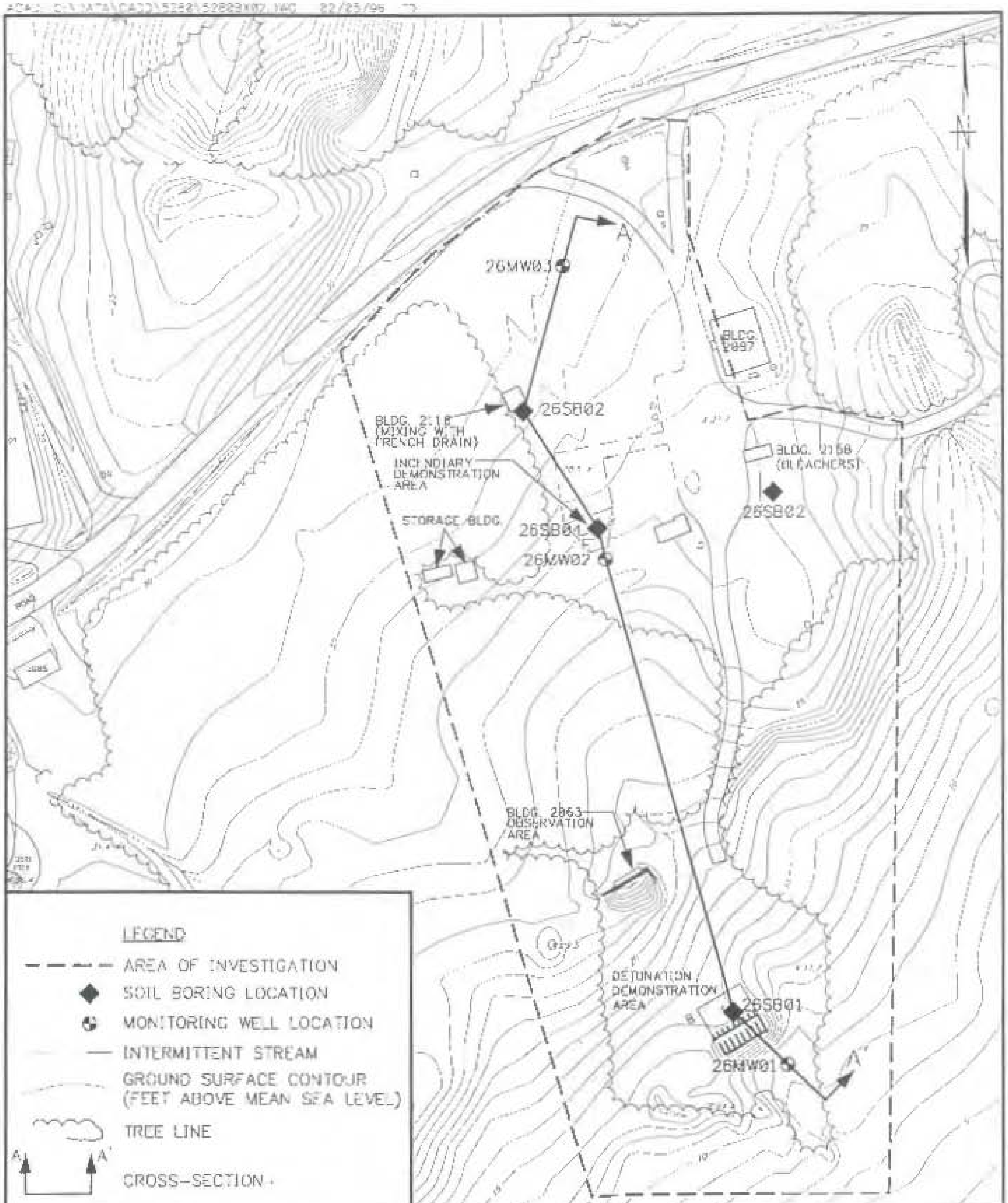
TABLE 5-6

ENVIRONMENTAL EFFECTS QUOTIENTS
IMPROVISED EXPLOSIVES DEVICES GROUNDWATER
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Parameter	Maximum Concentration	Chronic Ambient Water Quality Criterion(1)	Environmental Effects Quotient
Volatile Organics (μg/L)			
Chloroform	3.1	1240	0.0025
Inorganics (μg/L)			
Aluminum	11100^J (U)	NA	NA
Arsenic	2.1^J (U)	190(3)	0.01
Barium	140 (U)	NA	NA
Calcium	5200^K (F)	NA	NA
Chromium	14.8^L (U)	11(2,3)	1.3
Cobalt	22 (F)	NA	NA
Copper	16.3 (U)	12(3,4)	1.4
Iron	22100 (U)	NA	NA
Magnesium	4270^K (F)	NA	NA
Manganese	1160 (F)	NA	NA
Potassium	3640 (U)	NA	NA
Sodium	48400 (F)	NA	NA
Vanadium	37.4 (U)	NA	NA
Zinc	36.7 (U)	110(3,4)	0.3
Ammonia (mg/L)	0.60	3.9	0.2

U - Unfiltered sample
F - Filtered sample
J Positive detection is qualified as an estimate.
K Positive detection is qualified as biased high.
L Positive detection is qualified as biased low.
(1) Unless otherwise noted, Lowest Observed Effect Levels (LOEL) obtained from Quality Criteria for Water, 1986, U.S. EPA, May 1986.
(2) Criterion for chromium based on hexavalent chromium. No chronic ambient water quality criterion for the protection of freshwater aquatic life established for total chromium.
(3) Criterion 6/15/90 table.
(4) Criterion is based on a total hardness of 100 mg/L.

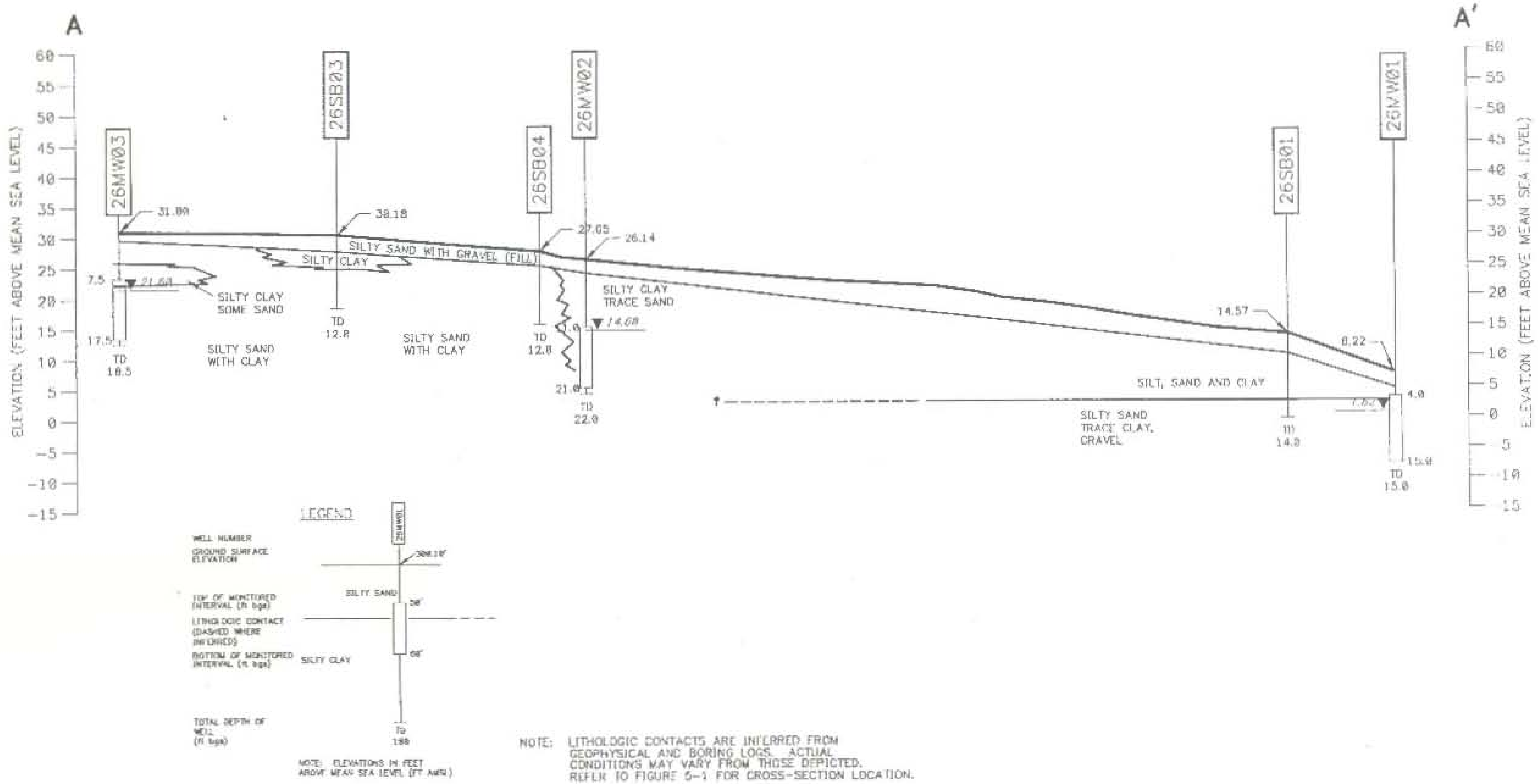


IED (SWMU 26) SITE PLAN & CROSS-SECTION
STUMP NECK ANNEX
NAVAL SURFACE WARFARE CENTER
INDIAN HEAD, MARYLAND

FIGURE 5-1

Brown & Root Environmental

ACAD: D:\DATA\CADD\5200\5200GX01.DWG 02/05/96 TD



IED (SWMU 26) GEOLOGIC CROSS SECTION A-A'
STUMP NECK ANNEX
NAVAL SURFACE WARFARE CENTER
INDIAN HEAD, MARYLAND

0 60 120
HORIZONTAL SCALE IN FEET
0 20 40
VERTICAL SCALE IN FEET

FIGURE 5-2

Brown & Root Environmental

CTO 222

6.0 The Inert Ordnance Devices (IOD) Site (SWMU 27)

6.1 SITE BACKGROUND AND PHYSICAL SETTING

The IOD is located off a dirt road in the vicinity of the intersection of Archer Avenue and Lewis Road. The site consists of a deteriorating concrete pad measuring approximately 18 by 12 feet. Two circular manholes exist in the top of the concrete pad, which is located on the slope of a steep hill. A 4- to 5-foot depression exists immediately below the concrete pad. Discarded inert ordnance (e.g., fuses), can be seen underneath the pad directly below the circular opening on the east side of the pad. Access to the IOD is controlled by a gate located on Archer Avenue. Wetlands and Chicamuxen Creek are located downgradient (southeast) of the site. The location and general features of the IOD are displayed in Figure 6-1.

6.2 SITE OPERATIONS AND HISTORY

Minimal background information is available to date regarding historical activities at the IOD. The building originally atop the concrete pad at the IOD may have been Building 2061. At one time, an aircraft fuselage may have been situated atop the IOD and may have been used in training exercises (i.e., the training exercise would have simulated the deactivation of unexploded ordnance aboard a downed aircraft). Based on visual inspection of the site, IOD was used for the disposal of inert ordnance. In the 1980s, concrete was poured into the hole in the concrete pad covering the IOD. It is not an active disposal site.

6.3 PREVIOUS INVESTIGATIONS

Prior to the field activities conducted for this VI, no sampling or analysis had been performed at the IOD Site.

6.4 FIELD INVESTIGATION

This section describes the field activities that took place at the IOD Site.

Two surface soil samples (0-2 feet below ground surface) were collected from a surface depression located immediately downgradient of the disposal area to determine the absence or presence of contamination in the soil. The samples were analyzed for Appendix IX volatile organics (VOAs), Appendix IX semivolatile organics (SVOAs), Target Analyte List (TAL) metals, tin (Sn), cyanide (CN), total organic carbon (TOC), nitrate-nitrite (NO_2/NO^3), ammonia (NH_3), Method 8330 explosives (including TNT, HMX, and RDX), nitrocellulose (NC), nitroguanidine (NQ), nitroglycerine (NG), and pentaerythritol tetranitrate (PETN). Sampling locations are shown on Figure 6-1.

6.5 SITE CHARACTERISTICS

This section discusses the site-specific geology and hydrogeology.

6.5.1 Geology and Soils

No soil borings were drilled at the IOD; therefore, the site-specific geology of the study area could not be determined. The general geology of the area is described in Section 3.4.

6.5.2 Hydrogeology

No monitoring wells exist at the SWMU; therefore, site-specific data do not exist to classify the hydrogeological conditions. However, the general groundwater flow direction can be interpreted by observing physical features present at the site, such as the ground surface topography. As shown on Figure 6-1, the surface topography dips to the southeast. Groundwater is expected to mimic the surface topography and flow to the southeast toward a wetlands area.

6.6 NATURE AND EXTENT OF CONTAMINATION

This section presents the results of the analysis of environmental samples collected at the IOD site, as described in Sections 6.4. All samples collected were analyzed according to the methods specified in the Verification Investigation Work Plan (HALLIBURTON NUS, September 1995). Samples were analyzed by GP Environmental Services, Inc. Analytical results are presented in Appendix I.

All data generated were validated according to EPA National and Region III guidelines. The data validation was performed by Brown & Root Environmental validation chemists who routinely validate data from numerous laboratories producing data under the EPA CLP. Data validation memorandum are presented in Appendix J. A copy of the complete data validation packages is available to the Navy and the U.S. EPA Region III upon request.

The analytical results for soil samples collected at the IOD are presented in Table 6-1. Methylene chloride (C_{max} = 192 μg/kg) and toluene (C_{max} = 32.1 μg/kg) were the only target organic analytes detected in the samples. (No energetic or semivolatile organic analytes were detected.) Because site-specific background data are not available for IOD soils, inorganic concentrations detected in the site samples were compared to the background data available for SWMU 26 (the IED). Inorganic concentrations were compared to the background soil concentrations for the IED, located northeast of the IOD. Antimony, cadmium, calcium, copper, magnesium, tin, and zinc were detected at concentrations two times (or more) than those noted in background. However, only the maximum concentrations of cadmium in S27-SS-002 (14.6 mg/kg) and copper in S27-SS-002 (30.4 mg/kg) were greater than five times background.

6.7 QUALITATIVE HUMAN HEALTH RISK ASSESSMENT FOR THE IOD

A qualitative risk assessment of target analyte concentrations detected in soil samples collected at the IOD is presented in Table 6-2. The maximum concentrations of arsenic and beryllium in the IOD soil samples exceed EPA Region III RBCs for ingestion of soils assuming a residential land use scenario. (The maximum concentrations of cadmium and iron are at least one half the respective RBCs.) None of the target analytes were detected at concentrations exceeding EPA Region III RBCs for soil ingestion assuming an industrial land use scenario. The maximum concentrations of barium and cadmium exceed the EPA SSL for the protection of groundwater. However, the arsenic, barium, and beryllium concentrations reported are similar to background concentrations. Consequently, these parameters will not be further evaluated in the risk assessment. Cadmium and iron are selected as COPCs and will be further evaluated in the following quantitative risk assessment.

6.8 QUANTITATIVE HUMAN HEALTH RISK ASSESSMENT FOR THE IOD

A quantitative risk assessment of cadmium and iron concentrations detected in the IOD soils was performed as detailed in the risk assessment spreadsheets included in Appendix I and summarized in Table 6-3. Neither compound has been classified as a carcinogen. Thus, cancer risk estimates are not presented. Hazard quotients presented for cadmium and iron approach 1, but do not exceed 1 in any of the cases evaluated. The Hazard Index for the residential land use scenario (1.3) marginally exceeds unity. It should be noted that the iron concentration in the IOD soils are similar to those noted in the IED background soil samples.

6.9 ECOLOGICAL RISK ASSESSMENT FOR THE IOD

Data on contaminant concentrations in surface soil are the only data available to evaluate ecological risk at the IOD site.

Various wildlife species have the potential for exposure to chemical contaminants present in the surface soil, for example through incidental ingestion accompanying feeding, burrowing, and/or grooming behavior. At the IOD site, metals, which are present in soils naturally, and two volatile organics were the only potential contaminants detected in the surface soils. Any potential ecological risk from surface soil contamination is likely to be due to these constituents. However, neither background soil concentrations for this area nor soil screening concentrations designed to be protective of wildlife are available, and thus the existence and magnitude of this risk cannot be evaluated. It should be noted that most metals detected at the IOD appear to reflect background concentrations.

TABLE 6-1

CONTAMINANT OCCURRENCE AND DISTRIBUTION
INERT ORDNANCE DISPOSAL (IOD) SITE - SURFACE SOIL SAMPLES
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Parameter	S27-SS-001[1]	S27-SS-002[1]
VOLATILE ORGANICS (μg/kg)		
Methylene chloride	69.7^{J}	192^{J}
Toluene	19.4^{J}	32.1^{J}
SEMIVOLATILE ORGANICS		
NOT DETECTED		
ENERGETICS		
NOT DETECTED		
INORGANICS (mg/kg)		
Aluminum	11800	5300
Antimony	0.21^{UL}	0.67^{L}
Arsenic	3.3	2.5^{K}
Barium	46.0	26.1
Beryllium	0.46	0.32
Cadmium	2.1	14.6
Calcium	749^{K}	1830
Chromium	18.1^{J}	11.0^{J}
Cobalt	7.8	5.0
Copper	17.8^{L}	30.4
Iron	20600^{J}	12200^{J}
Lead	10.5^{L}	14.2^{L}
Magnesium	1800	682^{K}
Manganese	208^{J}	47.3^{J}
Nickel	12.8	8.2^{K}
Potassium	932	572
Tin	22.8^{L}	5.0^{UL}
Vanadium	32.6	18.4
Zinc	56.0	131

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TABLE 6-1 (Continued)
CONTAMINANT OCCURRENCE AND DISTRIBUTION
INERT ORDNANCE DISPOSAL (IOD) SITE - SURFACE SOIL SAMPLES
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Parameter	S27-SS-001[1]	S27-SS-002[1]
INDICATOR PARAMETERS		
Ammonia (mg/kg)	**35.8**^{L}	**55.9**^{L}
Nitrate+Nitrite (mg/kg)	0.94^{U}	**2.2**
Percent Solids (%)	**82.5**	**80.5**
Total Organic Carbon (mg/kg)	**317**	**2280**

NOTE: **All positive detections have been bolded.**

1 Sample depth is 0 to 2 feet.

J Positive detection is qualified as an estimate.
K Positive detection is qualified as biased high.
L Positive result is qualified as biased low
U Analyte not detected. Reported result is the detection limit.
UL Nondetect of analyte considered biased low.

TABLE 6-2

IOD SOIL - QUALITATIVE RISK ASSESSMENT
VERIFICATION INVESTIGATION
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Chemical (a)	Frequency of Detection (b)	Range of Detection [mg/kg]	Location of Maximum	Risk-Based Action Levels (mg/kg) (c)				Background Concentration [S26-MW03-001] [mg/kg]	Maryland Background Concentration (d) [mg/kg]
				Soil Ingestion		Soil Screening Levels			
				Industrial	Residential	Air	Groundwater		
Volatile Organics									
Methylene chloride	2/2	0.0637 - 0.192	S27-SS-002	760	85	7	0.01	ND	NA
Toluene	2/2	.0194 - 0.032	S27-SS-002	410000	16000	520	5	ND	NA
Inorganics									
Aluminum	2/2	5300 - 11800	S27-SS-001	1000000	78000	NA	NA	12700	<20000
Antimony	1/2	0.67	S27-SS-002	820	31	NA	NA	ND	<1
Arsenic	2/2	2.5 - 3.3	S27-SS-001	3.8	0.43	380	15	3.3	2-6
Barium	2/2	26.1 - 46.0	S27-SS-001	140000	5500	350000	32	84.8	300
Beryllium	2/2	0.32 - 0.46	S27-SS-001	1.3	0.15	690	180	0.61	<1
Cadmium	2/2	2.1 - 14.6	S27-SS-002	1000	39	920	6	ND	ND
Calcium	2/2	749 - 1830	S27-SS-002	NA	NA	NA	NA	409	<2300
Chromium	2/2	11.0 - 18.1	S27-SS-001	1000000 (III) 10000 (VI)	78000 (III) 390 (VI)	140 (VI)	19 (VI)	20.8	<20
Cobalt	2/2	5.0 - 7.6	S27-SS-001	120000	4700	NA	NA	15	<3
Copper	2/2	17.6 - 30.4	S27-SS-002	82000	3100	NA	NA	4.4	<10
Iron	2/2	12200 - 20600	S27-SS-001	610000	23000	NA	NA	25300	<10000
Lead	2/2	10.5 - 14.2	S27-SS-002	NA	NA	NA	NA	9.9	15
Magnesium	2/2	682 - 1800	S27-SS-001	NA	NA	NA	NA	1090	1500
Manganese	2/2	47.3 - 208	S27-SS-001	10000	390	NA	NA	882	<150
Nickel	2/2	8.2 - 12.8	S27-SS-001	41000	1600	6900	21	10.5	<5
Potassium	2/2	572 - 932	S27-SS-001	NA	NA	NA	NA	783	<11000
Tin	1/2	22.8	S27-SS-001	1000000	47000	NA	NA	ND	1

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TABLE 6-2 (Continued)
IOD SOIL - QUALITATIVE RISK ASSESSMENT
VERIFICATION INVESTIGATION
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Chemical (a)	Frequency of Detection (b)	Range of Detection (mg/kg)	Location of Maximum	Risk-Based Action Levels (mg/kg) (c)				Background Concentration (S26-MW03-001) (mg/kg)	Maryland Background Concentration (d) (mg/kg)
				Soil Ingestion		Soil Screening Levels			
				Industrial	Residential	Air	Groundwater		
Inorganics (Continued)									
Vanadium	2/2	18.4 - 32.6	S27-SS-001	14000	550	NA	NA	38.7	<20
Zinc	2/2	56.0 - 131	S27-SS-002	610000	23000	NA	42000	30.8	<28
Indicator Parameters									
Ammonia	2/2	35.8 - 55.9	S27-SS-002	NA	NA	NA	NA	49.9	NA
Nitrate + Nitrite	1/2	2.2	S27-SS-002	1E6/2E5	13000/7800	NA	NA	ND	NA
Total Organic Carbon	2/2	317 - 2280	S27-SS-002	NA	NA	NA	NA	5020	NA

NA - Not Available.
ND - Not Detected.
(a) Chemical name displayed in bold font exceeds action level.
(b) Samples S27-SS-001 and S27-SS-002 were utilized in this statistical evaluation.
(c) Source: Risk Based Concentration Table, July - December 1995, USEPA, October 20, 1995.
(d) Source: Element Concentrations in Soils and Other Surficial Materials of the Coterminous United States, USGS Professional Paper 1270, 1984.
Data for Maryland utilized.

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TABLE 6-3

SUMMARY OF RISK ASSESSMENT RESULTS FOR IOD SOILS
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Area of Concern	Media of Concern	Exposure Route	Hazard Index	Parameters with Hazard Index > 1	Cancer Risk Estimates[1]	Parameters with Cancer Risk Estimates > 10^{-4}	Parameters with Cancer Risk Estimates > 10^{-5}
IOD	Soil (Industrial Scenario)	Ingestion	4.1E-02	--	NC	--	--
		Dermal Contact	5.6E-02	--	NC	--	--
		Totals	9.7E-02	--	NC	--	--
	Soil (Residential Scenario)	Ingestion	1.1E-00	--	NC	--	--
		Dermal Contact	1.9E-01	--	NC	--	--
		Totals	1.3E-00	--	NC	--	--

-- None found

1 NC - Not calculated because chemicals of potential concern are not carcinogenic via the routes of exposure evalauted.

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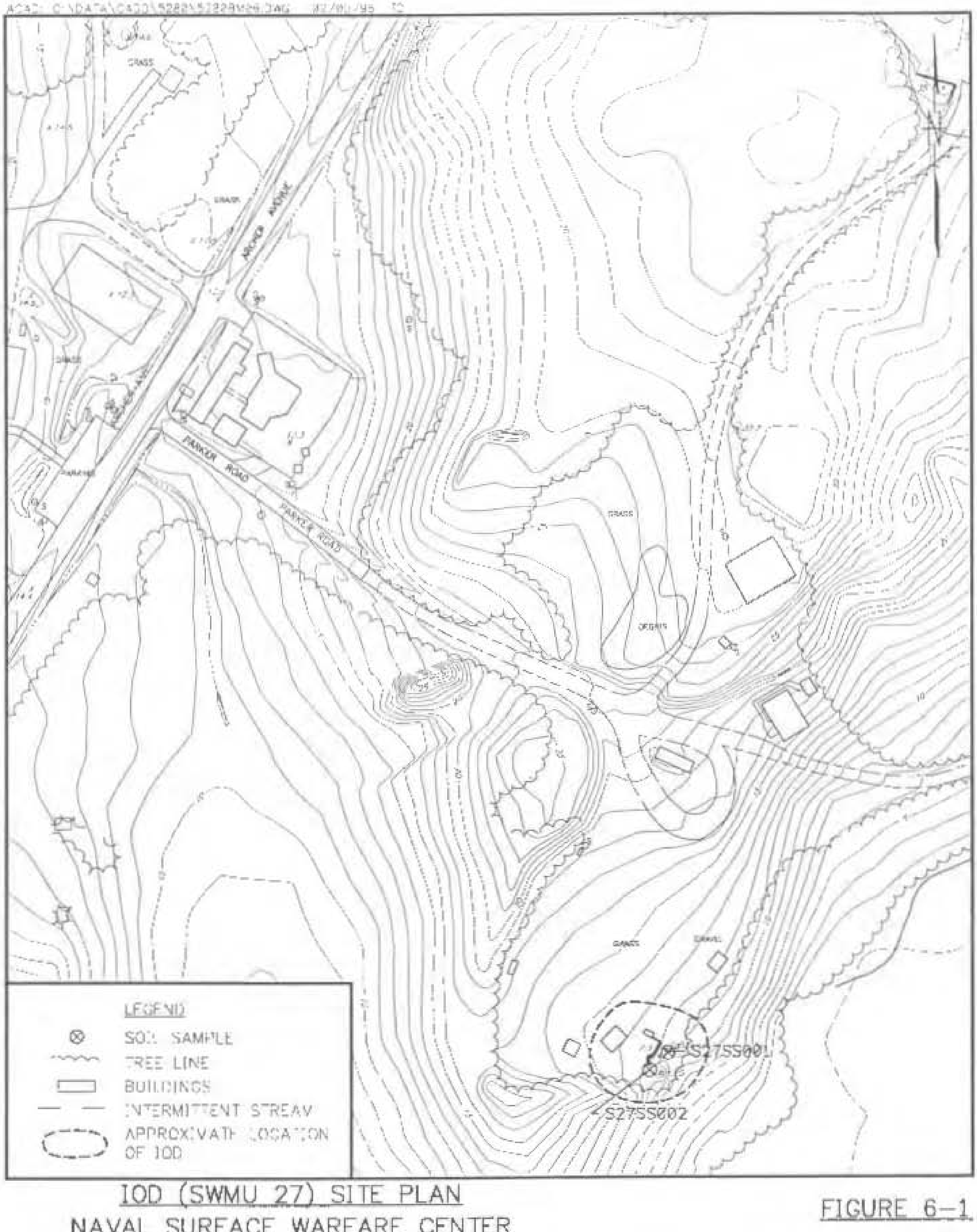
Figure 6-1 (8.5 x 11)



IOD (SWMU 27) SITE PLAN
NAVAL SURFACE WARFARE CENTER
INDIAN HEAD, MARYLAND

0 100 200
SCALE IN FEET

FIGURE 6-1

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7.0 AREA 8 (SWMU 25)

7.1 SITE BACKGROUND AND PHYSICAL SETTING

Area 8, the Underwater Ordnance Training Area, is an active training area located on Roach Road. Access to the site is controlled by fencing and a gate located on Archer Avenue. Significant features of the site are Buildings 2104 and 2125, a pond (approximately 1 acre in size), and numerous water-shot and air-shot test locations.

Area 8 is approximately 9.6 acres in size. In comparison to Range 6, the IOD, and the IED, the terrain at Area 8 is very steep and the site is heavily wooded. Two acres of wetlands have been identified along the northwest edge of the site. The water table ranges in depth from approximately 30 feet in the southern porion of the site to the ground surface near the wetlands. Chicamuxen Creek is located downgradient of Area 8. The location, sample locations, and general features of Area 8 are displayed on Figure 7-1.

7.2 SITE OPERATIONS AND HISTORY

Area 8, the Underwater Ordnance Training Area, is an active facility used to train military personnel to defuse explosive devices. Training exercises at Area 8 are performed 10 months a year. It is estimated that approximately 50 to 75 pounds (net explosive weight) of ordnance are used at this training facility each year. No more than 0.5 pound of explosives is used at the air- or water-shot locations during training exercises. At the water-shot locations, the explosive is placed 2 to 5 feet below the water surface. At the air-shot locations, the explosive is suspended (on wire) approximately 2 feet above ground. The types of ordnance used include TNT (2,4,6-trinitrotoluene) block, pentaerythritol tetranitrate (PETN), military dynamite, blasting caps, detonation cord, and similar devices.

Area 8 is defined by numerous water- and air-shot locations and a pond (Figure 7-1). The water-shot and air-shot locations have been the primary locations for training and testing activities. The pond has been inactive since 1993. The water-shot locations consist of depressions measuring a few feet in diameter and 6 to 9 feet deep. Surface water 4 to 5 feet deep fills these depressions. The shot locations appearing to the east of Roach Road on Figure 7-1 are referred to as "B-side" locations; those to the west of Roach Road are referred to as "A-side" locations. B-side Locations 5, 6, 7, 8, 9, 22, and 23 are the most used water-shot locations, whereas B-side locations 24 and 38 are the most used air-shot locations. A-side water-shot location 7 is the closest location to Chicamuxen Creek and is the most used water-shot location on A-side. This information is based on historical records maintained by the Explosive Safety Officer (Indian Head Naval Surface Warfare Center, February 1995).

7.3 PREVIOUS INVESTIGATIONS

Prior to the field activities conducted for this VI, no environmental sampling or analysis had been performed at Area 8.

7.4 FIELD INVESTIGATION

This section discusses the field activities that occurred at Area 8 (SWMU 25).

7.4.1 Field Screening Samples

The purpose of the field test-kit screening at Area 8 was to investigate the water-shot/air-shot locations for the presence of TNT, HMX, and RDX. This includes the surface water and sediment from the water-shot locations and the surface soil from the air-shot locations that may have been affected by site activities. The results of these tests were used to locate the soil and monitoring well borings. In addition, surface soil samples (0- to 2- feet deep) collected from the soil and monitoring well borings were analyzed with the test kits. The sample locations and their field test-kit results are shown on Figure 7-2. Twenty five of the most used air-shot/water-shot locations were sampled and analyzed by field test-kit screening (see Section 2.1.2.2).

7.4.2 Soil Investigation

For purposes of investigating potential soil contamination at Area 8, three soil borings and three monitoring well borings were installed. The analytical program for soil samples collected at Area 8 (SWMU 25) is presented in Table 2-1.

The first boring (S25-SB01) was drilled at the most used air-shot location (24B). The other two soil borings (S25-SB02 - located at air-shot 36/37B, and S25-SB03 - located at 44/48B) were selected based on the results of the field screening samples (see Figure 7-2 and Appendix D). These borings were used to collect soil samples for fixed-base laboratory analysis to determine the absence or presence of contamination. Two soil samples were collected from each boring. The first sample was collected from the 0- to 2-foot depth interval. The second soil sample was collected just above the water table in S25-SB01 and from 2 to 4 feet below ground surface in borings S25-SBO2 and S25-SB03. Visual observations and PID readings of the site soils did not identify any apparent contamination.

The first monitoring well boring (S25-MW01) was drilled adjacent to water-shot location 7A, which, according to base personnel, is one of the two most used water shot locations and is the closest location to Chicamuxen Creek. The second monitoring well boring (S25-MW02) was drilled adjacent to water-shot location 7B, which, according to base personnel, is the other most used water-shot. Soil samples were collected from the well borings to determine the absence or presence of contamination. Two soil samples were collected from each boring. The first sample was collected from the 0 to 2 foot depth interval. The second soil sample was collected from just above the water table. Visual observations and PID readings of the site soils did not identify any apparent contamination. Both borings were converted to monitoring wells (25MW01, 25MW02).

For purposes of characterizing the background soil conditions at the site, one monitoring well boring (S25-MW03) was drilled upgradient of all air-shot and water-shot locations at the site. Two soil samples were collected from the boring. The first sample was collected from the 0 to 2 foot interval, and the second soil sample was collected from 2 to 4 feet below ground surface. The soil boring was converted to monitoring well 25MW03.

7.4.3 Groundwater Investigation

Three monitoring wells (25MW01, 25MW02, 25MW03) were installed and sampled at the site to determine if groundwater contamination is present in the shallow water table aquifer (see Figure 7-1). The samples were analyzed for the parameters listed in Table 2-1.

One round of synoptic groundwater level measurements were taken at all three wells on October 17, 1995 to determine the groundwater flow direction across the site. The groundwater elevations are shown in the following table:

Well Name	Elevation of Measuring Point (ft. MSL)	Depth to Groundwater (ft.)	Groundwater Elevation (ft. MSL)
25MW01	6.24	2.13	4.11
25MW02	24.66	10.79	13.87
25MW03	74.17	34.91	39.26

Both rising and falling head slug tests were performed at monitoring wells 25MW01 and 25MW03 and a rising head slug test was performed at monitoring well 25MW02 to determine the permeability characteristics of the aquifer.

7.4.4 Surface Water and Sediment Samples

Four surface water and sediment samples were collected at Area 8. One set of surface water and sediment samples (S25-SW001, S25-SD001) was collected from water-shot location 7-B. A second set of surface water and sediment samples (S25-SW002, S25-SD002) was collected from water-shot location 23-B. These are considered by Base personnel to be among the most used water-shot locations. A third set of surface water and sediment samples (S25-SW003, S25-SD003) was collected from Chicamuxen Creek adjacent to water-shot location 7-A. The fourth set of surface water and sediment samples (S25-SW004, S25-SD004) was collected from Chicamuxen Creek, upstream of all air-shot and water-shot locations (see Figure 7-1 for all sediment sample locations). Field test-kit analyses were performed on surface water and sediment samples S25-SW/SD001, S25-SW/SD002, and S25-SW/SD003. All four sets of surface water and sediment samples were analyzed at a fixed-base laboratory for the parameters listed in Table 2-1.

7.5 SITE CHARACTERISTICS

This section discusses the site-specific geology and hydrogeology for Area 8.

7.5.1 Geology and Soils

Subsurface soil was classified in the field for three soil borings and three monitoring well borings drilled at the site. The information was used to classify the site geologic conditions.

The shallow subsurface geology of the study area, as observed from the boring logs, consisted of silty sand with clay. The relative amounts of sand, silt, and clay vary somewhat at each location.

7.5.2 Hydrogeology

Hydrogeological conditions at Area 8 have been interpreted from data obtained during the field investigation activities.

The site is characterized by a shallow groundwater table (ranging from 0 to 30 feet below ground surface), contained within a silty sand with clay aquifer. The presence of significant amounts of fine sediments resulted in a high turbidity in all three monitoring wells installed at Area 8. Recharge of the shallow aquifer is likely to occur primarily through infiltration of precipitation.

The potentiometric surface map generated from water levels collected on October 17, 1995, was used to determine the groundwater flow direction and gradient across the site. Based on the potentiometric surface map (Figure 7-3), groundwater flows to the northwest across the site toward the nearby wetlands. Based on linear measurements perpendicular to the potentiometric surface contours, the groundwater gradient was calculated to be approximately 0.047.

Both rising- and falling-head slug tests were performed in the monitoring wells to determine the permeability characteristics of the aquifer. As shown in the following table, the average hydraulic conductivity for the site was calculated to be approximately 1.47 ft/day (5.20×10^{-4} centimeters per second [cm/sec]).

SUMMARY OF SLUG TEST DATA

Well Number	Rising-Head Slug Test (cm/sec)	Falling-Head Slug Test (cm/sec)	Average (cm/sec)
25MW01	2.34×10^{-5}	3.44×10^{-5}	2.84×10^{-5}
25MW02	1.68×10^{-3}		1.68×10^{-3}
25MW03	3.21×10^{-3}	2.71×10^{-3}	2.95×10^{-3}
Site Average			5.20×10^{-4}

Assuming an effective aquifer porosity of 30 percent and using the calculated potentiometric surface gradient of 0.047, the groundwater velocity is calculated to be 84 feet per year. Hydraulic conductivity test data plots and calculations based on the slug tests are included in Appendix G.

7.6 NATURE AND EXTENT OF CONTAMINATION

This section presents the results of the analysis of environmental samples collected at Area 8, as described in Sections 7.4.1, 7.4.2, and 7.4.3. All samples collected were analyzed according to the methods specified in the Verification Investigation Work Plan (HALLIBURTON NUS, September 1995). Samples were analyzed by GP Environmental Services, Inc. Analytical results are presented in Appendix I.

All data generated were validated according to EPA National and Region III guidelines. The data validation was performed by Brown & Root Environmental validation chemists, who routinely validate data from numerous laboratories producing data under the EPA CLP. Data validation memorandum are presented in Appendix J. A copy of the complete data validation packages is available to the Navy and the U.S. EPA Region III upon request.

7.6.1 Soil

The results of the analysis of soil samples collected at Area 8 are presented in Table 7-1. Field screening results are compared to fixed-based lab results (i.e., GP Environmental Services results) in Table 7-2.

The following organics were detected in the soil samples collected during the installation of monitoring wells and soil boring installed at Area 8:

- Acetone (C_{max} = 12 μg/kg)
- Carbon disulfide (C_{max} = 2.6 μg/kg)
- Chloroform (C_{max} = 3.2 μg/kg)
- Methylene chloride (C_{max} = 5.0 μg/kg)
- Trichloroethene (C_{max} = 1.9 μg/kg)
- Xylene (C_{max} = 2.1 μg/kg)

All positive detections of organics were below 15 μg/kg. Trichloroethene is a degreasing agent often used historically at industrial or DOD sites to clean mechanical equipment. Xylene is a component of fuels. These two organics may be present in the soils as a result of possible occasional equipment maintenance or fuel use at Area 8. It should be noted that acetone, chloroform, and methylene chloride are common laboratory/field blank contaminants. These organics were detected in the Area 8 soil samples at concentrations similar to blank contamination "action levels" calculated and applied to other volatile organic data collected for the VI. No semivolatile organic or energetic compounds were detected in any of the soil samples.

Inorganic concentrations detected in the site soil samples were compared to concentrations reported for two soil samples collected during the installation of upgradient monitoring well 25MW03 (surface soil samples, collected from 0 to 2 feet below ground surface and subsurface soil samples, collected either from 2 to 4 feet below ground surface or just above the water table). The following metals were detected at maximum concentrations approximately equal to or greater than two times background concentrations:

- Aluminum
- Antimony
- Arsenic
- Barium
- Beryllium
- Calcium
- Chromium
- Cobalt
- Copper
- Iron
- Magnesium
- Nickel
- Potassium
- Vanadium
- Zinc

Of these metals, only arsenic, beryllium, cobalt, magnesium, nickel, and zinc were detected at concentrations greater than five times background. In general, the metals concentrations detected in most of the surface soil samples were below, at, or slightly above background (less than two times background). With the exception of S25-SB01-002, metals concentrations detected in most of the subsurface soil samples were also below, at, or slightly above background (less than two times background). Maximum metals concentrations were generally detected in subsurface soil samples, particularly in the sample collected at the most used air-shot location (SB01).

Ammonia and total organic carbon concentrations were also above background in most surface and subsurface soil samples.

7.6.2 Groundwater

The results of the analysis of groundwater samples collected at Area 8 are presented in table 7-3.

Chloroform (C_{max} = 2.7 μg/L) and bis(2-ethylhexyl)phthalate (C_{max} = 3.3 μg/L) were the only target analyte organics detected in the Area 8 groundwater. The maximum concentrations detected in samples collected from the upgradient well are similiar to or higher than concentrations detected in samples from the downgradient monitoring wells. These organic contaminants are common "blank" contaminants and may be present as a result of laboratory or field blank contamination. (It should be noted that phthalates are sometimes introduced into environmental samples as a result of the equipment [e.g., plastic gloves] used during sampling events.) No energetic organic compounds were detected.

Iron and potassium concentrations in the filtered groundwater samples and sodium concentrations in unfiltered and filtered groundwater samples collected from the downgradient monitoring wells exceed those reported for the upgradient monitoring well. However, only the metals concentrations (beryllium, cadmium, chromium, lead, and nickel) in the unfiltered sample from the upgradient monitoring well exceed federal primary (health-based) SDWA MCLs. Aluminum, iron, and manganese concentrations detected in unfiltered and/or filtered samples from all three monitoring wells also exceed secondary (aesthetic-based) MCLs. Ammonia, sulfate, total kjeldahl nitrogen (TKN), and total organic halides (TOX) were detected above background in 25MW02 only at concentrations less than two times background. Groundwater constituent concentrations are generally higher in samples from the upgradient monitoring well sample and do not indicate that groundwater at Area 8 has been affected by site activities.

7.6.3 Surface Water and Sediment

The results of the analysis of surface water and sediment samples collected at Area 8 are presented in Tables 7-4 and 7-5, respectively.

Bis(2-ethylhexyl)phthalate (BEHP) and 4-amino-2,6-dinitrotoluene (an energetic compound) were the only target organic analytes detected in the Area 8 surface waters. BEHP (C_{max} = 10.8 μg/L) was detected in one of the duplicate samples collected at location S25-SW001 and in the background (upstream) surface water sample (C = 1 μg/L). 4-Amino-2,6-dinitrotoluene (an energetic analyte) was detected at locations S25-SWOO1 (C = 1.9 μg/L) and S25-SW002 (C = 17.6 μg/L).

The following inorganic analytes were detected above background in surface water: unfiltered and filtered aluminum, unfiltered antimony, unfiltered barium, unfiltered beryllium, unfiltered cobalt, unfiltered and filtered copper, unfiltered and filtered iron, unfiltered and filtered lead, unfiltered and filtered manganese, unfiltered and filtered mercury, unfiltered nickel, and unfiltered cyanide. Of these analytes, unfiltered beryllium, filtered copper, filtered mercury, and unfiltered nickel were not detected in any sample except one of the duplicate sample pair. The maximum concentrations of inorganic analytes were generally detected in S25-SW001. The relatively high levels of aluminum, iron, and manganese in these samples suggest the elevated metals concentrations reported for location S25-SW001 are probably the result of turbidity. The maximum concentrations of unfiltered aluminum, unfiltered iron, unfiltered and filtered manganese and unfiltered cyanide were at least one order of magnitude greater than background. Unfiltered and filtered background concentrations of calcium, magnesium, and sodium were at least one order of magnitude greater than the other surface water samples. Elevated concentrations of ammonia, total Kjeldahl nitrogen, total organic carbon, and total phosphorus were also detected at S25-SW001.

The following volatile and semi-volatile organic analytes were detected in the Area 8 sediment samples:

- Benzo(a)pyrene (C_{max} = 170 μg/kg)
- Bis(2-ethylhexyl)phthalate [BEHP] (C_{max} = 73.8 μg/kg)
- Naphthalene (C_{max} = 85.9 μg/kg)
- Phenanthrene (C_{max} = 56.8 μg/kg)

BEHP, naphthalene, and phenanthrene were detected at location S25-SD001. Benzo(a)pyrene was detected at location S25-SD003. BEHP was detected in only one of the duplicate sample pair. It should be noted that phthalates are sometimes introduced into environmental samples as a result of the equipment (e.g., plastic gloves) used during sampling events. No volatile organic or energetic analytes were detected in any of the sediment samples.

Various inorganic analytes were detected above background in one or more sample and include aluminum, arsenic, barium, beryllium, cobalt, copper, iron, lead, manganese, mercury, nickel, potassium, selenium, vanadium, zinc, and cyanide. Antimony and silver were detected above background in only one of the duplicate sample pair but were not detected in the other sample pair. Copper (S25-SD001) and cyanide (S25-SD001 and S25-SD003) were detected at concentrations greater than 10 times background. The other inorganic analytes were generally below, at, or slightly above (less than two times background) background.

7.7 QUALITATIVE HUMAN HEALTH RISK ASSESSMENT FOR AREA 8

Table 7-6 presents a qualitative risk assessment of target analyte concentrations detected in the soil samples collected at Area 8. None of the organic target analytes were reported at concentrations exceeding EPA Region III RBCs or SSLs. However, arsenic, beryllium, and iron were detected at maximum concentrations exceeding EPA Region III RBCs for ingestion of soils assuming a residential land use scenario. (With the exception of arsenic, inorganics were not detected at concentrations exceeding EPA Region III RBCs for the industrial land use scenario.) These metals will be further evaluated in the following quantitative risk assessment. Barium and nickel were detected at maximum concentrations exceeding EPA Region III SSLs for the protection of groundwater. However, neither metal was detected in groundwater samples from the downgradient Area 8 monitoring wells at concentrations exceeding federal SDWA MCLs.

A qualitative risk assessment of target analyte concentrations detected in the Area 8 groundwater samples is presented in Table 7-7. As noted in Section 7.7.2, target analyte concentrations are generally higher in the upgradient monitoring well sample than in the downgradient monitoring well samples. Analytical results reported for the downgradient monitoring wells do not exceed available federal SDWA primary (health-based) MCLs. The available analytical results do not indicate that groundwater at Area 8 has been contaminated by site-related activities. Consequently, a quantitative human health risk assessment will not be prepared for the Area 8 groundwater.

Table 7-8 presents a qualitative risk assessment of target analyte concentrations detected in surface water samples collected at Area 8. Bis(2-ethylhexyl)phthalate, beryllium, iron, lead, manganese, cyanide and ammonia were detected at maximum concentrations exceeding federal SDWA MCLs or EPA Region III RBCs for tap water. These parameters will be further evaluated in the following quantitative risk assessment. However, it should be noted that the federal SDWA MCLs and the RBCs for tap water are typically used to evaluate a groundwater or surface water resource that is used for drinking water purposes. The use of these benchmarks to select COPCs for the surface water bodies at Area 8 is very conservative.

A qualitative risk assessment of target analyte concentrations detected in the sediment concentrations detected in the Area 8 sediment samples is presented in Table 7-9. Benzo(a)pyrene, arsenic, and beryllium were the only constituents reported at maximum concentrations exceeding EPA Region III RBCs for soil ingestion. However, beryllium concentrations reported for site environmental samples are simillar to those reported for background soil and sediment sample locations. Consequently, only arsenic and benzo(a)pyrene will be evaluated in the quantitative risk assessment.

7.8 QUANTITATIVE HUMAN HEALTH RISK ASSESSMENT FOR AREA 8

A quantitative risk assessment was performed for the constituents detected in Area 8 soils, surface waters, and sediments as detailed in the risk assessment spreadsheets included in Appendix I and summarized in Table 7-10. As discussed in the preceding paragraph, no COPCs were identified for the Area 8 groundwater.

Table 7-10 presents the results of the quantitative risk assessment of COPCs selected for soils. Cancer risk estimates developed for the residential and industrial land use scenarios do not exceed 10^{-4} for either land use scenario evaluated. Hazard quotients only exceed unity when maximum contaminant concentrations are evaluated and a hypothetical child is considered the receptor of concern (i.e., a future residential land use scenario is evaluated). It should be noted that arithmetic average iron concentrations at Area 8 do not exceed the EPA Region RBCs for soil ingestion.

The results of the quantitative risk assessment of COPC concentrations detected in surface water and sediment samples collected at Area 8 are included in Table 7-10. Cancer risk estimates developed assuming an adult receptor is periodically exposed (incidental ingestion/dermal contact) to COPCs in these media do not exceed 10^{-6} for any of the pathways evaluated and would not exceed 10^{-6} if risk estimates for the different pathways are summed. Hazard indices developed or summed for these pathways do not exceed 1 indicating that adverse noncarcinogenic health effects are not anticipated under the conditions established in the exposure assessment.

7.9 ECOLOGICAL RISK ASSESSMENT FOR AREA 8

Various wildlife species have the potential for exposure to chemical contaminants present in the soil, for example through incidental ingestion accompanying feeding, burrowing, and/or grooming behavior. However, soil screening concentrations designed to be protective of wildlife are not generally available. Thus, the ecological risk due to chemicals in the soil cannot be assessed. At the Area 8 site, however, the general lack of large differences between inorganic chemical concentrations in surface soil samples from the upgradient (background) soil samples and those taken from or near air-shot or water-shot locations suggests that significant soil contamination (and its associated risk) from inorganic chemicals is not likely at this site. Measurements of organic contaminants in soils from the background location are not available.

Ecological receptors would generally not be exposed to contaminants present in groundwater. However, the groundwater will eventually discharge into surface waters inhabited by aquatic organisms. The EPA's chronic Ambient Water Quality Criteria (CAWQC) are designed to be protective of freshwater aquatic life under a long-term exposure to contaminants, and thus are appropriate benchmarks to use in a qualitative assessment of risks to aquatic organisms from contaminants in groundwater. Table 7-11 shows maximum groundwater chemical concentrations, CAWQC, and calculated environmental effects quotients for Area 8. Environmental Effects Quotients (EEQs) above 1 indicate potential ecological risk.

Bis(2-ethylhexyl)phthalate had an EEQ of just over 1. Among the inorganic chemicals, beryllium, cadmium, chromium, copper, lead, nickel, and zinc had EEQs above 1. Many of the measurements of groundwater concentrations yielding EEQs greater than 1 were from the upgradient well (S25-MWO3). Several factors lessen the potential risk due to these chemicals, however. For metals, instances of EEQs greater than 1 were from unfiltered samples, rather than filtered samples, a fact which suggests that many of the metals present in the groundwater are associated with particulates. Metals associated with particulates would not be expected to be mobile in groundwater. In addition, it is generally believed that the dissolved fraction more closely approximates the bioavailable concentration of metal in the water column. The Maryland Water Quality Standards for protection of aquatic life are based on dissolved metals to reflect this belief. In addition, a chemical's concentration in groundwater may decrease as groundwater moves through the soil due to the adsorption of the chemical to soils. Finally, chemicals in groundwater would likely be significantly diluted upon discharge to surface water. For chromium, an additional factor is the fact that the criterion is based on hexavalent chromium, whereas total chromium (hexavalent + trivalent) was measured in the groundwater samples.

Table 7-12 shows the EEQs calculated for chemicals detected in surface waters at Area 8. Bis(2-ethylhexyl)pthalate, copper, lead, mercury, cyanide and ammonia had EEQs above 1. Examination of Table 7-12 indicates that EEQs above 1 would be associated with bis(2-ethylhexyl)phthalate, copper, lead, mercury, cyanide, and ammonia in samples from one or both of the water-shots sampled, with some of the metal EEQs above 1 from filtered samples. Copper, lead, and mercury had EEQs above 1 in the unfiltered sample from Chicamuxen Creek near water-shot 7A. The compound 4-amino-2-6-dinitrotoluene was also detected in both sampled water-shots. There are no CAWQC for this compound, so its risk to aquatic life cannot be assessed.

The numerous EEQs above 1 at the two sampled water-shots indicate a potential for adverse impacts to aquatic life. However, it is doubtful that these locations represent a significant habitat for aquatic organisms, given their size and use. Thus, the actual ecological risk to aquatic organisms is probably slight. Chicamuxen Creek, in contrast, represents a significant aquatic habitat. However, EEQs above 1 for mercury, copper, and lead were all associated with unfiltered samples. As discussed above, the dissolved fraction best represents the bioavailable fraction of metal in the water column, and the Maryland State Surface Water Standards for the protection of aquatic life are based on dissolved metal. Because the filtered samples from Chicamuxen Creek yield EEQs below 1, there should be little risk to aquatic biota in the creek.

Sediment quality guidelines based on a compilation of matching biological effects and sediment chemical concentration data from numerous modeling, laboratory, and field studies have been developed for a number of the compounds detected in sediments from Area B. At sediment contaminant concentrations below the effects range-low (ER-L), adverse biological effects were rare. Between the ER-L and effects range-median (ER-M), adverse biological effects were observed occasionally, whereas above the ER-M value, adverse effects were encountered frequently. Sediment quality guidelines and calculation of environmental effects quotients for Area 8 sediments sediments are shown in Table 7-13.

The maximum sediment concentrations of mercury and copper yielded EEQs above 1, a fact which indicates potential risk to benthic organisms. However, an examination of Table 7-13 shows that exceedances of sediment guidelines occur only in the sampled water-shots. Because the water-shot locations do not represent significant aquatic habitats, the actual risk is probably slight. All detected contaminants in Chicamuxen Creek were below their ERL guidelines, a fact which suggests no ecological risk from sediments to the organisms living there.

TABLE 7-1

CONTAMINANT OCCURRENCE AND DISTRIBUTION
AREA 8 - SOIL SAMPLES
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Parameter	S25-SB01-001[1]	S25-SB01-002[2]	S25-SB02-001[1]	S25-SB02-002[3]	S25-SB03-001[1]	S25-SB03-002[3]	S25-MW01-01[3,4]	S25-MW01-02[4,4]	S25-MW02-001[1]	S25-MW02-002[4]	S25-MW03-001[1]	S25-MW03-002[7]
	Air-Shot Location 24B		Air-Shot Location 36/37B		Air-Shot Location 44/48B		Adjacent to Water-Shot Location 7A		Adjacent to Water-Shot Location 7B		Upgradient	
VOLATILE ORGANICS (µg/kg)												
Acetone	NA	4.4[LJ]	NA	4.0[J]	NA	17.0[B]	NA	5.5[J]/12.0[J]	NA	4.1[J]	NA	NA
Carbon disulfide	NA	1.3[J]	NA	1.4[J]	NA	1.2[J]	NA	2.6[J]/1.5[J]	NA	1.14[J]	NA	NA -
Chloroform	NA	0.42[LJ]	NA	1.2	NA	0.4[J]	NA	3.2/2.8[J]	NA	0.4[J]	NA	NA
Methylene chloride	NA	5.0[J]	NA	32.8[B]	NA	18.8[B]	NA	69.1[B]/61.8[B]	NA	7.0[B]	NA	NA
Trichloroethene	NA	1.9[J]	NA	0.27[J]	NA	0.27[J]	NA	0.33[J]/0.33[J]	NA	0.28[J]	NA	NA
Xylene	NA	0.79[LJ]	NA	2.1	NA	0.73[J]	NA	0.86[J]/0.87[J]	NA	0.74[J]	NA	NA
SEMIVOLATILE ORGANICS												
NOT DETECTED												
ENERGETICS												
NOT DETECTED												
INORGANICS (mg/kg)												
Aluminum	2310	8340	5410	5710	3490	2290	2970/3100	1780	4900[J]	6020[J]	4010[J]	3070[J]
Antimony	0.51[L]	0.19[LR]	0.16[LR]	0.18[LR]	0.16[LR]	0.16[LR]	0.21[LR]/0.21[LR]	0.21[LR]	0.18[LR]	0.18[LR]	0.18[LR]	0.17[LR]
Arsenic	1.3[L]	2.4[L]	1.3[L]	2.5[L]	12.4[L]	10.2[L]	0.78[K]/1.7[K]	0.67[K]	1.5[L]	3.9[L]	2.2	3.7
Barium	24.2	55.0	20.3	20.7	20.6	13.4	24.1/23.0	18.7	45.6	18.6	29.8	9.1

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TABLE 7-1 (Continued)
CONTAMINANT OCCURRENCE AND DISTRIBUTION
AREA 8 - SOIL SAMPLES
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Parameter	S25-SB01-001^{1}	S25-SB01-002^{2}	S25-SB02-001^{1}	S25-SB02-002^{2}	S25-SB03-001^{1}	S25-SB03-002^{2}	S25-MW01-01^{1,4}	S25-MW01-02^{2,3}	S25-MW02-001^{1}	S25-MW02-002^{2}	S25-MW03-001^{1}	S25-MW03-002^{2}
	Air-Shot Location 24B		Air-Shot Location 36/37B		Air-Shot Location 44/48B		Adjacent to Water-Shot Location 7A		Adjacent to Water-Shot Location 7B		Upgradient	
Beryllium	0.24	0.84	0.24	0.35	0.40	0.39	0.11^{U}/0.11^{L}	0.32	0.32	0.24	0.20	0.14
Cadmium	0.53^{U}	0.57^{U}	0.53^{U}	0.52^{U}	0.56^{L}	0.61^{L}	0.62^{L}/0.62^{J}	0.62^{U}	0.53^{U}	0.54^{U}	0.54^{U}	0.51^{U}
Calcium	69.9^{J}	303^{K}	46.4^{J}	48.1^{J}	41.3^{B}	39.7^{B}	74.9^{L}/30.5^{J}	233^{K}	81.1^{J}	43.2^{J}	101^{B}	113^{J}
Chromium	17.2	18.4	16.8^{J}	9.3^{J}	8.7^{J}	7.3^{J}	5.1/6.6	4.5	8.3	10.6	10.5	8.5
Cobalt	4.1	21.2	2.6^{L}	2.9^{L}	5.4	3.7^{L}	1.8/1.7^{U}	3.5	5.2	3.9	3.5	3.3
Copper	4.4^{J}	20.0	3.2^{B}	3.6^{B}	3.1^{B}	1.6^{B}	1.6^{U}/2.1	5.1	3.5	4.4	2.5^{L}	1.5^{L}
Iron	7280	34900	10800^{J}	12400^{J}	23400^{J}	26900^{J}	3410^{J}/5280^{J}	2300^{J}	8920^{J}	17800^{J}	7930	10200
Lead	5.6^{J}	8.2^{J}	2.2^{J}	1.9^{L}	3.0^{J}	2.0^{J}	5.0^{J}/4.8^{L}	5.1^{J}	7.7^{J}	5.4^{J}	10.0	3.1
Magnesium	148^{K}	1540	365^{J}	381^{J}	102^{K}	63.1^{K}	176/178	217	292^{J}	276^{J}	236^{J}	215^{J}
Manganese	58.7	77.8	171^{J}	49.8^{J}	82.5^{J}	56.6^{J}	9.5/11.7	17.3	116^{J}	78.1^{J}	123^{J}	50.1^{J}
Nickel	9.8	25.4	5.9^{B}	4.0^{B}	1.9^{B}	3.0^{B}	2.1^{U}/2.1^{L}	2.1^{J}	4.8^{J}	4.2^{J}	2.3^{J}	3.3^{J}
Potassium	153	761	292	330	232	163	158/160	335	273	387	221	250
Selenium	0.19^{R}	0.17^{U}	0.19^{U}	0.15^{U}	0.45^{J}	0.31^{J}	0.18^{L}/0.19^{U}	0.19^{U}	0.09^{J}	0.55^{J}	0.17^{L}	0.15^{U}
Sodium	19.0^{J}	26.2	19.3^{J}	18.9^{U}	19.4^{J}	19.0^{L}	77.4^{B}/66.6^{B}	54.3^{B}	18.9^{J}	19.3^{U}	19.2^{J}	18.4^{L}
Vanadium	9.2^{B}	34.3	13.7	14.4	11.0	7.8	6.6/9.8	5.5	13.3	19.4	9.8	9.8
Zinc	8.4	92.1	10.3	13.2	9.8	7.2	7.1/8.1^{B}	5.0^{B}	12.5^{J}	15.8^{J}	11.4	11.3
Total Cyanide	1.1^{U}	1.1^{U}	1.1^{U}	1.0^{U}	1.1^{L}	1.1^{J}	1.2^{U}/1.3^{U}	1.2^{J}	1.5	1.1	1.1^{U}	1.0^{U}

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TABLE 7-1 (Continued)
CONTAMINANT OCCURRENCE AND DISTRIBUTION
AREA 8 - SOIL SAMPLES
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Parameter	S25-SB01-001[1]	S25-SB01-002[2]	S25-SB02-001[1]	S25-SB02-002[3]	S25-SB03-001[1]	S25-SB03-002[5]	S25-MW01-01[1,4]	S25-MW01-02[4,5]	S25-MW02-001[1]	S25-MW02-002[6]	S25-MW03-001[1]	S25-MW03-002[7]
	Air-Shot Location 24B		Air-Shot Location 36/37B		Air-Shot Location 44/46B		Adjacent to Water-Shot Location 7A		Adjacent to Water-Shot Location 7B		Upgradient	
INDICATOR PARAMETERS												
Ammonia (mg/kg)	**52.3**[J]	**14.9**[J]	**30.9**	**49.0**	**25.4**	**12.5**	10.8[UJ]/12.0[UJ]	11.6[UJ]	**66.5**	**28.5**	**21.9**	**7.8**
Nitrate+Nitrite (mg/kg)	0.72[UJ]	0.68[UJ]	1.7[UL]	1.5[UJ]	1.7[UJ]	1.6[UL]	0.53[J]/0.98[J]	0.87[J]	2.3[UR]	2.0[UR]	**1.9**	1.6[J]
Percent Solids(%)	94.6	87.7	93.5	96.0	92.9	94.8	81.3/80.2	80.7/79.2	96.3	93.4	93.5	97.9
Total Organic Carbon (mg/kg)	**5250**	**713**	**2640**[L]	1390[L]	1900[L]	1260[L]	**1840/682**	**698**	**2650**	**1270**	**1620**	87.5[UJ]

NOTE: **All positive detections have been bolded.**

1 Sample depth is 0 to 2 feet.
2 Sample depth is just above groundwater (4 to 8 feet)
3 Sample depth is 2 to 4 feet.
4 Duplicate samples taken from this location.
5 Sample depth is just above groundwater (7 to 11 feet)
6 Sample depth is just above groundwater (5 to 8 feet)
7 Sample depth is just above groundwater (3 to 5 feet).

B Positive result qualified as a result of method or field quality control blank contamination. Compound is not considered to be present in sample.
J Positive detection is qualified as an estimate.
K Positive detection is qualified as biased high.
L Positive result is qualified as biased low.
U Analyte not detected. Reported result is the detection limit.
UJ Analyte not detected. Reported result is the estimated detection limit.
UL Nondetect of analyte considered biased low.
UR Nondetect of analyte considered unreliable.

TABLE 7-2

COMPARISON OF FIXED-BASED LAB AND FIELD SCREENING RESULTS
AREA 8 ENVIRONMENTAL MEDIA
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

SEDIMENT SAMPLES (ppm)

Sample Location	25SW-SD01			25SW-SD02			25SW-SD03			25SW-SD04	
Parameter	Kit		Lab	Kit		Lab	Kit		Lab	Kit	Lab
	D-Tech	Omichron		D-Tech	Omichron		D-Tech	Omichron		D-Tech	
TNT	1.5	< 0.25	ND	1.5	< 0.25	ND	1.5	< 0.25	ND	1.5	ND
RDX	1.5		ND	1.5		ND	1.5		ND	< 0.5	ND

SURFACE WATER SAMPES (ppb)

Sample Location	25SW-SD01		25SW-SD02		25SW-SD03		25SW-SD04	
Parameter	Kit	Lab	Kit	Lab	Kit	Lab	Kit	Lab
	D-Tech		D-Tech		D-Tech		D-Tech	
TNT	< 5	1.91[a]	15	17.6[a]	15	ND	< 5	ND
RDX	< 5	ND	< 5	ND	15	ND	< 5	ND

SOIL BORING SAMPLES (ppm)

Sample Location	25MW01			25MW02			25SB01			25SB02			25SB03		
Parameter	Kit		Lab	Kit		Lab	Kit		Lab	Kit		Lab	Kit		Lab
	D-Tech	Omi.		D-Tech	Omi.		D-Tech	Omi.		D-Tech	Omi.		D-Tech	Omi.	
TNT	1.5	< 0.25	ND	< 0.5	< 0.25	ND	1.5	< 0.25	ND	1.5	< 0.25	ND	< 0.5	< 0.25	ND
RDX	< 0.5		ND	1.5		ND	< 0.5		ND	< 0.5		ND	1.5		ND

(a) Test kit specific to TNT was used. Reported lab results were ND for TNT. Values shown in Table are for 4-amino-2,6-dinitrotoluene (which was the only SW-846 Method 8330 analyte detected in the laboratory analysis).

A comparison of test kit performance between two vendors (D-Tech and Omichron) was staged during the field event. D-Tech test kit results appear to correlate well for the water matrix, but lack analyte specificity. D-Tech test kit results appear to be biased high for the soil matrix. RDX was not analyzed for by the Omichron field test kit vendor.

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TABLE 7-3

CONTAMINANT OCCURRENCE AND DISTRIBUTION
AREA 8 - GROUNDWATER SAMPLES
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Parameter[1]		25MW01	25MW02	25MW03
		Adjacent Water-Shot Location 7A	Adjacent Water-Shot Location 7B	Upgradient
VOLATILE ORGANICS (µg/L)				
Chloroform		**1.6**	**2.7**	**2.6**^{J}
SEMIVOLATILE ORGANICS (µg/L)				
Bis(2-ethylhexyl)phthalate		2.8^{J}	2.8^{UJ}	**3.3**^{J}
ENERGETICS				
NOT DETECTED				
INORGANICS (µg/L)				
Aluminum	U F	**1300**^{J} 110^{UL}	**13800**^{J} 110^{U}	**73400**^{J} 110^{UL}
Arsenic	U F	1.9^{UL} 1.9^{U}	1.9^{U} 1.9^{U}	**2.2**^{L} 1.9^{U}
Barium	U F	**67.8** **16.9**	**101** **16**	**688** **51.2**
Beryllium	U F	0.9^{U} 0.9^{U}	**1.0** 0.9^{U}	**11.0** 0.9^{U}
Cadmium	U F	5.0^{UL} 5.0^{UL}	5.0^{UL} 5.0^{UL}	**6.4**^{L} 5.0^{UL}
Calcium	U F	**3570**^{K} **3910**^{K}	**3080**^{K} **2000**^{K}	**40300** **9650**^{K}
Chromium	U F	10.0^{UL} 10.0^{UL}	**40.4** 10.0^{UL}	**191** 10.0^{UL}
Cobalt	U F	14.0^{U} 14.0^{U}	14.0^{U} 14.0^{U}	**169** 14.0^{U}
Copper	U F	15.0^{U} 15.0^{U}	**28.4** 15.0^{U}	**166**^{L} 15.0^{U}
Iron	U F	**3710** **938**	**17900** **758**	**252000** 47.0^{U}
Lead	U F	4.2^{B} 0.6^{U}	**11.9** 0.6^{U}	**51.0** 0.6^{U}

TABLE 7-3 (Continued)
CONTAMINANT OCCURRENCE AND DISTRIBUTION
AREA 8 - GROUNDWATER SAMPLES
VERFICIATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Parameter[1]		25MW01	25MW02	25MW03
		Adjacent Water-Shot Location 7A	Adjacent Water-Shot Location 7B	Upgradient
Magnesium	U	**1170^{K}**	**1410^{K}**	**16800**
	F	**1250^{K}**	**538^{K}**	**3610^{K}**
Manganese	U	**120**	**176**	**2290**
	F	**148**	**113**	**288**
Nickel	U	17.7^{B}	27.7^{B}	**166^{K}**
	F	17.0^{U}	17.0^{U}	17.0^{U}
Potassium	U	**2940**	**2010**	**8430**
	F	**4090**	**1590**	**3440**
Sodium	U	**6810**	**14000**	**8840**
	F	**10500**	**14300**	**8790**
Vanadium	U	22.0^{U}	**54.6**	**281**
	F	22.0^{U}	22.0^{U}	22.0^{U}
Zinc	U	15.6^{B}	38.4^{B}	**483**
	F	8.0^{U}	8.0^{U}	8.0^{U}
INDICATOR PARAMETERS				
Ammonia (mg/L)		**0.31**	**0.42**	**0.41**
Sulfate (mg/L)		**1.6^{L}**	**14.8^{L}**	**8.0^{L}**
Total Kjedahl Nitrogen (mg/L)		**0.34^{L}**	**0.55^{L}**	**0.43^{L}**
Total Organic Halides (μg/L)		10.0^{UR}	**24.6^{L}**	**13.6^{L}**
Total Phosphorus (mg/L)		**0.17**	**0.41**	**1.5**

NOTE: All positive detections have been bolded.

1 U - Unfiltered sample
F - Filtered sample

B Positive result qualified as a result of method or field quality control blank contamination. Compound is not considered to be present in sample.
J Positive detection is qualified as an estimate.
K Positive detection is qualified as biased high.
L Positive result is qualified as biased low.
U Analyte not detected. Reported result is the detection limit.
UJ Analyte not detected. Reported result is the estimated detection limit.
UL Nondetect of analyte considered biased low.
UR Nondetect of analyte considered unreliable

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TABLE 7-4

CONTAMINANT OCCURRENCE AND DISTRIBUTION
AREA 8 - SURFACE WATER SAMPLES
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Parameter[1]		S25-SW001[2]	S25-SW002	S25-SW003	S25-SW004
		Water-Shot Location 7B	Water-Shot Location 23B	Chicamuxen Creek near Water-Shot 7A	Chicamuxen Creek Upstream of Area 8
VOLATILE ORGANICS					
NOT DETECTED					
SEMIVOLATILE ORGANICS (µg/L)					
Bis(2-ethylhexyl)phthalate		13.6^{U}/**10.8^{J}**	2.8^{U}	2.8^{UL}	**1.1^{J}**
ENERGETICS (µg/L)					
4-Amino-2,6-dinitrotoluene		**1.9/1.9**	**17.6**	1.2^{U}	0.37^{U}
INORGANICS (µg/L)					
Aluminum	U F	**19800^{J}/23000^{J}** **577^{J}/310^{J}**	**1200^{J}** **202^{J}**	**2090^{J}** 110^{UJ}	110^{UJ} 110^{UJ}
Antimony	U F	1.7^{U}/1.7^{U} 1.7^{U}/1.7^{U}	1.7^{U} 1.7^{U}	**2.3^{L}** 1.7^{U}	1.7^{U} 1.7^{U}
Barium	U F	**99/111** 14.0^{U}/14.0^{U}	**19.8** 14.0^{U}	**57.8** **38.3**	**69.9** **85.3**
Beryllium	U F	0.9^{U}/**1.1** 0.9^{U}/0.9^{U}	0.9^{U} 0.9^{U}	0.9^{J} 0.9^{J}	0.9^{U} 0.9^{U}
Calcium	U F	**2000^{K}/2070^{K}** **1100^{K}/1070^{K}**	**2150^{K}** **2460^{K}**	**5980^{K}** **5870^{K}**	**39500** **48000**
Cobalt	U F	**26.6/26.9** 14.0^{U}/14.0^{U}	14.0^{U} 14.0^{U}	14.0^{U} 14.0^{U}	14.0^{U} 14.0^{U}
Copper	U F	**55.5/55.8** **18.0**/15.0^{U}	15.0^{UL} 15.0^{UL}	**20.8** 15.0^{U}	15.0^{UL} 15.0^{UL}
Iron	U F	**42000^{K}/52000^{K}** **564^{K}/987^{K}**	**3010^{K}** **395^{K}**	**8520^{K}** **2970^{K}**	**619** 47.0^{U}
Lead	U F	**57.3^{K}/57.6^{K}** **0.72^{K}/4.2^{K}**	**3.5^{J}** 0.60^{UJ}	**17.6^{K}** 0.60^{U}	**0.94^{K}** 0.60^{J}

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TABLE 7-4 (Continued)
CONTAMINANT OCCURRENCE AND DISTRIBUTION
AREA 8 - SURFACE WATER SAMPLES
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Parameter[1]		S25-SW001[2]	S25-SW002	S25-SW003	S25-SW004
		Water-Shot Location 7B	Water-Shot Location 23B	Chicamuxen Creek near Water-Shot 7A	Chicamuxen Creek Upstream of Area 8
Magnesium	U F	**2040^{K}/2100^{K}** **744^{K}/770^{K}**	**1130^{K}** **1170^{K}**	**4620^{K}** **4690^{K}**	**43900** **51100**
Manganese	U F	**1200/1230** **612/640**	**183** **199**	**61.6** **62.9**	**37.7** **24.7**
Mercury	U F	**0.29/0.23** **0.16**/0.10^{U}	0.10^{U} 0.10^{U}	**0.12** 0.10^{U}	0.10^{U} 0.10^{U}
Nickel	U F	**18.0^{J}**/17.0^{UJ} 17.0^{UJ}/17.0^{UJ}	17.0^{UJ} 17.0^{UJ}	17.0^{UJ} 17.0^{UJ}	17.0^{UJ} 17.0^{UJ}
Potassium	U F	**5500/6010** **4530/4980**	**1560** **1590**	**2450** **2380**	**16200** **18300**
Sodium	U F	**1040/1150** **1250/1300**	**3520** **4160**	**32200** **36100**	**353000** **368000**
Total Cyanide		**470/442**	**56.0**	**8.0**	5.0^{U}
INDICATOR PARAMETERS (mg/L)					
Ammonia (mg/L)		**9.3/9.3**	**0.60^{J}**	**0.26**	**0.67**
Nitrate+Nitrite (mg/L)		**0.05^{L}/0.07^{L}**	0.05^{U}	0.05^{UL}	0.05^{U}
Sulfate (mg/L)		25.0^{U}/25.0^{U}	1.0^{UL}	**6.8**	**98.7**
Total Kjeldahl Nitrogen (mg/L)		**10.4/11.1**	**1.5^{J}**	**2.6**	**0.74**
Total Organic Carbon (mg/L)		**29.5^{L}/30.1^{L}**	**4.0**	**16.0^{L}**	**2.3^{L}**
Total Organic Halides (μg/L)		**39.8^{L}/42.4^{L}**	10.0^{UR}	**29.3^{L}**	**42.2^{L}**
Total Phosphorus (mg/L)		**0.78/0.81**	**0.08**	**0.21**	**0.09**

NOTE: All positive detections have been bolded.

1 U - Unfiltered
F - Filtered

2 Duplicate samples taken from this location.

TABLE 7-4 (Continued)
CONTAMINANT OCCURRENCE AND DISTRIBUTION
AREA 8 - SURFACE WATER SAMPLES
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

B	Positive result qualified as a result of method or field quality control blank contamination. Compound is not considered to be present in sample.
J	Positive detection is qualified as an estimate.
K	Positive detection is qualified as biased high.
L	Positive result is qualified as biased low
U	Analyte not detected. Reported result is the detection limit.
UJ	Analyte not detected. Reported result is the estimated detection limit
UL	Nondetect of analyte considered biased low.
UR	Nondetect of analyte considered unreliable.

TABLE 7-5

CONTAMINANT OCCURRENCE AND DISTRIBUTION
AREA 8 - SEDIMENT SAMPLES
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Parameter	S25-SD001[1]	S25-SD002	S25-SD003	S25-SD004
	Water-Shot Location 7B	Water-Shot Location 23B	Chicamuxen Creek Adjacent to Water-Shot 7B	Upstream Chicamuxen Creek
VOLATILE ORGANICS				
NOT DETECTED				
SEMIVOLATILE ORGANICS (μg/kg)				
Benzo(a)pyrene	$18.6^{UJ}/19.0^{UJ}$	18.3^{UJ}	170	20.4^{UJ}
Bis(2-ethylhexyl)phthalate	$73.8^{J}/82.0^{UJ}$	78.7^{UJ}	80.7^{UJ}	87.8^{UJ}
Naphthalene	$80.7^{J}/85.9^{J}$	37.2^{UJ}	38.1^{UJ}	41.5^{UJ}
Phenanthrene	$50.5^{J}/56.8^{J}$	45.5^{UJ}	46.6^{UJ}	50.7^{UJ}
ENERGETICS				
NOT DETECTED				
INORGANICS (mg/kg)				
Aluminum	$6930^{J}/4960^{J}$	8530	5070^{J}	4230^{J}
Antimony	$0.21^{UL}/0.39^{L}$	0.21^{UL}	0.21^{UL}	0.23^{UL}
Arsenic	$2.3^{L}/5.5^{L}$	3.2^{L}	1.8^{L}	1.6
Barium	31.2/26.2	51.8	37.9	18.6
Beryllium	0.23/0.26	0.32	0.29	0.21
Calcium	$124^{B}/121^{B}$	269^{K}	106^{B}	432^{J}
Chromium	10.3/9.0	13.2	6.9	26.8
Cobalt	4.3/4.2	7.0	3.4	1.9^{U}
Copper	16.8/44.6	7.3	3.0	2.0^{UL}
Iron	$14200^{J}/12000^{J}$	16000	4830^{J}	8120
Lead	$12.9^{J}/15.2^{J}$	9.6^{J}	7.9^{J}	6.0
Magnesium	$374^{J}/288^{J}$	519^{K}	294^{J}	562^{J}

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TABLE 7-5 (Continued)
CONTAMINANT OCCURRENCE AND DISTRIBUTION
AREA 8 - SEDIMENT SAMPLES
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Parameter	S25-SD001[†]	S25-SD002	S25-SD003	S25-SD004
	Water-Shot Location 7B	Water-Shot Location 23B	Chicamuxen Creek Adjacent to Water-Shot 7B	Upstream Chicamuxen Creek
Manganese	**129^{J}/104^{J}**	**132**	**17.9^{J}**	**33.5^{J}**
Mercury	**0.16/0.21**	**0.19^{L}**	0.06^{U}	0.06^{B}
Nickel	**5.1^{J}/3.4^{J}**	**4.9^{J}**	**5.2^{J}**	**4.3^{J}**
Potassium	**400/363**	**768**	**277**	**505**
Silver	0.12^{U}/**0.39**	0.12^{U}	0.12^{U}	0.13^{U}
Sodium	22.2^{U}/22.9^{U}	**29.0**	22.5^{U}	**171**
Vanadium	**20.6/15.2**	**21.2**	10.3^{B}	**10.8**
Zinc	**19.2^{J}/18^{J}**	**21.8**	**10.7^{J}**	**7.1**
Total Cyanide	**32.2**/1.3^{U}	**3.1**	**23.5**	1.4^{U}
INDICATOR PARAMETERS				
Ammonia (mg/kg)	**128/193**	**29.1^{L}**	**109**	**102**
Nitrate+Nitrite (mg/kg)	**2.4^{L}**/2.0^{UL}	0.92^{UJ}	2.7^{UJ}	3.3^{U}
Percent Solids (%)	**80.9/78.6**	**81.7**	**80.1**	**73.7**
Total Organic Carbon (mg/kg)	**3580/3410**	**1350**	**4130**	**1920**

NOTE: **All positive detections have been bolded.**

† Duplicate samples taken from this location.

B Positive result qualified as a result of method or field quality control blank contamination. Compound is not considered to be present in sample.
J Positive detection is qualified as an estimate.
K Positive detection is qualified as biased high
L Positive result is qualified as biased low
U Analyte not detected. Reported result is the detection limit
UJ Analyte not detected. Reported result is the estimated detection limit
UL Nondetect of analyte considered biased low.

TABLE 7-6

AREA 8 SOIL - QUALITATIVE RISK ASSESSMENT
VERIFICATION INVESTIGATION
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Chemical (a)	Frequency of Detection (b)	Range of Detection (mg/kg)	Location of Maximum	Risk-Based Action Levels (mg/kg) (c)				Background Concentration (S25-MW03-001/002) (mg/kg)	Maryland Background Concentration (d) (mg/kg)
				Soil Ingestion		Soil Screening Levels			
				Industrial	Residential	Air	Groundwater		
Volatile Organics									
Acetone	2/6	0.0055 - 0.012	25-MW01-02d	200000	7800	62000	8	NA	NA
Carbon disulfide	1/6	0.0026	S25-MW01-02	200000	7800	11	14	NA	NA
Chloroform	2/6	.0012 - 0.003	S25-MW01-02	940	100	0.2	0.3	NA	NA
Methylene chloride	1/6	0.005	S25-SB01-002	760	85	7	0.01	NA	NA
Trichloroethene	1/6	0.0019	S25-SB01-002	520	58	3	0.02	NA	NA
Xylene	1/6	0.0021	S25-SB02-002	1000000	160000	320	74	NA	NA
Inorganics									
Aluminum	13/13	1780 - 8340	S25-SB01-002	1000000	78000	NA	NA	4010/3070	<20000
Antimony	1/13	0.51	S25-SB01-001	820	31	NA	NA	ND	<1
Arsenic	13/13	0.67 - 12.4	S25-SB03-001	3.8	0.43	380	15	2.2/3.7	2-6
Barium	13/13	9.1 - 55.0	S25-SB01-002	140000	5500	350000	32	29.8/9.1	300
Beryllium	11/13	0.14 - 0.84	S25-SB01-002	1.3	0.15	690	180	0.20/0.14	<1
Cadmium	2/13	0.56 - 0.61	S25-SB03-002	1000	39	920	6	ND	ND
Calcium	5/13	30.5 - 303	S25-SB01-002	NA	NA	NA	NA	ND	<2300
Chromium	13/13	4.5 - 18.4	S25-SB01-002	1000000 (III) 10000 (VI)	78000 (III) 390 (VI)	140 (VI)	19 (VI)	10.5/8.5	<20
Cobalt	12/13	1.5 - 21.2	S25-SB01-002	120000	4700	NA	NA	3.5/3.3	<3
Copper	7/13	2.1 - 20.0	S25-SB01-002	82000	3100	NA	NA	2.5/ND	<10
Iron	13/13	2300 - 34900	S25-SB01-002	NA	NA	NA	NA	7930/10200	<10000
Lead	13/13	1.9 - 10.0	25-MW03-00	NA	NA	NA	NA	10.0/3.1	15
Magnesium	13/13	63.1 - 1540	S25-SB01-002	NA	NA	NA	NA	236/215	1500

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TABLE 7-6 (Continued)
AREA 8 SOIL - QUALITATIVE RISK ASSESSMENT
VERIFICATION INVESTIGATION
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Chemical (a)	Frequency of Detection (b)	Range of Detection (mg/kg)	Location of Maximum	Risk-Based Action Levels (mg/kg) (c)				Background Concentration (S25-MW03-001/002) (mg/kg)	Maryland Background Concentration (d) (mg/kg)
				Soil Ingestion		Soil Screening Levels			
				Industrial	Residential	Air	Groundwater		
Inorganics (Continued)									
Manganese	13/13	9.5 - 171	S25-SB02-001	10000	390	NA	NA	123/50.1	<150
Nickel	6/13	2.3 - 25.4	S25-SB01-002	41000	1600	6900	21	2.3/3.3	<5
Potassium	13/13	153 - 761	S25-SB01-002	NA	NA	NA	NA	221/250	<11000
Selenium	1/13	0.17	25-MW03-00	10000	390	NA	3	0.17/ND	0.3
Sodium	1/13	26.2	S25-SB01-002	NA	NA	NA	NA	ND	5000
Vanadium	12/13	5.5 - 34.3	S25-SB01-002	14000	550	NA	NA	9.8/9.8	<20
Zinc	11/13	8.4 - 92.1	S25-SB01-002	610000	23000	NA	42000	11.4/11.3	<28
Total Cyanide	2/13	1.1 - 1.5	25-MW02-00	41000	1600	NA	NA	ND	NA
Indicator Parameters									
Ammonia	10/13	7.8 - 55.5	25-MW02-00	NA	NA	NA	NA	21.9/7.8	NA
Nitrate + Nitrite	1/13	1.9	25-MW03-00	1E6/2E5	13000/7800	NA	NA	1.9/ND	NA
Total Organic Carbon	12/13	682 - 5250	S25-SB01-001	NA	NA	NA	NA	1620/ND	NA

NA - Not Available.

ND - Not Detected.

(a) Chemical name displayed in bold font exceeds action level.

(b) Samples S25-SB01-002, S25-SB02-002, S25-SB03-002, S25-MW01-02, S25-MW01-02dup, and S25-MW02-002 were utilized for the statistical evaluation of volatile organic compounds, inorganics, and indicator parameters. Samples S25-SB01-001, S25-SB02-001, S25-SB03-001, S25-MW01-01, S25-MW01-01dup, S25-MW-02-001, S25-MW03-001, and S25-MW03-002 were utilized for the statistical evaluation of inorganic and indicator parameters.

(c) Source: Risk-Based Concentration Table, July - December, 1995, USEPA, October 20, 1995.

(d) Source: Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States, USGS Professional Paper 1270, 1984. Data for Maryland utilized.

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TABLE 7-7

AREA 8 GROUNDWATER - QUALITATIVE RISK ASSESSMENT
VERIFICATION INVESTIGATION
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Chemical (a)	Frequency of Detection (b)	Range of Detection (ug/L)	Location of Maximum	Risk-Based Action Level for Tap Water (c) (ug/L)	Federal Maximum Contaminant Level (MCL) (d) (ug/L)	Maryland State Drinking Water Standard (d) (ug/L)	USEPA Health Advisories (d) (ug/L)	Background Concentration (25MW03) (ug/L)
Volatile Organics								
Chloroform	3/3	1.6-2.7	25MW02	0.15	100/80 (THM)	100 (THM)	100	2.6
Semivolatile Organics								
Bis(2-ethylhexyl)phthalate	1/3	3.3	25MW03	4.8	6	6	NA	3.3
Inorganics								
Aluminum unfiltered	3/3	1300 - 73400	25MW03	37000	50 TO 200	NA	NA	73400
Arsenic unfiltered	1/3	2.2	25MW03	0.038	50	50	NA	2.2
Barium unfiltered (filtered)	3/3 (3/3)	67.8 - 688 (16.0 - 51.2)	25MW03 (25MW03)	2600	2000	2000	2000	688 (51.2)
Beryllium unfiltered	2/3	1.0 - 11.0	25MW03	0.016	4	4	4000	11
Cadmium unfiltered	1/3	6.4	25MW03	18	5	5	5	6.4
Calcium unfiltered (filtered)	3/3 (3/3)	3080 - 40300 (2000 - 9650)	25MW03 (25MW03)	NA	NA	NA	NA	40300 (9650)
Chromium unfiltered	2/3	40.4 - 191	25MW03	37000 (III) 180 (VI)	100	100	100	191
Cobalt unfiltered	1/3	169	25MW03	2200	NA	NA	NA	169
Copper unfiltered	2/3	28.4 - 166	25MW03	1500	1300 (e)	NA	NA	166
Iron unfiltered (filtered)	3/3 (2/3)	3710 - 252000 (758 - 938)	25MW03 (25MW01)	11000	300	NA	NA	252000 (ND)
Lead unfiltered	2/3	11.9 - 51	25MW03	NA	15(e)	NA	NA	51
Magnesium unfiltered (filtered)	3/3 (3/3)	1170 - 16800 (538 - 3610)	25MW03 (25MW03)	NA	NA	NA	NA	16800 (3610)
Manganese unfiltered (filtered)	3/3 (3/3)	120 - 2290 (113 - 288)	25MW03 (25MW03)	180	50	NA	NA	2290 (288)

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TABLE 7-7 (Continued)
AREA 8 GROUNDWATER - QUALITATIVE RISK ASSESSMENT
VERIFICATION INVESTIGATION
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Chemical (a)	Frequency of Detection (b)	Range of Detection (ug/L)	Location of Maximum	Risk-Based Action Level for Tap Water (c) (ug/L)	Federal Maximum Contaminant Level (MCL) (d) (ug/L)	Maryland State Drinking Water Standard (d) (ug/L)	USEPA Health Advisories (d) (ug/L)	Background Concentration (25MW03) (ug/L)
Inorganics (Continued)								
Nickel unfiltered	1/3	166	25MW03	730	100	100	100	166
Potassium unfiltered (filtered)	3/3 (3/3)	2010 - 8430 (1590 - 4090)	25MW03 (25MW01)	NA	NA	NA	NA	8430 (3440)
Sodium unfiltered (filtered)	3/3 (3/3)	6810 - 14000 (8790 - 14300)	25MW02 (25MW02)	NA	NA	NA	NA	8840 (8790)
Vanadium unfiltered	2/3	54.6 - 281	25MW03	260	NA	NA	NA	281
Zinc unfiltered	1/3	483	25MW03	11000	5000	NA	2000	483
Indicator Parameters								
Ammonia	3/3	310 - 420	25MW02	1000	NA	NA	30000	410
Sulfate	3/3	1600 - 14800	25MW02	NA	500000	NA	NA	8000
TKN	3/3	340 - 550	25MW02	NA	NA	NA	NA	430
TOX	2/3	13.6 - 24.6	25MW02	NA	NA	NA	NA	13.6
Total Phosphorus	3/3	170 - 1500	25MW03	NA	NA	NA	NA	1500

NA - Not Available.

ND - Not Detected.

(a) Chemicals displayed in bold font exceed action levels.

(b) Samples 25MW01, 25MW02, and 25MW03 were utilized in this statistical evaluation.

(c) Source: Risk-Based Concentration Table, July - December, 1995, USEPA, October 20, 1995.

(d) Taken from Table 2-3, Standards and Criteria for Chemicals of Concern.

(e) The actual MCLs for these compounds are treatment techniques, the values displayed are action levels.

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TABLE 7-8

AREA 8 SURFACE WATER QUALITATIVE RISK ASSESSMENT
VERIFICATION INVESTIGATION
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Chemical (a)	Frequency of Detection (b)	Range of Detection (ug/L)	Location of Maximum	Risk Based Action Level for Tap Water (c) (ug/L)	Federal Ambient (d) Water Quality Criteria (ug/L)		Maryland State (d) Surface Water Standards (ug/L)		Background Concentration (S25-SW004) (ug/L)
					Protection of Freshwater Aquatic Life	Consumption of Aquatic Life Only	Protection of Freshwater Aquatic Life	Consumption of Aquatic Life Only	
Semivolatile Organics									
Bis(2-ethylhexyl)phthalate	2/5	1.1 - 10.5	S25-SW001dup	4.8	3	12000	NA	NA	1.1
Energetics									
4-Amino-2,6-dinitrotoluene	3/5	1.9 - 17.6	S25-SW002	NA	NA	NA	NA	NA	ND
Inorganics									
Aluminum, unfiltered (filtered)	4/5 (3/5)	1200 - 23000 (207 - 577)	S25-SW001dup (S25-SW001)	37000	NA	NA	NA	NA	ND (ND)
Antimony, unfiltered	1/5	2.3	S25-SW003	15	1600	4300	NA	NA	ND
Barium unfiltered (filtered)	5/5 (2/5)	19.8 - 111 (38.3 - 85.3)	S25-SW001dup (S25-SW004)	2600	NA	NA	NA	NA	69.9 (85.3)
Beryllium unfiltered	1/5	1.1	S25-SW001dup	0.016	5.3	0.13	NA	NA	ND
Calcium unfiltered (filtered)	5/5 (5/5)	2000 - 39500 (1070 - 48000)	S25-SW004 (S25-SW004)	NA	NA	NA	NA	NA	39500 (48000)
Cobalt unfiltered	2/5	26.6 - 26.9	S25-SW001dup	2200	NA	NA	NA	NA	ND
Copper unfiltered (filtered)	3/5 (1/5)	20.5 - 55.8 (18)	S25-SW001dup (S25-SW001)	1500	12	NA	12	NA	ND (ND)
Iron unfiltered (filtered)	5/5 (4/5)	619 - 52000 (395 - 2870)	S25-SW001dup (S25-SW003)	11000	1000	NA	NA	NA	619 (ND)
Lead unfiltered (filtered)	5/5 (2/5)	0.94 - 57.6 (0.72 - 4.2)	S25-SW001dup (S25-SW001dup)	NA	3.2	NA	3.2	NA	0.94 (ND)
Magnesium unfiltered (filtered)	5/5 (5/5)	1130 - 43900 (744 - 51100)	S25-SW004 (S25-SW004)	NA	NA	NA	NA	NA	43900 (51100)
Manganese unfiltered (filtered)	5/5 (5/5)	37.7 - 1230 (24.7 - 640)	S25-SW001dup (S25-SW001dup)	180	NA	NA	NA	NA	37.7 (74.7)

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TABLE 7-8 (Continued)
AREA 8 SURFACE WATER QUALITATIVE RISK ASSESSMENT
VERIFICATION INVESTIGATION
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Chemical (a)	Frequency of Detection (b)	Range of Detection (ug/L)	Location of Maximum	Risk-Based Action Level for Tap Water (c) (ug/L)	Federal Ambient (d) Water Quality Criteria (ug/L)		Maryland State (d) Surface Water Standards (ug/L)		Background Concentration (S25-SW004) (ug/L)
					Protection of Freshwater Aquatic Life	Consumption of Aquatic Life Only	Protection of Freshwater Aquatic Life	Consumption of Aquatic Life Only	
Inorganics (Continued)									
Mercury unfiltered	3/5	0.12 - 0.29	S25-SW001	11	0.012	0.15	0.012	0.146	ND
(filtered)	(1/5)	(0.15)	(S25-SW001)						(ND)
Nickel unfiltered	1/5	18	S25-SW001	730	160	4600	160	100	ND
Potassium unfiltered	5/5	1580 - 16200	S25-SW004	NA	NA	NA	NA	NA	16200
(filtered)	(5/5)	(1590 - 18300)	(S25-SW004)						(18300)
Sodium unfiltered	5/5	1040 - 353000	S25-SW004	NA	NA	NA	NA	NA	353000
(filtered)	(5/5)	(1250 - 368000)	(S25-SW004)						(368000)
Total Cyanide	4/5	8.0 - 470	S25-SW001	730	5.2	NA	5.2	NA	ND
Indicator Parameters									
Ammonia	5/5	200 - 9300	S25-SW001	1000	3.9	NA	NA	NA	670
Nitrate/Nitrite	2/5	50 - 70	S25-SW001dup	58000/3700	NA	NA	NA	NA	ND
Sulfate	2/5	6800 - 98700	S25-SW004	NA	NA	NA	NA	NA	98700
TKN	5/5	740 - 11100	S25-SW001dup	NA	NA	NA	NA	NA	740
TOC	5/5	2300 - 30100	S25-SW001dup	NA	NA	NA	NA	NA	2300
TOX	4/5	29.3 - 42.4	S25-SW001dup	NA	NA	NA	NA	NA	42.2
Total Phosphorus	5/5	80 - 780	S25-SW001	NA	NA	NA	NA	NA	90

NA - Not Available.

ND - Not Detected

(a) Chemical names displayed in bold font exceed action levels.

(b) Samples S25-SW001, S25-SW001dup, S25-SW002, S25-SW003, and S25-SW004 were utilized in this statistical evaluation.

(c) Source: Risk-Based Concentration Table, July - December, 1995, USEPA, October 20, 1995.

(d) Taken from Table 2-3, Standards and Criteria for Chemicals of Concern.

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TABLE 7-9

AREA 8 SEDIMENT - QUALITATIVE RISK ASSESSMENT
VERIFICATION INVESTIGATION
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Chemical (a)	Frequency of Detection (b)	Range of Detection (mg/kg)	Location of Maximum	Risk-Based Action Level (mg/kg) for Soil Ingestion (c)		Background Concentration (S25-SD004) (mg/kg)
				Industrial	Residential	
Semivolatile Organics						
Benzo(a)pyrene	1/5	0.17	S25-SD003	0.78	**0.088**	ND
Bis(2-ethylhexyl)phthalate	1/5	0.0738	S25-SD001	410	46	ND
Naphthalene	2/5	0.0807 - 0.0859	S25-SD001dup	82000	3100	ND
Phenanthrene	2/5	0.0505 - 0.0568	S25-SD001dup	NA	NA	ND
Inorganics						
Aluminum	5/5	4230 - 8530	S25-SD002	1000000	78000	4230
Antimony	1/5	0.39	S25-SD001dup	820	31	ND
Arsenic	5/5	1.6 - 5.5	S25-SD001dup	**3.8**	**0.43**	1.6
Barium	5/5	18.6 - 51.8	S25-SD002	140000	5500	18.6
Beryllium	5/5	0.21 - 0.32	S25-SD002	1.3	0.16	0.21
Calcium	2/5	269 - 432	S25-SD004	NA	NA	432
Chromium	5/5	6.9 - 26.8	S25-SD004	1000000 (III) 10000 (VI)	78000 (III) 390 (VI)	26.8
Cobalt	4/5	3.4 - 7.0	S25-SD002	120000	4700	ND
Copper	4/5	3.0 - 44.6	S25-SD001dup	82000	3100	ND
Iron	5/5	4830 - 16000	S25-SD002	610000	23000	8120
Lead	5/5	6.0 - 15.2	S25-SD001dup	NA	NA	5
Magnesium	5/5	288 - 562	S25-SD004	NA	NA	562
Manganese	5/5	17.9 - 132	S25-SD002	10000	390	33.5
Mercury	3/5	0.16 - 0.21	S25-SD001dup	610	23	ND
Nickel	5/5	3.4 - 5.2	S25-SD003	41000	1600	4.3
Potassium	5/5	277 - 768	S25-SD002	NA	NA	505

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TABLE 7-9 (Continued)
AREA 8 SEDIMENT - QUALITATIVE RISK ASSESSMENT
VERIFICATION INVESTIGATION
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Chemical (a)	Frequency of Detection (b)	Range of Detection (mg/kg)	Location of Maximum	Risk-Based Action Level (mg/kg) for Soil Ingestion (c)		Background Concentration (S25-SD004) (mg/kg)
				Industrial	Residential	
Inorganics (Continued)						
Silver	1/5	0.39	S25-SD001dup	10000	390	ND
Sodium	2/5	29 - 171	S25-SD004	NA	NA	171
Vanadium	5/5	10.8 - 21.2	S25-SD002	14000	550	10.8
Zinc	5/5	7.1 - 21.8	S25-SD002	610000	23000	7.1
Total cyanide	3/5	3.1 - 32.2	S25-SD001	41000	1600	ND
Indicator Parameters						
Ammonia	5/5	29.1 - 193	S25-SD001dup	NA	NA	102
Nitrate + Nitrite	1/5	2.4	S25-SD001	1E6/2E5	13000/7800	ND
TOC	5/5	1350 - 4130	S25-SD003	NA	NA	1920

NA - Not Available.
ND - Not Detected.
(a) Chemical names displayed in bold font exceed action levels.
(b) Samples S25-SD001, S25-SD001dup, S25-SD002, S25-SD003, and S25-SD004 were utilized in this statistical evaluation.
(c) Source: Risk Based Concentration Table, July - December, 1995, USEPA, October 20, 1995.

TABLE 7-10

SUMMARY OF RISK ASSESSMENT RESULTS FOR AREA 8 ENVIRONMENTAL MEDIA
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Area of Concern	Media of Concern	Exposure Route	Hazard Index	Parameters with Hazard Index > 1	Cancer Risk Estimates	Parameters with Cancer Risk Estimates > 10^{-4}	Parameters with Cancer Risk Estimates > 10^{-5}
Area 8	Soil (Industrial Scenario)	Ingestion	7.27E-02	--	3.15E-6	--	--
		Dermal Contact	7.97E-02	--	4.53E-6	--	--
		Totals	1.52E-01	--	7.68E-6	--	--
	Soil (Residential Scenario)	Ingestion	1.90E+00	--	2.82E-5	--	Arsenic
		Dermal Contact	2.70E-01	--	1.25E-5	--	--
		Totals	2.17E+00	--	4.07E-5	--	--
Area 8	Sediment (Industrial Scenario)	Ingestion	8.61E-04	--	1.59E-7	--	--
		Dermal Contact	3.91E-05	--	5.65E-8	--	--
		Totals	9.00E-04	--	2.16E-7	--	--
Area 8	Surface water (Industrial Scenario)	Dermal Contact	4.92E-02 (2.44E-02)	--	7.64E-7 (6.60E-8)	--	--
		Totals	4.92E-02 (2.44E-02)	--	7.64E-7 (6.60E-8)	--	--

-- None found

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TABLE 7-11

ENVIRONMENTAL EFFECTS QUOTIENTS
AREA 8 GROUNDWATER
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Parameter	Maximum Concentration	Chronic Ambient Water Quality Criterion[1]	Environmental Effects Quotient
Volatile Organics (μg/L)			
Chloroform	2.7	1240	0.0022
Semivolatile Organics (μg/L)			
Bis-(2-ethylhexyl)phthalate	3.3	3	1.1
Inorganics (μg/L)			
Aluminum	73400[a] (U)	NA	NA
Arsenic	2.2 (U)	190[2]	0.01
Barium	688 (U)	NA	NA
Beryllium	11.0 (U)	5.3	2.1
Cadmium	6.4[L] (U)	1.1[2,4]	5.8
Calcium	40300 (U)	NA	NA
Chromium	191 (U)	11[2,3]	17.4
Cobalt	169 (U)	NA	NA
Copper	165[L] (U)	12[2,4]	13.6
Iron	252000 (U)	NA	NA
Lead	51.0 (U)	3.2[2,4]	15.9
Magnesium	16800 (U)	NA	NA
Manganese	2290 (U)	NA	NA
Nickel	166[K]	160	1.0
Potassium	8430 (U)	NA	NA
Sodium	14300 (F)	NA	NA
Vanadium	281 (U)	NA	NA

TABLE 7-11 (Continued)
ENVIRONMENTAL EFFECTS QUOTIENTS
AREA 8 GROUNDWATER
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Parameter	Maximum Concentration	Chronic Ambient Water Quality Criterion(1)	Environmental Effects Quotient
Zinc	483 (U)	110(3,4)	4.4
Ammonia (mg/L)	0.42	3.9	0.1

U - Unfiltered sample
F - Filtered sample
J Positive detection is qualified as an estimate.
K Positive detection is qualified as biased high.
L Positive detection is qualified as biased low.
(1) Unless otherwise noted, Lowest Observed Effect Levels (LOEL) obtained from Quality Criteria for Water, 1986, U.S. EPA, May 1986.
(2) Criterion for chromium based on hexavalent chromium. No chronic ambient water quality criterion for the protection of freshwater aquatic life established for total chromium.
(3) Criterion 6/15/90 table.
(4) Criterion is based on a total hardness of 100 mg/L.

TABLE 7-12

ENVIRONMENTAL EFFECTS QUOTIENTS
AREA 8 SURFACE WATER
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Parameter	Maximum Concentration	Chronic Ambient Water Quality Criterion[1]	Environmental Effects Quotient
Semivolatile Organics (μg/L)			
Bis-(2-ethylhexyl)phthalate	10.8[J]	3	3.6
ENERGETICS (μg/L)			
4-Amino-2,6-dinitrotoluene	1.9	NA	NA
Inorganics (μg/L)			
Aluminum	23000[J] (U)	NA	NA
Antimony	2.3[L] (U)	1600	0.0014
Barium	111 (U)	NA	NA
Beryllium	1.1 (U)	5.3	0.21
Calcium	48000 (U)	NA	NA
Cobalt	26.9 (U)	NA	NA
Copper	55.8 (U)	12[3,4]	4.7
Iron	52000[K] (U)	NA	NA
Lead	57.6[K] (U)	3.2[3,4]	18
Magnesium	51100 (F)	NA	NA
Manganese	1230 (U)	NA	NA
Mercury	0.29 (U)	0.012	24.2
Nickel	18.0[J] (U)	160	0.11
Potassium	18300 (F)	NA	NA
Sodium	368000 (F)	NA	NA
Total cyanide	470	5.2	90.4
Ammonia (mg/L)	9.3	3.9	2.4

TABLE 7-12 (Continued)
ENVIRONMENTAL EFFECTS QUOTIENTS
AREA 8 SURFACE WATER
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

U - Unfiltered sample
F - Filtered sample

J Positive detection is qualified as an estimate.
K Positive detection is qualified as biased high.
L Positive detection is qualified as biased low.
(1) Unless otherwise noted, Lowest Observed Effect Levels (LOEL) obtained from Quality Criteria for Water, 1986, U.S. EPA, May 1986.
(2) Criterion for chromium based on hexavalent chromium. No chronic ambient water quality criterion for the protection of freshwater aquatic life established for total chromium.
(3) Criterion 6/15/90 table.
(4) Criterion is based on a total hardness of 100 mg/L.

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TABLE 7-13

ENVIRONMENTAL EFFECTS QUOTIENTS
AREA 8 SEDIMENT
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

Parameter	Maximum Concentration	ERL/ERM[1]	Environmental Effects Quotient[2]
Semivolatile Organics (μg/kg)			
Benzo(a)pyrene	170	430/1600	0.40
Bis-(2-ethylhexyl)phthalate	73.8^J	NA	NA
Naphthalene	85.9^J	160/2100	0.54
Phenanthrene	56.8^J	240/1500	0.24
Inorganics (mg/kg)			
Aluminum	8530	NA	NA
Antimony	0.39^L	NA	NA
Arsenic	5.5^L	8.2/70	0.67
Barium	51.8	NA	NA
Beryllium	0.32	NA	NA
Calcium	432^J	NA	NA
Chromium	26.8	81/370	0.33
Cobalt	7.0	NA	NA
Copper	44.6	34/270	1.31
Iron	16000	NA	NA
Lead	15.2^J	46.7/218	0.33
Magnesium	582^J	NA	NA
Manganese	132	NA	NA
Mercury	0.21	0.15/0.71	1.4
Nickel	5.2^J	20.9/51.6	0.25
Potassium	768	NA	NA
Silver	0.39	1.0/3.7	0.39

**TABLE 7-13 (Continued)
ENVIRONMENTAL EFFECTS QUOTIENTS
AREA 8 SEDIMENT
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND**

Parameter	Maximum Concentration	ERL/ERM(1)	Environmental Effects Quotient(2)
Sodium	171	NA	NA
Vanadium	21.2	NA	NA
Zinc	21.8	150/410	0.15
Total cyanide	32.2	NA	NA
Ammonia (mg/L)	193	NA	NA

J Positive detection is qualified as an estimate.
L Positive detection is qualified as biased low.

(1) ERL (effects range-low) and ERM (effects range-median) sediment quality guidelines are from Long et al. Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments. Environmental Management 19: 81-97.
(2) Environmental effects quotients were calculating using the ERL guideline in the denominator.

TABLE 7-13 (Continued)
ENVIRONMENTAL EFFECTS QUOTIENTS
AREA 8 SEDIMENT
VERIFICATION INVESTIGATION REPORT
THE NAVAL SCHOOL, EXPLOSIVE ORDNANCE DISPOSAL
STUMP NECK ANNEX, INDIAN HEAD DIVISION
INDIAN HEAD, MARYLAND

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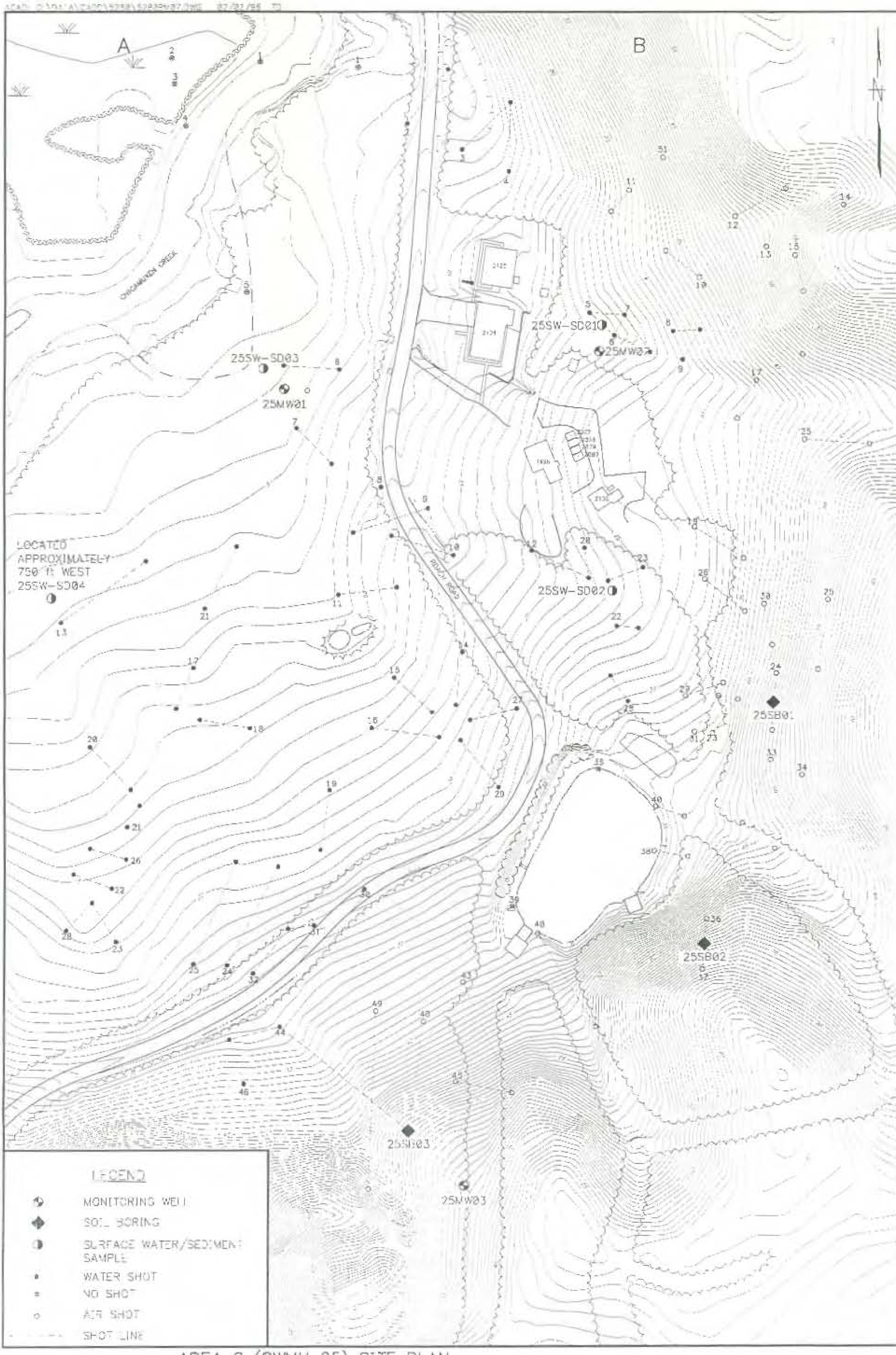
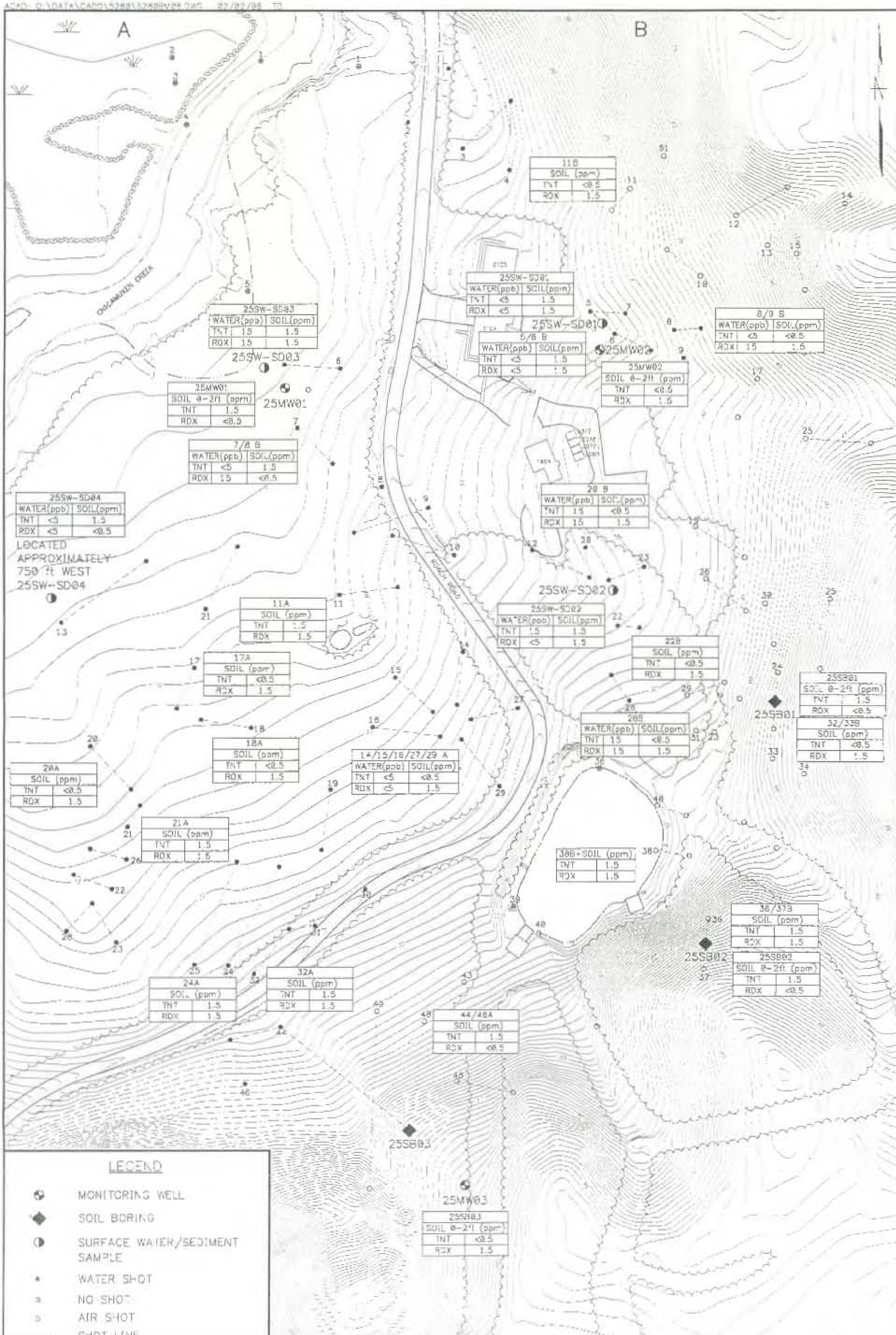


AREA 8 (SWMU 25) SITE PLAN
STUMP NECK ANNEX
NAVAL SURFACE WARFARE CENTER
INDIAN HEAD, MARYLAND

SCALE IN FEET

FIGURE 7-1

Brown & Root Environmental

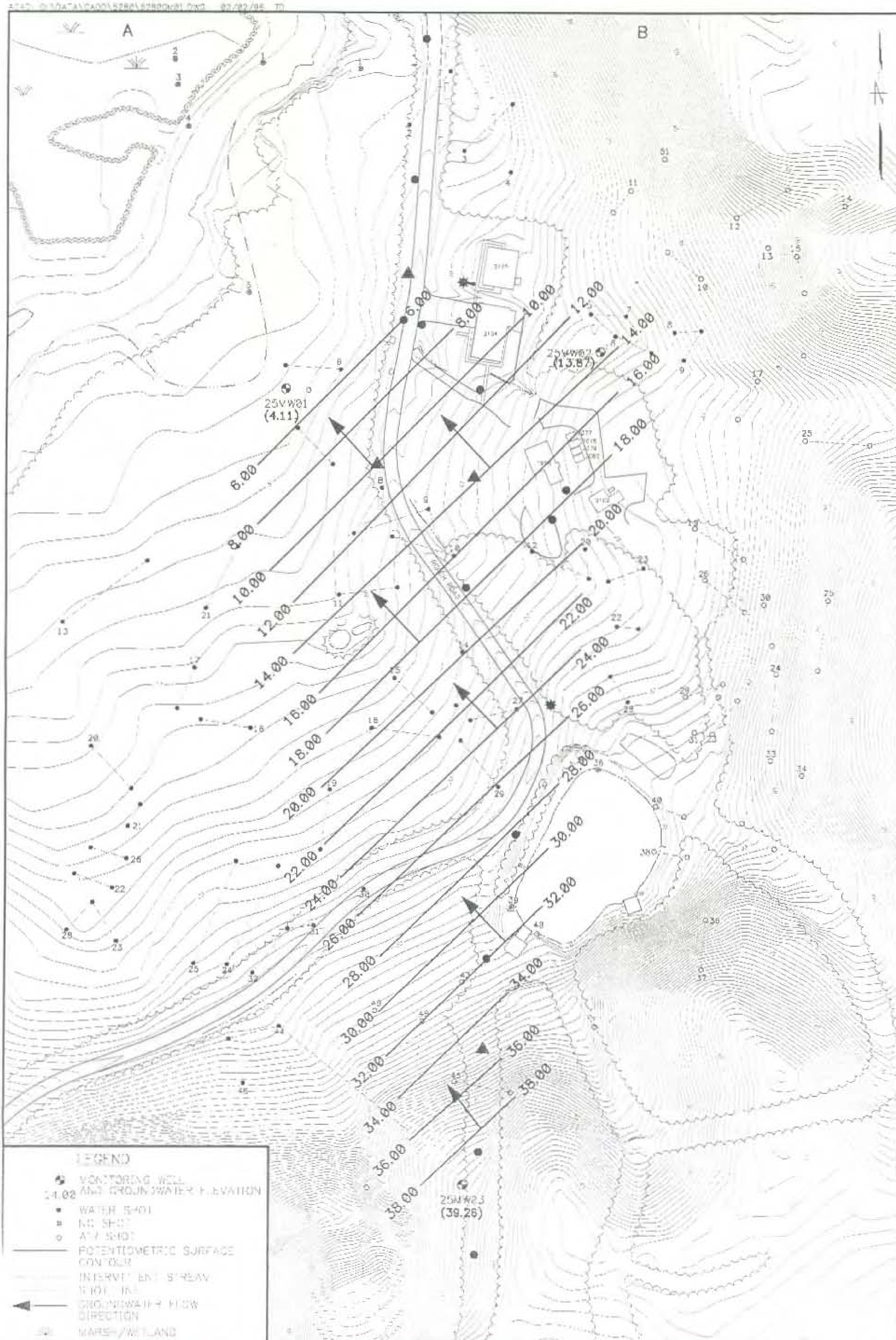


AREA 8 (SWMU 25) AIR SHOT/WATER SHOT
FIELD SCREENING RESULTS
STUMP NECK ANNEX – NAVAL SURFACE WARFARE CENTER
INDIAN HEAD, MARYLAND

SCALE IN FEET

FIGURE 7-7

Brown & Root Environmental



AREA 8 (SWMU 25) POTENTIOMETRIC SURFACE MAP
STUMP NECK ANNEX
NAVAL SURFACE WARFARE CENTER
INDIAN HEAD, MARYLAND

0 100 200
SCALE IN FEET

FIGURE 7-3

Brown & Root Environmental

APPENDIX A

QUESTIONNAIRE USED IN INTERVIEWS

IED - Incendiary Demonstration Area

IED - Incendiary Demonstration Area

Building 2090

Possible leach field outside Building 2118

IED - Detonation Demonstration Area

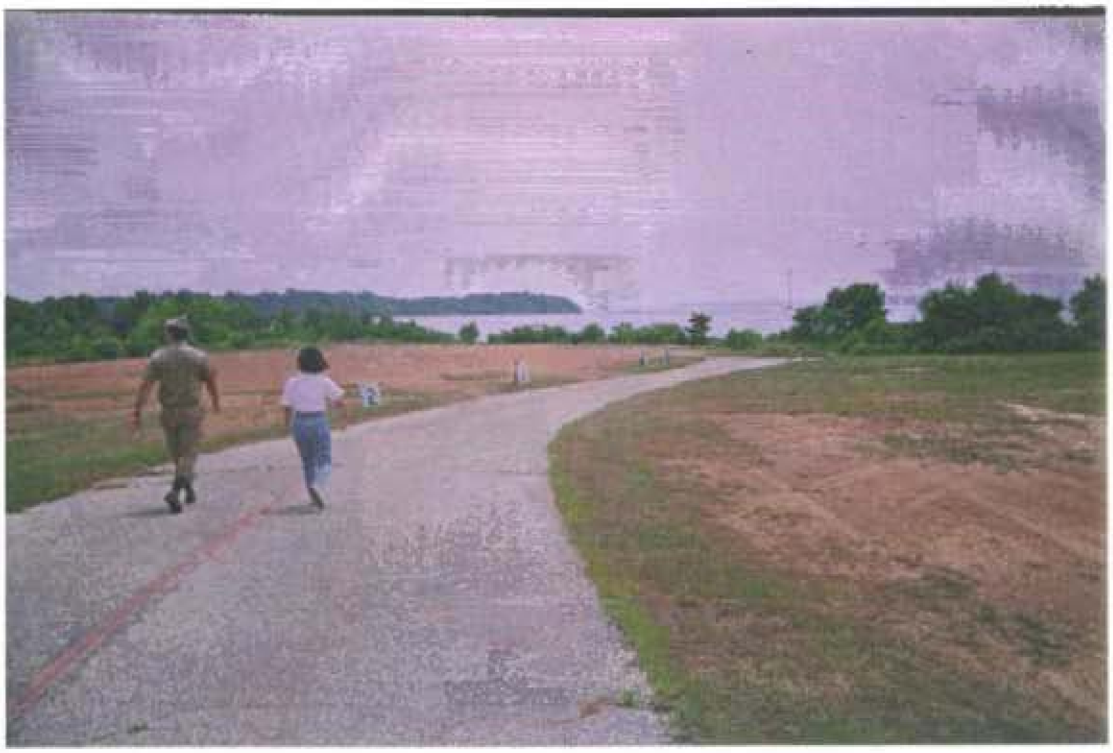
IED - Detonation Demostration Area

Range 6

Range 6

Range 6

Range 6



Range 6

Range 6

Range 6

Range 6

Range 6

APPENDIX B

LITERATURE ON FIELD TEST KIT

IMPORTANT

Read all instructions and handling procedures before using this kit. For assistance call the TECHNICAL SERVICE HOT LINE 1-800-222-0342.

INTENDED USE

The D TECH™ TNT/RDX Soil Extraction Pac is designed to extract TNT and RDX from soil samples. This extract is analyzed using the D TECH TNT Explosives Test Kit (Item #TK-1004-1), the D TECH TNT/RDX Screening Kit (Item #TK1001-1), or the D TECH RDX Explosives Test Kit (Item #TK-1005-1).

PRINCIPLE

Trinitrotoluene (TNT) and hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) are explosives commonly found in munitions. The presence of these compounds in soil is an indication of contamination from explosive waste residue. TNT and RDX physically bind to soil particles and must be extracted to be analyzed.

The D TECH TNT/RDX Soil Extraction Pac uses an organic solvent to extract these compounds for analysis. Following this step, the extracted compounds in the solvent are further prepared for analysis by an aqueous dilution. This enables the sample to be tested with the D TECH™ TNT Explosives Test Kit, (Item #TK-1004-1), the D TECH TNT/RDX Screening Kit (Item #TK1001-1), or the D TECH RDX Explosives Test Kit (Item #TK-1005-1).

KIT DESCRIPTION

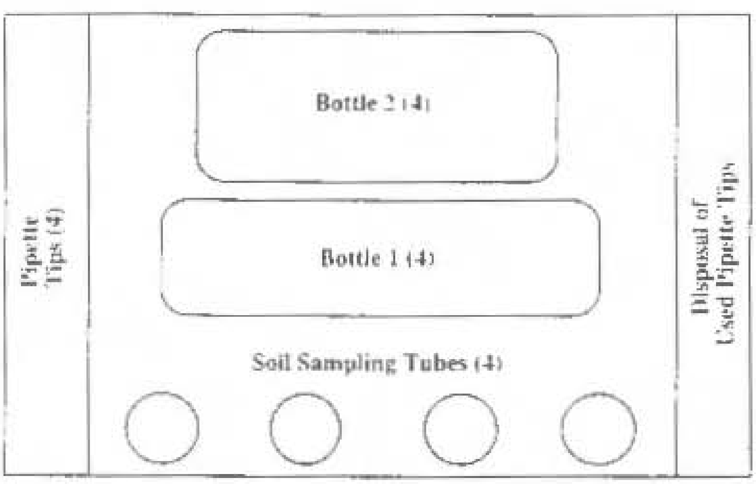
The D TECH TNT/RDX Soil Extraction Pac contains sufficient materials to perform four (4) sample extractions.

STORAGE AND STABILITY

This kit has excellent stability at room temperature and under refrigeration. For expiration dating under these conditions, see the package label.

MATERIALS PROVIDED

See tray diagram below. This diagram includes the D TECH TNT/RDX Soil Extraction Pac component names and quantity of each item.



Not shown in diagram

Used Kit Label (1)

Instruction Guide (1)

Red dot labels (4) for used Bottle 2 components.

HEALTH/SAFETY

Material Safety Data Sheets (MSDS) have been supplied with the purchase of this product. The MSDS should be read before using this test.
Included in this section, we have emphasized health and safety precautions that should be followed when handling these solutions.

PROTECT EYES WITH SAFETY GLASSES
PROTECT SKIN WITH PROTECTIVE GLOVES

Bottle 1 (50664) 100% ACETONE

Associated Hazards
Extremely Flammable Liquid and Vapor (NO SMOKING OR OPEN FLAME)
Harmful if Inhaled or Swallowed
Causes Eye Irritation

May cause damage to the central nervous system, liver, and kidneys. Chronic exposure during pregnancy may be harmful.

Symptoms of Exposure
High concentrations or prolonged exposure causes headache, dizziness, nausea, irritation of eyes and respiratory tract, narcosis and eventually unconsciousness.
Prolonged or repeated skin contact may cause irritation.

First Aid Measures
GET MEDICAL ASSISTANCE FOR ALL CASES OF OVEREXPOSURE

Skin:	Wash thoroughly with soap and water.
Eyes:	Immediately flush with water for at least 15 minutes.
Inhalation:	Remove to fresh air; give artificial respiration if breathing has stopped.
Ingestion:	If conscious, drink water and induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person.

Bottle 2 (50663) Buffer Solution

Associated Hazards
May be irritating to skin, eyes and mucous membranes.

Symptoms of Exposure
May be irritating on contact with skin, eyes or mucous membranes.

First Aid Measures
GET MEDICAL ASSISTANCE FOR ALL CASES OF OVEREXPOSURE

Skin:	Wash thoroughly with soap and water.
Eyes:	Immediately flush with water for at least 15 minutes.
Inhalation:	Remove to fresh air; give artificial respiration if breathing has stopped.
Ingestion:	Get immediate medical attention; if conscious, give water freely.

PERFORMANCE CHARACTERISTICS

INTERPRETATION OF THE TEST The results from the D TECH RDX Explosives Test Kit can be interpreted using either the **Color Card** supplied with the kit or *the* DTECHTOR and the table provided below. If the color of the test does not exactly match a panel of the color card, user interpretation is required.

the DTECHTOR Table

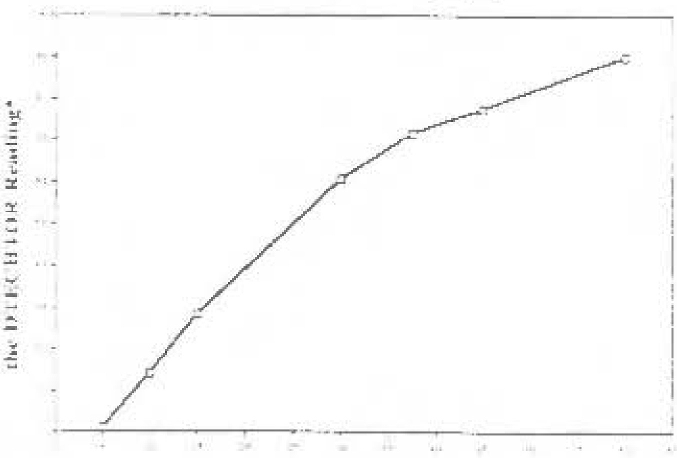
Sample	*the* DTECHTOR Reading	RDX Equivalents (ppb)
Water	LO	< 5
	1 - 30	5 - 15
	30 - 50	15 - 25
	50 - 80	25 - 45
	HI	> 45
		(ppm)
Soil	LO	< 0.5
	1 - 20	0.5 - 1.5
	20 - 45	1.5 - 2.5
	45 - 60	2.5 - 4.5
	60 - 80	4.6 - 6.0
	HI	> 6.0

SENSITIVITY The D TECH RDX Explosives Test Kit can be used to reliably measure RDX in the following ranges.

Sample	*the* DTECHTOR	Color Card
Water (ppb)	5 - 45	5 - 60
Soil (ppm)	0.5 - 6.0	0.5 - 6.0

The Minimum Detection Limit (MDL) of the test for RDX in a water sample is 5 ppb and in soil is 0.5 ppm. The graph below is a typical standard curve for the D TECH RDX Explosives Test Kit.

D TECH RDX Explosives Text Kit Standard Curve



RDX Concentration in Water (ppb)

*Percent Reflectance Relative to Reference

SPECIFICITY The D TECH RDX Explosives Test Kit has been tested for cross-reactivity with various explosives, including those found in EPA SW-846 Method 8330. The table below summarizes the cross-reactivity of these compounds in water samples using *the* DTECHTOR. A positive test result may be due to the presence of RDX, HMX or a mixture of these compounds (RDX Equivalents). Samples testing positive for RDX should be confirmed by standard methods. The D TECH RDX Explosives Test Kit has been designed to minimize the effect of environmental interferences. Sample pH, nitrate, nitrite and ammonium do not effect test results.

Compound	IC_{50}[a] (ppb)	MDL[b] (ppb)	Cross-reactivity[c]
RDX[d]	21	5	+
HMX[d]	>500	150	+
TNT[d]	>500	>500	-
Tetryl[d]	>500	>500	-
1,3,5-Trinitrobenzene	>500	>500	-
2-amino-4,6-dinitrotoluene	>500	>500	-
4-amino-2,6-dinitrotoluene	>500	>500	-
2,4-dinitrotoluene	>500	>500	-
2,6-diaminonitrotoluene	>500	>500	-
1,3-dinitrobenzene	>500	>500	-
Nitrobenzene	>500	>500	-
2-nitrotoluene	>500	>500	-
3-nitrotoluene	>500	>500	-
4-nitrotoluene	>500	>500	-
Nitroglycerin	>500	>500	-
PETN[d]	>500	>500	-

a The IC_{50} is defined as the concentration of compound required to produce a test response equivalent to 50% of the maximum response.

b The Minimum Detection Limit (MDL) is defined as the lowest concentration of compound that yields a positive test result.

c A compound is considered cross-reactive when a concentration 100 times the MDL of RDX (5 ppb) yields a positive test result.

d Chemical Names: RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine), HMX (octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine), TNT (trinitrotoluene) Tetryl (methyl-2,4,6-(trinitrophenyl)nitramine), PETN (pentaerythritol tetranitrate)

TESTING HIGHER RDX CONCENTRATIONS

RDX concentrations greater than the upper limit of the test may be determined by diluting the extract with acetone. For example, an extract from a 100 ppm soil sample, processed using the D TECH TNT/RDX Soil Extraction Pac, may be diluted 1:25 in acetone and run in the D TECH RDX Explosives Test Kit. The concentration of the undiluted sample (100 ppm) is determined by multiplying the RDX concentration of the diluted sample (4.0 ppm) by the dilution factor (25). For further information, please call our technical service hot line 1-800-222-0342.

HEALTH/SAFETY

Material Safety Data Sheets (MSDS) have been supplied with the purchase of this product. The MSDS should be read before using this test. During the execution of the test, any excess RDX is absorbed into the **Cup Assembly** absorbant plug. It is not retained on the surface of the **Cup Assembly**.
When all kit components have been used, apply the warning label to seal the box and set it aside for proper disposal. In this section, we have emphasized health and safety precautions that should be followed when handling these solutions.

PROTECT EYES WITH SAFETY GLASSES
PROTECT SKIN WITH PROTECTIVE GLOVES

Associated Hazards
May be irritating to skin, eyes, and mucous membranes.

Symptoms of Exposure
May be irritating on contact with skin, eyes, and mucous membranes.

First Aid Measures
GET MEDICAL ASSISTANCE FOR ALL CASES OF OVEREXPOSURE

Skin:	Wash thoroughly with soap and water.
Eyes:	Immediately flush with water for at least 15 minutes.
Inhalation:	Remove to fresh air; give artificial respiration if breathing has stopped.
Ingestion:	Get immediate medical attention; if conscious, give water freely.

QUALITY CONTROL

All D TECH Test Kits are thoroughly quality controlled and manufactured at Strategic Diagnostics Incorporated's GMP facility. All products undergo extensive validation and field testing to assure accuracy and reliability. All lots of product are thoroughly quality controlled to consistently meet the published specification.

EM SCIENCE/Strategic Diagnostics Inc.
480 Democrat Road
P.O. Box 70
Gibbstown, N.J. 08027
(800) 222-0342

D TECH™ RDX Explosives Field Test Kit

EPA SW-846 Method 4051 (RDX)

D TECH RDX TEST KIT FEATURES

Sensitive
- 5 ppb RDX in water
- 0.5 ppm RDX in soil

Field Tested
- Results correlated to SW-846 Method 8330
- Designed for on-site conditions

Fast
- Provides test results for water or soil samples in less than 20 minutes

Easy-to-use
- Requires no special training

Convenient
- Basic kit includes all necessary materials for water samples; soil samples require D TECH TNT/RDX Soil Extraction Pac (TK-100IS-1)
- Kit package is designed for use as on-site workstation
- *the* DTECHTOR meter (TK-100IM-1) is sold separately for semiquantitative results

D TECH TNT/RDX SOIL EXTRACTION PAC

Fast
- Extracts RDX and TNT from soil samples in five minutes

Easy-to-use
- Only six easy steps

Performance
- Extraction efficiency >95%

RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine) along with TNT (2,4,6-trinitrotoluene) are the major components of many military munitions. Their long-term stability, widespread use, and rapid migration characteristics make these compounds (and associated degradation products) a serious contamination issue for both soil and groundwater. Contamination from these compounds is common at or near military installations, munitions manufacturing, depot, destruction (disposal) facilities, and ballistic test ranges.

Testing water and soil samples for RDX has never been easier or faster. Use the D TECH RDX Explosives Field Test Kit to identify hot spots, map sites, monitor remediation, determine risk, and select field samples for laboratory analysis. The D TECH RDX test kit gives you results in less than 20 minutes to help you make on-the-spot decisions in the field.

The D TECH RDX test kit has been extensively field tested to maximize its performance and convenience for on-site applications. The field trial data demonstrate correlation of field results with SW-846 Method 8330 for RDX analysis.*

General Description

The basic D TECH RDX kit contains all the necessary materials to test four (4) water samples. Soil samples require prior extraction using the D TECH TNT/RDX Soil Extraction Pac. Extraction takes less than five minutes, and multiple samples can be extracted simultaneously.

The D TECH test kit package is designed for use as an on-site workstation. Step-by-step instructions guide the user through the analysis procedure–previous laboratory or field testing experience is not required.

Methodology

The D TECH RDX test is based on an Enzyme Linked Immunosorbent Assay (ELISA). Immunoassay is a technology recognized by the EPA as a valuable field screening tool. For the D TECH RDX test, antibodies specific to RDX are linked to latex particles. RDX molecules present in the sample are captured by these latex particles and collected on the membrane surface of the collection device, then a color-developing solution is added. The presence (or absence) of RDX can then be quantitated with a hand-held DTECHTOR meter or, for quick screening, with the color comparison card supplied with the kit. The working range for the D TECH RDX kit is in parts per billion for RDX in water, and in parts per million for RDX in soil.

D TECH™

*For further technical information on field results, ask your EM Science representative.

Assay Range

	Water	Soil
RDX w. DTECHTOR	5-45 ppb	0.5-6.0 ppm
RDX w. Color Card	5-60 ppb	0.5-6.0 ppm

Upper limit of the test can easily be extended by simple dilution procedures

Method Correlation

Based on 262 field and laboratory samples, the D TECH RDX test kit with the DTECHTOR meter, correlates to the EPA SW-846 HPLC Method 8330. Correlation studies indicate that the methods agreed on the presence or absence of RDX in the samples in the detectable range of the kit. The false positive and false negative results are interpreted according to the recommended EPA definitions.

Correlated values	96%
False positives	4%
False negatives	<0.1%

(No false negatives recorded)

Specificity

The D TECH RDX test kit has been tested for cross-reactivity with various explosives, including those found in EPA SW-846 Method 8330. A positive test result may be due to the presence of RDX, cross-reactants or mixtures of detectable compounds.

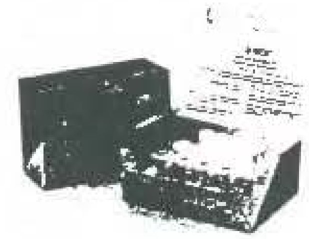
Compound	Cross-reactivity	MDL* (ppb)
RDX	–	5
HMX	+	150
TNT	-	>500
Tetryl	-	>500
1,3,5-Trinitrobenzene	-	>500
2-amino-4,6-dinitrotoluene	-	>500
4-amino-2,6-dinitrotoluene	-	>500
2,4-dinitrotoluene	-	>500
2,6-diaminonitrotoluene	-	>500
1,3-dinitrobenzene	-	>500
Nitrobenzene	-	>500
2-nitrotoluene	-	>500
3-nitrotoluene	-	>500
4-nitrotoluene	-	>500
Nitroglycerin	-	>500
PETN	-	>500

*The Minimum Detection Limit (MDL) is defined as the lowest concentration of compound that yields a positive test result.

D TECH RDX Explosive Field Test Kit

Order No. TK-1005-1

- Includes materials necessary to test four (4) samples
- Step-by-step instruction guide
- Color Comparison card



D TECH TNT/RDX Soil Extraction Pac

Order No. TK-1001S-1

- Includes all materials necessary to perform four (4) sample extractions
- Step-by-step instruction guide

the DTECHTOR Environmental Field Test Meter

The DTECHTOR is a hand-held reflectometer for interpreting results of D TECH RDX test samples. It is completely portabl and powered with a 9-volt, plug-in battery. Operation is a simple push-button procedure that takes only one minute. Readings are displayed in a large, easy-to-read window, along with a sample ID, date, and time of analysis. Results for up to 127 samples can be stored in memory. Size: 7" x 2" x 1.5" Weight: 170 gm (6 oz) with battery

Order No. TK-1001M-1

- Includes calibrators, protective canisters, and meter cover
- Step-by-step instruction guide
- Maintenance and service manual

Ordering Information

D TECH Field Test Products can be ordered from EM Science by calling toll-free **1-800-222-0342** or by sending a fax to **1-800-336-4422**.

D TECH Field Test Products currently available from EM Science are RDX, TNT, BTEX, PAH and PCB soil and wipe test kits, the D TECH Soil Extraction Pacs, and the DTECHTOR Environmental Field Test Meter.

For complete technical information on D TECH Field Test Products, call the EM Science Technical Support Group at **1-800-222-0342**.

D TECH™
Environmental Detection Systems

EM Science/Strategic Diagnostics Incorporated
480 Democrat Road
Gibbstown, NJ 08027
800-222-0342

Printed in the U.S.A. on recycled paper. ST-0005-1

D TECH® TNT Explosives Field Test Kit

EPA SW-846 Method 4050 (TNT)

D TECH TNT EXPLOSIVES TEST KIT FEATURES

Sensitive
- ppb TNT in water
- ppm TNT in soil

Field Tested
- Results correlated to SW-846 Method 8330
- Designed for on-site conditions

Fast
- Provides test results for water or soil samples in less than 20 minutes

Easy-to-use
- Requires no special training

Complete
- Basic kit includes all necessary materials for water samples; soil samples require D TECH TNT/RDX Soil Extraction Pac (TK-1001S-1)
- Kit package is designed for use as on-site workstation
- *the* DTECHTOR meter (TK-1001M-1) is sold separately for semiquantitative results

D TECH TNT/RDX SOIL EXTRACTION PAC

Fast
- Extracts TNT from soil samples in five minutes

Easy-to-use
- Only six easy steps

Performance
- Extraction efficiency > 95%

Testing water and soil samples for TNT has never been easier or faster. Use the D TECH TNT Explosives Field Test Kit to identify hot spots, map sites, monitor remediation, determine risk, and select field samples for laboratory analysis. The D TECH TNT test kit gives you results in less than 20 minutes to help you make on-the-spot decisions in the field.

The D TECH TNT test kit has been extensively field tested to maximize its performance and convenience for on-site applications. The field trial data demonstrated correlation of field results with SW-846 Method 8330 for TNT analysis.*

General Description

The basic D TECH TNT kit contains all the necessary materials to test four (4) water samples. Soil samples require prior extraction using the D TECH TNT/RDX Soil Extraction Pac. Extraction takes less than five minutes, and multiple samples can be extracted simultaneously.

The D TECH test kit package is designed for use as an on-site workstation. Step-by-step instructions guide the user through the analysis procedure — previous laboratory or field testing experience is not required.

Methodology

The D TECH TNT test is based on an Enzyme Linked Immunosorbent Assay (ELISA). Immunoassay is a technology recognized by the EPA as a valuable field screening tool. For the D TECH TNT test, antibodies specific to TNT are linked to solid particles. TNT molecules present in the sample are captured by these solid particles and collected on the membrane surface of the collection device. A color developing solution is then added and the presence (or absence) of TNT can be semiquantitated with a hand-held DTECHTOR meter or, for quick screening purposes, the color in the device can be compared to a color card supplied with the kit. The working range for the D TECH TNT kit is in parts per billion for TNT in water, and in parts per million for TNT in soil.

D TECH

*For further technical information on field results, ask your EM Science representative.

Assay Range

	Water	Soil
TNT w/ DTECHTOR	5–45 ppb	0.5–5 ppm
TNT w/ Color Card	5–40 ppb	0.5–5 ppm

Method Correlation

Based on 375 field and laboratory samples, the D TECH TNT test kit with the DTECHTOR meter correlates to the EPA SW-846 HPLC Method 8330. Correlation indicates that the methods agreed on the presence or absence of TNT in the samples in the detectable range of the kit. The false positive and false negative results are interpreted according to the recommended EPA definitions:

Correlated values	96%
False positives	3%
False negatives	<1%

Specificity

The D TECH TNT test kit has been tested for cross-reactivity with the following compounds.

Compound	Cross-reactivity TNT	TNT MDL* (ppb)
TNT (2,4,6-trinitrotoluene)	NA	5
TETRYL	•	15
2-amino-4,6-dinitrotoluene	•	15
1,3,5-trinitrobenzene	•	20
2,4-dinitrotoluene	•	120
4-amino-2,6-dinitrotoluene	–	> 500
2,6-dinitrotoluene	–	> 500
2,6-diaminonitrotoluene	–	> 500
2-nitrophenol	–	> 500
4-nitrophenol	–	> 500
2,4-dinitrophenol	–	> 500
RDX	–	> 500
HMX	–	> 500

*The Minimum Detection Limit (MDL) is defined as the lowest concentration of compounds that yield a positive test result equivalent to 5 ppm TNT.

D TECH TNT Explosives Field Test Kit

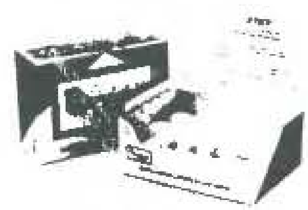
Order No. TK-1004-1

- Includes materials necessary to test four (4) samples
- Step-by-step instruction guide
- Color comparison card

D TECH TNT/RDX Soil Extraction Pac

Order No. TK-1001S-1

- Includes materials necessary to perform four (4) sample extractions
- Step-by-step instruction guide



the DTECHTOR Environmental Field Test Meter

The DTECHTOR is a hand-held reflectometer for interpreting results of D TECH TNT test samples. It is completely portable and powered with a 9 volt, plug-in battery. Operation is a simple push-button procedure that takes only one minute. Readings are displayed in a large, easy-to-read window, along with a sample ID, date, and time of analysis. Results for up to 127 samples can be stored in memory. Size: 7" x 2" x 1.5" Weight: 170 gm (6 oz) with battery

Order No. TK-1001M-1

- Includes calibrators, protective canisters, and meter cover
- Step-by-step instruction guide
- Maintenance and service manual

Ordering Information

D TECH Field Test Products can be ordered from EM Science by calling toll-free **1-800-222-0342** or by sending a fax to 1-800-336-4422.

D TECH Field Test Products currently available from EM Science are TNT (Quantitative), RDX, BTEX, and PCB test kits, the D TECH Soil Extraction Pacs, and the DTECHTOR Environmental Field Test Meter.

For complete technical information on D TECH Field Test Products, call the EM Science Technical Support Group at **1-800-222-0342.**

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D TECH
Environmental Detection Systems

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480 Democrat Road • P.O. Box 70
Gibbstown, NJ 08027-0070
800-222-0342

APPLICATION FOR METHOD 40xx (TNT) CERTIFICATION

United States Environmental Protection Agency

Methods Section (5304)

Office of Solid Waste

TNT USEPA SUBMISSION
MAR 1994

On-Site Sample Screening Has Never Been Easier

APPLICATION FOR METHOD 40XX CERTIFICATION
United States Environmental Protection Agency
Methods Section (5304)
Office of Solid Waste

APPLICANT INFORMATION

Product Name:

D TECH™ TNT Kit

Assay Development:

STRATEGIC DIAGNOSTICS INCORPORATED
128 Sandy Drive
Newark, Delaware 19713
(302) 456-6789
(302) 456-6770 (fax)

Contacts:
Bob Hudak -- Group Leader, D TECH Development
Joe Dautlick -- Marketing Manager

Marketing Group:

EM SCIENCES
480 Democrat Road
Gibbstown, New Jersey
(800) 222-0342

Contacts:
Bruce Crane -- Marketing Manager
Wayne Sawyer -- D TECH Product Manager

ASSAY DESCRIPTION AND SPECIFICS

The D TECH™ TNT kit is based on a latex particle immunoassay format. The antibody is attached to a latex particle which is greater than 3 microns in diameter. These particles are lyophilized in a glass vial to achieve long term room temperature storage stability. A competition reaction occurs in this tube when analyte in the sample and analyte enzyme conjugate compete for antibody binding sites. Rapid binding is facilitated by having all reagent suspended in solution rather than affixed to the walls of a reaction tube. Separation of bound and unbound reagents is accomplished by pouring the reaction mixture through a filter with a 1 micron nominal pore size. Conjugate (enzyme marker) bound to latex particles is retained on the filter surface due to the particle's larger size relative to the pore size. A clear chromogenic substrate is added. Bound enzyme catalyzes the formation of a non-soluble colored compound, whose intensity is proportional to bound enzyme conjugate concentration. A reference sample with a known quantity of analyte is processed similarly and simultaneously. The inclusion of the reference controls the effect of temperature on the test (the rate of the enzyme reaction) while setting the minimum detection limit of the test. Color intensity and thus concentration are determined either by comparison to a color chart or by inserting the separation cup into the optional DTECHTOR, a hand held reflectometer. The DTECHTOR yields a value for the test sample which is given as percent relative reflectance (%RR) to the reference reaction. The %RR can be converted to a concentration range by comparison to a look-up chart provided with the kit.

The D TECH TNT test kit is designed for the semiquantitative determination of TNT with reportable concentrations as shown:

ANALYTE	SAMPLE	DTECHTOR	COLOR CARD
TNT	Soil (ppm)	0.5 - 5.0	0.5 - 5.0
	Water (ppb)	5 - 45	5 - 60

Similar immunoassays have been used for in-vitro diagnostics during the past twenty-five (25) years to determine therapeutic drug levels, drugs of abuse monitoring, blood bank screening of hepatitis, HIV, etc., and hormone concentrations. Convenient, easy to use unit dose immunoassay tests in a format similar to D TECH are commonly used for home pregnancy tests and physicians' office tests.

The technology employed in these products is not patent protected; however, proprietary antibodies, conjugates and buffer formulations are used to deliver the unique performance found in this D TECH assay.

The kit is calibrated against Trinitrotoluene (TNT), but because of the antiserum's cross reactivity characteristics, the results are reported as ppm of TNT equivalents.

The test kit is a self contained workstation. The base kit provides the materials required to perform four (4) analyses. A supplementary D TECH TNT extraction pac, for four (4) soil extractions, is designed for integration into the base kit to provide soil results.

The specificity of this method is included in the test kit instruction guide. It indicates the compounds the test will detect along with their relative sensitivity as well as compounds of similar structure which will not react.

The method detection level (MDL) of the D TECH TNT kit is 5 ppb in water and 0.5 ppm in soil. The reference produces a color equivalent to these concentrations. This reference reaction is set at a level that gives 96% confidence that the MDL is distinguished from zero.

To assure competent handling of the D TECH kits in the field, all products have been designed with the following features:

1. All materials needed for an assay are included in the kit except for a timing device and the optional DTECHTOR. This minimizes error opportunity due to inaccurate, mislabeled, or contaminated pipets, glassware or reagents.

2. Each kit is set up as its own self-contained and preassembled workstation.

3. Caps are color coded for easy identification.

4. Each kit contains a fully detailed and diagrammatic set of instructions.

5. An 800 toll-free hot line is provided for technical support.

6. Kits are set up with side by side sample and reference processing to assure identical processing conditions for both. In addition, the development of the blue color in the reference well indicates all assay steps were completed with the appropriate reagent in correct order.

METHOD 40xx

SOIL SCREENING FOR TRINITROTOLUENE (TNT) BY IMMUNOASSAY

1.0 SCOPE AND APPLICATION

1.1 Method 40XX is a procedure for screening waters and soils to determine when Trinitrotoluene is present at concentrations above 0.5 mg/Kg in soil and 5 µg/L in water. Method 40xx provides an estimate of the concentration of TNT by comparison with a reference.

1.2 Using this test, 93% of soil samples containing 0.25 ppm or less of TNT will produce a negative result and 99+% of soil samples containing 1.0 ppm or greater of TNT will produce a positive result. In addition, 93% of water samples containing 2.5 ppb or less of TNT will produce a negative result and 99%+ of water samples containing 10 ppb or more of TNT will produce a positive result.

1.3 In cases where the exact concentrations of TNT are required, quantitative techniques (i.e., Methods 8330) should be used.

2.0 SUMMARY OF METHOD

2.1 Test kits are commercially available for this immunoassay method. For optimal results, the manufacturer's instructions should be followed. In general, the method is performed using an extract of a soil sample. Samples and an enzyme-analyte conjugate reagent are added to immobilized TNT antibody. The enzyme conjugate "competes" with TNT present in the sample for binding to immobilized TNT antibody. The enzyme-analyte conjugate bound to the antibody then catalyzes a colorless substrate to a colored product. The test is interpreted by comparing the color produced by a sample to the response produced by a reference reaction.

3.0 INTERFERENCES

3.1 Chemically similar compounds and compounds that might be expected to be found in conjunction with TNT contamination were tested to determine the concentration required to produce a positive test result. These data are shown in Tables 1 and 2.

4.0 APPARATUS AND MATERIALS

4.1 The D TECH TNT test kit or equivalent. Each commercially available kit will supply or specify all materials necessary for successful completion of the test.

5.0 REAGENTS

5.1 The D TECH TNT test contains all the reagents necessary for successful completion of four (4) analyses. A supplementary soil extraction pac is required for soil analyses.

6.0 SAMPLE COLLECTION, PRESERVATION, AND TRANSPORTATION

6.1 See the introductory material to this chapter, Organic Analytes, Section 4.1.

6.2 Soil and water samples may be contaminated, and should therefore be considered hazardous and handled accordingly.

7.0 PROCEDURE

7.1 Follow the manufacturer's instructions for the test kit being used. Those test kits used must meet or exceed the performance indicated in Tables 3-13

8.0 QUALITY CONTROL

8.1 Follow the manufacturer's instructions for the test kit being used for quality control procedures specific for that test. Additionally, guidance is provided in Chapter One.

8.2 Do not use test kits past their expiration date.

8.3 Do not use reagents designated for the TNT kit with another kit type.

8.4 Do not mix reagents from one kit lot with a different kit lot.

8.5 Use the test kits within their specified storage temperature and operating temperature limits.

9.0 METHOD PERFORMANCE

9.1 This method has been tested in the laboratory with a wide range of soil and water matrices. Spike and recovery studies, matrix effect studies, and real world sample analysis have proven this method to be accurate and reliable over a wide range of matrix chemistries. See Tables 1-13

10.0 REFERENCES

1. D TECH™ TNT Users Guide , SDI/EM Sciences 1994

2. Hutter,L., G. Teaney, and J.W.Stave, "A Novel Field Screening System for TNT Using EIA", in Field Screeening Methods for Hazardous Wastes and Toxic Chemicals, Vol 1, Proceedings of the 1993 U.S. EPA/A&WMA International Symposium, p.472, 1993.

3. Teaney,G., J.Melby, L.Hutter and J.Stave, "A Novel Field Analytical Method for TNT", Proceedings of the American Association of Analytical Chemists, 1993

TABLE 1
CROSS REACTANTS

METHOD: The compounds listed below were assayed at various concentrations and compared against an inhibition curve generated using TNT. The concentration of the compound required to elicit a positive response at the MDL as well as the concentration required to yield 50% inhibition compared to the standard curve were determined. The results are given below:

SAMPLE	MDL[a] (ppm)	IC 50[b] (ppm)	% CROSS REACTIVITY[c]
TNT (2,4,6-trinitrotoluene)	0.5	17	100
Tetryl[d]	3	48	35
1,3,5-trinitrobenzene	4	75	23
2-amino-4,6-dinitrotoluene	13	150	11
4-amino-2,6-dinitrotoluene	>500	>500	<1
2,4-dinitrotoluene	90	390	4
2,6-diaminonitrotoluene	>500	>500	<1
2-nitrophenol	>500	>500	<1
4-nitrophenol	>500	>500	<1
2,4-dinitrophenol	>500	>500	<1
RDX[d]	>500	>500	<1
HMX[d]	>500	>500	<1

a The Method Detection Limit (MDL) is defined as the lowest concentration of compound that yields a positive test result.

b The IC_{50} is defined as the concentration of compound required to produce a test response equivalent to 50% of the maximum response.

c % Crossreactivity is determined by dividing the equivalent TNT concentration by the actual compound concentration at IC_{50}

d Tetryl = methyl-2,4,6-trinitrophenylnitramine
RDX = hexahydro-1,3,5-trinitro-1,3,5-triazine
HMX = octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine

TABLE 1A
CROSS REACTANTS

Below is the data used to calculate the cross reactivity shown in Table 1.

COMPOUND	PPM ASSAYED	D TECH %RR *
TNT	5,15,30,45,60	10,27,60,74,87
Tetryl	5,15,30,50,90	5,7,20,43,61.
1,3,5-trinitrobenzene	5,15,30,50,90	3,6,10,23,46
2-amino-4,6-dinitrotoluene	30,45,75,150,300	13,15,17,43,65
4-amino-2,6-dinitrotoluene	500	<0
2,4-dinitrotoluene	30,75,150,300,600	-1,-1,10,30,54
2,6-diaminonitrotoluene	500	<0
2-nitrophenol	500	<0
4-nitrophenol	500	<0
2,4-dinitrophenol	500	<0
RDX	500	<0
HMX	500	<0

Tetryl = methyl-2,4,6-trinitrophenylnitramine
RDX = hexahydro-1,3,5-trinitro-1,3,5-triazine
HMX = octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine

D TECH %RR = % Relative Reflectance. This is a mathematical expression of the reflectance of the color produced using the DTECHTOR. % Relative Reflectance can be calculated using the following formula:

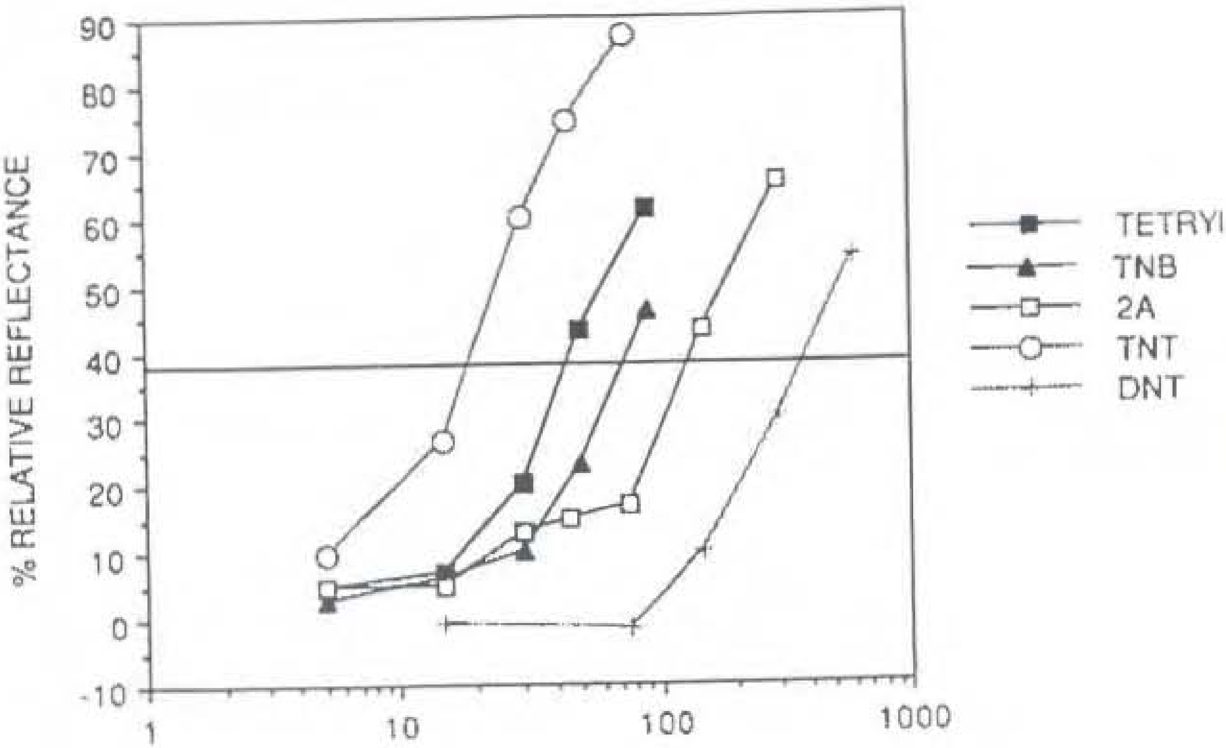
$$\% \text{ RR} = \frac{(\text{sample reflectance}) - (\text{reference reflectance})}{(\text{white}) - (\text{reference reflectance})} \times 100$$

where 700 is defined as white for the TNT assay.

TABLE 1B
CROSS REACTANTS

Below is a graphic representation of the cross reactivity data given in Table 1A

D TECH TNT CROSS REACTIVITY GRAPH



NOTE: Since the effective working range of the assay is 0 to 75% Relative Reflectance when using the DTECHTOR, IC_{50} occurs at 37.5% Relative Reflectance. This is the point on the curve from which cross reactivites have been calculated.

TABLE 2A
POSSIBLE INTERFERING COMPOUNDS

COMPOUND	PPM ASSAYED	D TECH %RR
Benzene	100	-9
Toluene	100	-9
Ethylbenzene	100	-8
Xylenes	100	-7
PAHs	100	-7
PCB 1254	100	-6
PCP	100	-7
Triazine	100	-5

NOTE: Since all % relative reflectances are <0, none of the compounds tested are detectable at 100 ppm in the assay.

TABLE 3
D TECH TNT COMPOSITE STANDARD CURVE DATA

CONFIDENTIAL

METHOD: Seven (7) standard curves were run by different technicians over the course of one week to determine the variance. The results are given below.

TNT CONCENTRATION (ppb)	MEAN REFLECTANCE	STANDARD DEVIATION	% CV
5	257	25	10
9	316	14	5
15	337	23	7
30	501	28	6
40	565	20	3
60	635	20	3

D TECH TNT STANDARD CURVE

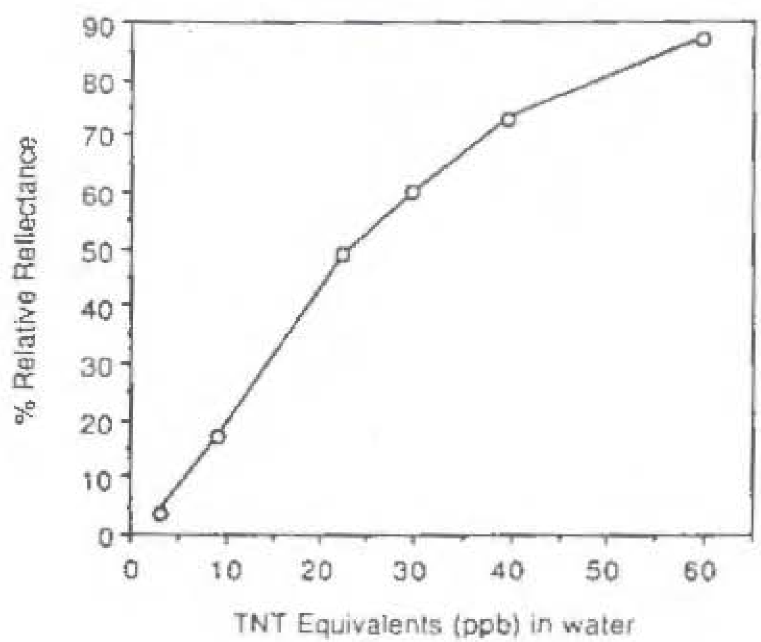


TABLE 4
D TECH TNT REALWORLD NEGATIVE SOILS

METHOD: Twenty five (25) real world negative soils were extracted and analyzed using the D TECH TNT kit to determine the extent of soil matrix effects. The results are given below.

Soil	Soil type		D TECH RANGE (ppm)	D TECH %RR
133	Avonburg Fine Sine Silt	N/A	<0.5	-2
101	Matapeake Silt Loam	DE	<0.5	-3
100	Clay Loam	DE	<0.5	-7
102	Sassafras Sand Loam	DE	<0.5	-6
106	Evesboro Low Organic	DE	<0.5	-6
107	Pokomoke High OM Sand	DE	<0.5	-3
109	Davidson Clay Loam	GA	<0.5	-4
111	Shontic Casa Grande Sand	AZ	<0.5	-1
112	Casa Grande Clay Loam	AZ	<0.5	-5
113	Trix Sand Clay Loam	AZ	<0.5	-4
114	Trix Casa Grande Clay	AZ	<0.5	-8
115	Yolo Loam	CA	<0.5	-2
116	Capay Silt Clay	CA	<0.5	-2
117	Sycamore Silt Loam	CA	<0.5	-5
118	Dennis Silt Loam	KS	<0.5	-5
119	Grundy Silt Clay Loam	KS	<0.5	-3
120	Luray Silt Clay Loam	OH	<0.5	-2
121	Wooster Silt Loam	OH	<0.5	-5
122	Vienna Loam	SD	<0.5	-7
123	Opal Clay	SD	<0.5	-4
124	Raub Silt Loam	IN	<0.5	-3
125	Rockfield Silt Loam	IN	<0.5	-6
127	Cisne	IL	<0.5	-4
128	Muscatine Loam	IL	<0.5	-5
130	Sandy Brae	DE	<0.5	-6

NOTE: All soil %RR are less than 0 (the %RR of the MDL) therefore all soils have a concentration less than 0.5 ppm (the concentration of the MDL).

TABLE 5

D TECH TNT REALWORLD NEGATIVE WATERS

METHOD: Thirty (30) real world negative waters were analyzed using the D TECH TNT kit to determine the extent of water matrix effects. The results are given below.

Water #	Water type		D TECH RANGE(ppm)	D TECH % RR
1	Ground Water, Burlington	IA	<5.0	-10
2	Well Water, Burlington	IA	<5.0	-1
3	Surface Water #1, Houston	TX	<5.0	-4
4	Unknown Creek, Dartmouth	MA	<5.0	-1
5	City Well Water, Ontario	CA	<5.0	-14
6	Pacific Ocean, Victoria	CA	<5.0	-5
7	Surface Water, Harmony Woods	DE	<5.0	-13
8	Adamsville River, Adamsville	RI	<5.0	-3
9	Suface Water #2, Houston	TX	<5.0	-14
10	Buttermilk Falls, White Haven	PA	<5.0	-6
11	Main St Pond, Germantown	NY	<5.0	-10
12	Hudson River, Germantown	NY	<5.0	-1
13	Atlantic Ocean	NJ	<5.0	-7
14	Ground Water #1, Dover	DE	<5.0	-16
15	Ground Water #2, Dover	DE	<5.0	-14
16	Ground Water #3, Dover	DE	<5.0	-13
17	Drinking Well Water, Landenberg	PA	<5.0	-2
18	Ground Water, Elsmere	DE	<5.0	-4
19	Ground Water, Elsmere	DE	<5.0	-13
20	Ground Water, Elsmere	DE	<5.0	-4
21	Lab Sample 20643	N/A	<5.0	-7
22	Lab Sample 20645	N/A	<5.0	-5
23	Lab Sample 20659	N/A	<5.0	-8
24	Lab Sample 20826	N/A	<5.0	-5
25	Lab Sample 20827	N/A	<5.0	-11
26	Lab Sample 20843	N/A	<5.0	-4
27	Lab Sample 20850	N/A	<5.0	-8
28	Lab Sample 20848	N/A	<5.0	-4
29	Ground Water, Adrian	GA	<5.0	-7
30	Ground Water, Adrian	GA	<5.0	-7

NOTE: All soil %RR are less than 0 (the %RR of the MDL) therefore all waters have a concentration less than 5 ppb (the concentration of the MDL).

TABLE 6
ESTIMATE ERROR RATE FOR MINIMUM DETECTION LEVEL (MDL) IN SOILS

METHOD: Thirty (30) real world negative soils were spiked with TNT at one-half and two times the MDL (0.25 and 1.0 ppm respectively). These samples were analyzed in the D TECH assay to determine the error rate of the assay as defined by the USEPA. The actual data are given in Table 5A.

True ppm	0.25 ppm	1.0 ppm
Positive Rate (%)	7	100
Negative Rate (%)	93	0

TABLE 7
ESTIMATE ERROR RATE FOR MINIMUM DETECTION LEVEL (MDL) IN WATER

METHOD: Thirty (30) real world negative waters were spiked with TNT at one-half and two times the MDL (2.5 and 10 ppb respectively). These samples were analyzed in the D TECH assay to determine the error rate of the assay as defined by the USEPA. The actual data are given in Table 5A.

True ppb	2.5 ppb	10 ppb
Positive Rate (%)	7	100
Negative Rate (%)	93	0

TABLE 6A

ESTIMATE ERROR RATE FOR MINIMUM DETECTION LEVEL (MDL) IN SOILS

CONFIDENTIAL

Below is the actual data used to determine the error rate in soil samples.

0.25 ppm TNT			1.0 ppm TNT		
Sample	% RR	Conc	Sample	% RR	Conc (ppm)
100	-9	<0.5	100	6	0.5-1.5
102	-6	<0.5	102	10	0.5-1.5
108	-10	<0.5	108	8	0.5-1.5
109	-3	<0.5	109	15	0.5-1.5
111	-3	<0.5	111	7	0.5-1.5
113	-3	<0.5	113	10	0.5-1.5
114	-3	<0.5	114	7	0.5-1.5
115	-6	<0.5	115	10	0.5-1.5
116	-3	<0.5	116	4	0.5-1.5
117	-3	<0.5	117	13	0.5-1.5
118	-2	<0.5	118	12	0.5-1.5
120	-4	<0.5	120	11	0.5-1.5
121	-3	<0.5	121	11	0.5-1.5
122	-6	<0.5	122	6	0.5-1.5
123	1	0.5-1.5	123	9	0.5-1.5
124	-2	<0.5	124	6	0.5-1.5
125	-5	<0.5	125	4	0.5-1.5
127	-4	<0.5	127	7	0.5-1.5
128	-8	<0.5	128	6	0.5-1.5
133	1	0.5-1.0	133	4	0.5-1.5
101	-7	<0.5	101	12	0.5-1.5
106	-2	<0.5	106	7	0.5-1.5
110	-4	<0.5	110	14	0.5-1.5
112	-6	<0.5	112	11	0.5-1.5
119	-5	<0.5	119	13	0.5-1.5
126	-5	<0.5	126	6	0.5-1.5
27	-7	<0.5	27	13	0.5-1.5
28	-4	<0.5	28	11	0.5-1.5
29	-9	<0.5	29	8	0.5-1.5
30	-12	<0.5	30	8	0.5-1.5

TABLE 7A

ESTIMATE ERROR RATE FOR MINIMUM DETECTION LEVEL (MDL) IN WATERS

CONFIDENTIAL

Below is the actual data used to determine the error rate in water samples.

2.5 ppb TNT			10 ppb TNT		
Sample	% RR	Conc	Sample	% RR	Conc (ppm)
1	-14	<5.0	1	24	5.0-15
2	-3	<5.0	2	36	15-25
3	-11	<5.0	3	17	5.0-15
4	-3	<5.0	4	17	5.0-15
5	-16	<5.0	5	22	5.0-15
6	-8	<5.0	6	14	5.0-15
7	-8	<5.0	7	19	5.0-15
8	0	<5.0	8	16	5.0-15
9	-3	<5.0	9	13	5.0-15
10	-2	<5.0	10	17	5.0-15
11	-3	<5.0	11	11	5.0-15
12	-7	<5.0	12	5	5.0-15
13	2	5.0-15	13	10	5.0-15
14	4	5.0-15	14	27	5.0-15
15	-6	<5.0	15	14	5.0-15
16	-6	<5.0	16	26	5.0-15
17	-11	<5.0	17	11	5.0-15
15	-8	<5.0	18	23	5.0-15
19	-8	<5.0	19	16	5.0-15
20	-6	<5.0	20	13	5.0-15
21	-4	<5.0	21	17	5.0-15
22	-1	<5.0	22	21	5.0-15
23	-6	<5.0	23	36	15-25
24	-7	<5.0	24	23	5.0-15
25	-12	<5.0	25	17	5.0-15
26	-1	<5.0	26	21	5.0-15
27	-7	<5.0	27	25	5.0-15
28	0	<5.0	28	36	15-25
29	-14	<5.0	29	52	15-25
30	-9	<5.0	30	38	25-45

TABLE 8
EXTRACTION EFFICIENCY DETERMINATION

METHOD: Ten (10) different soil types (TNT negative soils) were spiked with an acetone solution containing approximately 1.0 ppm TNT. This spiking solution was later quantitated by method 8330 and found to contain 0.77 ppm TNT. The spiked soil samples were analyzed three (3) times in the D TECH kit to determine the extraction efficiency of the method. The data are presented below:

SOIL ID	MEAN TNT CONC. (ppm)	SD	%CV	%RECOVERY
101	0.54	0.04	7	70
106	0.64	0.06	9	84
108	0.87	0.18	20	113
109	0.63	0.08	13	82
110	0.88	0.15	17	115
116	1.02	0.15	17	115
117	0.82	0.15	15	132
123	0.87	0.23	26	113
126	0.95	0.26	28	123
128	0.65	0.11	16	84
SPIKING SOLUTION	0.77	N/A	N/A	100

TABLE 8A

CHARACTERIZATION OF SOIL USED IN EXTRACTION EFFICIENCY EXPERIMENT

METHOD: The ten (10) soils used for the extraction efficiency study were sent to soil testing laboratory for content analysis. The data are given below:

Sample ID	OM (%) by LOI	pH	Ca (mg/Kg)	Mn (mg/Kg)	Zn (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Sand %	Silt %	Clay %
101	1.5	6.0	486.1	111.3	1.7	1.4	61.9	34	46	20
106	0.1	5.5	67.7	1.2	0.3	0.4	18.8	93	4	3
108	2.2	6.6	453.8	10.2	0.1	0.5	45.7	31	15	54
109	2.3	5.4	243.5	105.4	0.1	0.4	167.7	37	12	51
110	12.1	4.9	1468.9	4.3	5.0	0.7	8.8	88	6	6
116	2.2	6.8	1154.6	55.5	0.9	2.9	16.5	14	35	51
117	2.8	7.6	1577.8	99.2	14.1	2.5	18.6	52	30	18
123	3.6	6.7	2638.3	109.9	1.0	1.5	8.1	11	27	62
126	5.2	5.2	2587.8	79.3	1.9	1.3	66.8	15	46	39
128	4.4	6.2	2913.9	14.3	1.4	0.8	1.4	68	68	10

TABLE 9
RECOVERY OF TNT SPIKED INTO REAL SOILS

METHOD: Three (3) soils were spiked at approximately 1 and 3 ppm TNT. Each sample was analyzed once by method 8330 and ten (10) times by D TECH. The results are given below.

SAMPLE ID	AMOUNT SPIKED	D TECH %RR	D TECH (ppm)	HPLC METHOD 8330
106-1	1.0	4	0.5 - 1.5	0.69
		5	0.5 - 1.5	
		6	0.5 - 1.5	
		3	0.5 - 1.5	
		5	0.5 - 1.5	
		8	0.5 - 1.5	
		6	0.5 - 1.5	
		8	0.5 - 1.5	
		6	0.5 - 1.5	
		16	1.5 - 3.0	
116-1	1.0	9	0.5 - 1.5	0.73
		8	0.5 - 1.5	
		16	1.5 - 3.0	
		12	0.5 - 1.5	
		8	0.5 - 1.5	
		9	0.5 - 1.5	
		11	0.5 - 1.5	
		10	0.5 - 1.5	
		9	0.5 - 1.5	
		16	1.5 - 3.0	
128-1	1.0	8	0.5 - 1.5	0.75
		9	0.5 - 1.5	
		12	0.5 - 1.5	
		10	0.5 - 1.5	
		11	0.5 - 1.5	
		16	1.5 - 3.0	
		14	0.5 - 1.5	
		10	0.5 - 1.5	
		9	0.5 - 1.5	
		11	0.5 - 1.5	

TABLE 9 (cont)
RECOVERY OF TNT SPIKED INTO REAL SOILS

SAMPLE ID	AMOUNT SPIKED	D TECH %RR	D TECH (ppm)	HPLC METHOD 8330
106-3	3.0	31	1.5 - 3.0	1.53
		20	1.5 - 3.0	
		25	1.5 - 3.0	
		14	0.5 - 1.5	
		18	1.5 - 3.0	
		15	1.5 - 3.0	
		19	1.5 - 3.0	
		23	1.5 - 3.0	
		20	1.5 - 3.0	
		14	0.5 - 1.5	
116-3	3.0	20	1.5 - 3.0	2.12
		26	1.5 - 3.0	
		28	1.5 - 3.0	
		31	1.5 - 3.0	
		24	1.5 - 3.0	
		20	1.5 - 3.0	
		18	1.5 - 3.0	
		16	1.5 - 3.0	
		14	0.5 - 1.5	
		19	1.5 - 3.0	
128-3	3.0	14	0.5 - 1.5	2.07
		16	1.5 - 3.0	
		18	1.5 - 3.0	
		22	1.5 - 3.0	
		25	1.5 - 3.0	
		24	1.5 - 3.0	
		29	1.5 - 3.0	
		21	1.5 - 3.0	
		18	1.5 - 3.0	
		19	1.5 - 3.0	

TABLE 10
COMPARISON OF D TECH WITH METHOD 8330

FIELD TRIAL A
METHOD: Samples from borings were obtained at a West Coast site using a split spoon technique. The samples were homogenized by placing approximately six cubic inches of soil into a stainless steel vessel and mixing for five minutes with a stainless steel trowel. The soil was aliquotted into two (2) six ounce glass bottles, tested on-site using the D TECH method and transported to Roy F. Weston (Lionville, Pa) for method 8330 analysis.

SAMPLE ID	D TECH %RR	D TECH RANGE (ppm)	METHOD 8330 TNT (ppm)
61-1	4	< 0.2	< 0.09
61-10	11	< 0.2	< 0.09
61-11	0	< 0.2	< 0.09
61-12	-2	< 0.2	< 0.09
61-13	-3	< 0.2	< 0.09
61-14	5	< 0.2	< 0.09
61-15	5	< 0.2	< 0.09
61-16	5	< 0.2	< 0.09
61-17	-1	< 0.2	< 0.09
61-18	1	< 0.2	< 0.09
61-19	12	< 0.2	< 0.09
61-2	82	> 1.5	> 3.0
61-20	4	< 0.2	< 0.09
61-21	36	0.5-1.0	2.44
61-22	11	< 0.2	< 0.09
61-23	8	< 0.2	< 0.09
61-24	67	1.0-1.5	1.4
61-25	14	< 0.2	< 0.09
61-26	9	< 0.2	< 0.09
61-27	21	0.2-0.5	0.27
61-28	1	< 0.2	< 0.09
61-29	2	< 0.2	< 0.09
61-3	64	1.0-1.5	1.3

SAMPLE ID	D TECH %RR	D TECH RANGE (ppm)	METHOD 8330 TNT (ppm)
61-30	4	< 0.2	< 0.09
61-4	90	> 1.5	1.1
61-5	52	0.5-1.0	1.0
61-6	91	> 1.5	> 3.0
61-7	1	< 0.2	< 0.09
61-8	38	0.5-1.0	1.0
61-9	25	0.2-0.5	0.56
TET-1	56	0.5-1.0	< 0.09
TET-2	12	< 0.2	< 0.09
TET-3	2	< 0.2	< 0.09
TL-1	21	0.2-0.5	0.99
TL-2	96	> 1.5	1.2
TL-3	95	> 1.5	> 3.0
TL-4	29	0.2-0.5	0.66
TL-5	89	> 1.5	> 3.0
TL-6	19	0.2-0.5	0.66
TL-7	16	0.2-0.5	0.71
TL-8	36	0.5-1.0	1.46
TL-9	23	0.2-0.5	0.92

FIELD TRIAL B

METHOD: Samples from borings were obtained at a Western state site using a split spoon technique. The samples were homogenized by placing approximately six cubic inches of soil into a stainless steel vessel and mixing for five minutes with a stainless steel trowel. The soil was aliquotted into two (2) six ounce glass bottles, tested on-site using the D TECH method and transported to DataChem (Salt Lake City, Utah) for method 8330 analysis.

Well #	Depth	D TECH Range (ppm)	8330 TNT (ppm)	8330 TNB (ppm)	TNT Equivalent (ppm)
1	2	0.2 - 0.5	<2.0	< 1.0	<2.25
1	4	> 1.5	5.75	< 1.0	5.75-6.0
1	6	< 0.2	<2.0	< 1.0	<2.25
1	8	< 0.2	<2.0	< 1.0	<2.25
1	10	< 0.2	<2.0	< 1.0	<2.25
1	12	< 0.2	<2.0	< 1.0	<2.25
2	2	> 1.5	3.32	< 1.0	3.32-3.57
2	4	> 1.5	166	< 1.0	166
2	6	< 0.2	<2.0	< 1.0	<2.25
2	8	< 0.2	<2.0	< 1.0	<2.25
2	10	< 0.2	<2.0	< 1.0	<2.25
2	12	< 0.2	<2.0	< 1.0	<2.25
3	2	> 1.5	2500	18.50	2504
3	4	> 1.5	2.72	< 1.0	2.72-2.97
3	6	1.0 - 1.5	<2.0	< 1.0	<2.25
3	8	0.2 - 0.5	<2.0	< 1.0	<2.25
3	10	0.2 - 0.5	<2.0	< 1.0	<2.25
3	12	> 1.5	<2.0	7.02	1.76-3.76
4	2	< 0.2	<2.0	< 1.0	<2.25
4	4	< 0.2	<2.0	< 1.0	<2.25
4	6	< 0.2	<2.0	< 1.0	<2.25
4	8	< 0.2	<2.0	< 1.0	<2.25
4	10	< 0.2	<2.0	< 1.0	<2.25

Well #	Depth	D TECH Range (ppm)	8330 TNT (ppm)	8330 TNB (ppm)	TNT Equivalent (ppm)
4	12	< 0.2	<2.0	< 1.0	<2.25
5	2	< 0.2	<2.0	< 1.0	<2.25
5	4	< 0.2	<2.0	< 1.0	<2.25
5	6	< 0.2	<2.0	< 1.0	<2.25
5	8	< 0.2	<2.0	< 1.0	<2.25
5	10	< 0.2	<2.0	< 1.0	<2.25
5	12	< 0.2	<2.0	< 1.0	<2.25
6	2	< 0.2	<2.0	< 1.0	<2.25
6	4	> 1.5	<2.0	5.12	1.28-3.28
6	6	> 1.5	140	12.2	143
6	8	> 1.5	230	20.2	235
6	10	> 1.5	1100	16.9	1104
6	12	> 1.5	23.5	11.5	26.0
7	2	< 0.2	<2.0	< 1.0	<2.25
7	4	< 0.2	<2.0	< 1.0	<2.25
7	6	< 0.2	<2.0	< 1.0	<2.25
7	8	< 0.2	<2.0	< 1.0	<2.25
7	10	< 0.2	<2.0	< 1.0	<2.25
7	12	0.5 - 1.0	<2.0	2.95	0.74-2.74
8	2	< 0.2	<2.0	< 1.0	<2.25
8	4	< 0.2	<2.0	< 1.0	<2.25
8	6	0.2 - 0.5	<2.0	< 1.0	<2.25
8	8	0.2 - 0.5	<2.0	< 1.0	<2.25
8	10	0.5 - 1.0	<2.0	1.30	0.33-2.33
8	12	0.5 - 1.0	<2.0	1.89	0.47-2.47
9	2	0.5 - 1.0	<2.0	< 1.0	<2.25
9	4	< 0.2	<2.0	< 1.0	<2.25
9	6	< 0.2	<2.0	< 1.0	<2.25
9	8	> 1.5	<2.0	3.94	0.99-2.99
9	10	0.5 - 1.0	<2.0	4.54	1.14-3.14

Well #	Depth	D TECH Range (ppm)	8330 TNT (ppm)	8330 TNB (ppm)	TNT Equivalent (ppm)
10	2	< 0.2	<2.0	< 1.0	<2.25
10	4	< 0.2	<2.0	< 1.0	<2.25
10	6	< 0.2	<2.0	< 1.0	<2.25
10	8	< 0.2	<2.0	< 1.0	<2.25
10	10	< 0.2	<2.0	< 1.0	<2.25
10	12	0.2 - 0.5	<2.0	< 1.0	<2.25
11	2	0.5 - 1.0	<2.0	< 1.0	<2.25
11	4	< 0.2	<2.0	< 1.0	<2.25
11	6	0.2 - 0.5	<2.0	< 1.0	<2.25
11	8	0.5 - 1.0	<2.0	< 1.0	<2.25
11	10	1.0 - 1.5	<2.0	< 1.0	<2.25
11	12	1.0 - 1.5	<2.0	< 1.0	<2.25
12	2	< 0.2	<2.0	< 1.0	<2.25
12	4	< 0.2	<2.0	< 1.0	<2.25
12	6	0.2 - 0.5	<2.0	< 1.0	<2.25
12	8	0.5 - 1.0	<2.0	< 1.0	<2.25
12	10	> 1.5	<2.0	< 1.0	<2.25
12	12	1.0 - 1.5	<2.0	< 1.0	<2.25
12	15	> 1.5	<2.0	4.57	1.14-3.14
12	20	> 1.5	<2.0	10.5	2.63-4.63
12	25	> 1.5	3.23	24.3	9.3
12	30	> 1.5	<2.0	81	20.3
12	35	> 1.5	<2.0	1.61	0.40-2.40
12	40	1.0 - 1.5	<2.0	< 1.0	<2.25
12	45	0.2 - 0.5	<2.0	< 1.0	<2.25
12	50	< 0.2	<2.0	< 1.0	<2.25
12	55	< 0.2	<2.0	< 1.0	<2.25
12	60	< 0.2	<2.0	< 1.0	<2.25
13	8	< 0.2	<2.0	< 1.0	<2.25
13	10	< 0.2	<2.0	< 1.0	<2.25

Well #	Depth	D TECH Range (ppm)	8330 TNT (ppm)	8330 TNB (ppm)	TNT Equivalent (ppm)
13	12	0.5 - 1.0	<2.0	< 1.0	<2.25
13	20	> 1.5	<2.0	< 1.0	<2.25
14	2	< 0.2	<2.0	< 1.0	<2.25
14	4	< 0.2	<2.0	< 1.0	<2.25
14	6	< 0.2	<2.0	< 1.0	<2.25
14	8	< 0.2	<2.0	< 1.0	<2.25
14	10	< 0.2	<2.0	< 1.0	<2.25
14	12	< 0.2	<2.0	< 1.0	<2.25
15	2	< 0.2	<2.0	< 1.0	<2.25
15	4	< 0.2	<2.0	< 1.0	<2.25
15	6	< 0.2	<2.0	< 1.0	<2.25
15	8	< 0.2	<2.0	< 1.0	<2.25
15	10	< 0.2	<2.0	< 1.0	<2.25
15	12	< 0.2	<2.0	< 1.0	<2.25
16	2	< 0.2	<2.0	< 1.0	<2.25
16	4	< 0.2	<2.0	< 1.0	<2.25
16	6	< 0.2	<2.0	< 1.0	<2.25
16	8	< 0.2	<2.0	< 1.0	<2.25
16	10	0.2 - 0.5	<2.0	< 1.0	<2.25
16	12	< 0.2	<2.0	< 1.0	<2.25
17	2	< 0.2	<2.0	< 1.0	<2.25
17	4	< 0.2	<2.0	< 1.0	<2.25
17	6	< 0.2	<2.0	< 1.0	<2.25
17	8	< 0.2	<2.0	< 1.0	<2.25
17	10	< 0.2	<2.0	< 1.0	<2.25
17	12	< 0.2	<2.0	< 1.0	<2.25
18	2	< 0.2	<2.0	< 1.0	<2.25
18	4	< 0.2	<2.0	< 1.0	<2.25
18	6	< 0.2	<2.0	< 1.0	<2.25
18	8	< 0.2	<2.0	< 1.0	<2.25

Well #	Depth	D TECH Range (ppm)	8330 TNT (ppm)	8330 TNB (ppm)	TNT Equivalent (ppm)
18	10	< 0.2	<2.0	< 1.0	<2.25
18	12	< 0.2	<2.0	< 1.0	<2.25
19	2	< 0.2	<2.0	< 1.0	<2.25
19	4	< 0.2	<2.0	< 1.0	<2.25
19	6	< 0.2	<2.0	< 1.0	<2.25
19	8	< 0.2	<2.0	< 1.0	<2.25
19	10	0.2 - 0.5	<2.0	< 1.0	<2.25
19	12	< 0.2	<2.0	< 1.0	<2.25
20	2	< 0.2	<2.0	< 1.0	<2.25
20	4	0.5 - 1.0	<2.0	< 1.0	<2.25
20	6	> 1.5	<2.0	< 1.0	<2.25
20	8	> 1.5	4.75	2.60	5.40
20	10	> 1.5	<2.0	2.97	0.74-2.74
20	12	> 1.5	<2.0	6.29	1.57-3.57
21	2	> 1.5	<2.0	< 1.0	<2.25
21	4	> 1.5	3.64	5.05	4.90
21	6	> 1.5	<2.0	6.62	1.66-3.66
21	8	> 1.5	<2.0	1.94	0.49-2.49
21	10	> 1.5	<2.0	8.53	2.13-4.13
21	12	> 1.5	<2.0	6.77	1.69-3.69
21	15	> 1.5	<2.0	6.75	1.69-3.69
21	20	> 1.5	<2.0	17.6	4.40-6.41
21	25	> 1.5	6.39	39.2	16.2
21	30	> 1.5	<2.0	< 1.0	<2.25
21	35	> 1.5	4.20	1.39	4.55
21	40	> 1.5	<2.0	< 1.0	<2.25
21	45	1.0 - 1.5	<2.0	< 1.0	<2.25
21	50	0.5 - 1.0	<2.0	< 1.0	<2.25
21	55	< 0.2	<2.0	< 1.0	<2.25
21	60	< 0.2	<2.0	< 1.0	<2.25

Well #	Depth	D TECH Range (ppm)	8330 TNT (ppm)	8330 TNB (ppm)	TNT Equivalent (ppm)
22	2	> 1.5	5.14	< 1.0	5.14-5.39
22	4	> 1.5	<2.0	< 1.0	<2.25
22	6	< 0.2	<2.0	< 1.0	<2.25
22	8	< 0.2	<2.0	< 1.0	<2.25
22	10	< 0.2	<2.0	< 1.0	<2.25
22	12	< 0.2	<2.0	< 1.0	<2.25
22	15	> 1.5	<2.0	2.68	0.67-2.67
22	20	> 1.5	<2.0	7.65	1.91-3.91
22	25	> 1.5	<2.0	27.70	6.9-8.9
22	30	> 1.5	<2.0	9.01	2.25-4.25
22	35	> 1.5	<2.0	30.90	7.7-9.7
22	40	> 1.5	<2.0	35.70	8.9-10.9
22	45	0.5 - 1.0	<2.0	< 1.0	<2.25
22	50	< 0.2	<2.0	< 1.0	<2.25
22	55	< 0.2	<2.0	< 1.0	<2.25
22	60	< 0.2	<2.0	< 1.0	<2.25
23	2	> 1.5	820	5.69	821
23	4	> 1.5	1200	24.0	1206
23	6	> 1.5	27.6	11.9	31
23	8	> 1.5	7.43	9.01	9.70
23	10	> 1.5	4.98	9.46	7.40
23	12	> 1.5	3.32	10.4	5.90
23	15	> 1.5	3.42	16.5	7.60
23	20	> 1.5	4.32	28.2	11.4
23	25	> 1.5	7.57	44.8	18.8
23	30	> 1.5	5.12	81.2	25.4
23	35	> 1.5	<2.0	1.64	0.41-2.41
23	40	0.5 - 1.0	<2.0	2.27	0.57-2.57
23	45	0.2 - 0.5	<2.0	< 1.0	<2.25
23	50	0.5 - 1.0	<2.0	< 1.0	<2.25

Well #	Depth	D TECH Range (ppm)	8330 TNT (ppm)	8330 TNB (ppm)	TNT Equivalent (ppm)
23	60	< 0.2	<2.0	< 1.0	<2.25
24	2	> 1.5	33.5	23.4	39.4
24	4	> 1.5	2.19	8.43	4.30
24	6	> 1.5	7.00	11.0	9.75
24	8	> 1.5	2.84	4.69	4.01
24	10	> 1.5	<2.0	5.67	1.42-3.42
24	12	> 1.5	2.23	12.8	5.43
24	15	> 1.5	5.38	31.4	13.23
24	20	> 1.5	2.60	13.0	5.85
24	25	> 1.5	4.43	31.1	12.2
24	30	> 1.5	4.79	25.9	11.3
24	35	> 1.5	2.29	18.2	6.8
24	40	1.0 - 1.5	8.84	148	45.8
24	45	> 1.5	9.01	< 1.0	9.01
24	50	0.5 - 1.0	<2.0	< 1.0	<2.25
24	55	1.0 - 1.5	<2.0	< 1.0	<2.25
24	60	0.5 - 1.0	<2.0	< 1.0	<2.25
25	2	> 1.5	29.00	6.02	30.50
25	4	> 1.5	<2.0	< 1.0	<2.25
25	6	> 1.5	<2.0	1.30	0.33-2.33
25	8	> 1.5	<2.0	7.50	1.88-3.88
25	10	> 1.5	<2.0	4.70	1.18-3.18
25	12	> 1.5	2.49	30.0	9.99
25	15	> 1.5	<2.0	29.1	7.28-9.28
25	20	> 1.5	<2.0	8.86	2.22-4.22
25	25	> 1.5	<2.0	30.7	7.68-9.68
25	30	> 1.5	<2.0	38.1	9.59-11.6
25	35	> 1.5	3.98	183	49.7
25	40	> 1.5	5.67	122	36.2
25	45	> 1.5	7.05	< 1.0	7.05-7.3

Well #	Depth	D TECH Range (ppm)	8330 TNT (ppm)	8330 TNB (ppm)	TNT Equivalent (ppm)
25	50	0.2 - 0.5	<2.0	< 1.0	<2.25
25	55	< 0.2	<2.0	< 1.0	<2.25
25	60	< 0.2	<2.0	< 1.0	<2.25
26	2	> 1.5	8.04	< 1.0	8.04-8.29
26	4	> 1.5	1000	7.49	1001
26	6	0.5 - 1.0	2.12	2.99	2.87
26	8	0.5 - 1.0	8.83	5.56	10.20
26	10	1.0 - 1.5	3.64	3.20	4.44
26	12	> 1.5	3.22	10.6	5.87
26	15	> 1.5	<2.0	18.3	4.58-6.58
26	20	> 1.5	<2.0	17.4	4.43-6.43
26	25	> 1.5	<2.0	20.4	5.10-7.10
26	30	> 1.5	<2.0	117	29.2-31.2
26	35	1.0 - 1.5	<2.0	1.96	0.49-2.49
26	40	1.0 - 1.5	<2.0	< 1.0	<2.25
26	45	< 0.2	<2.0	< 1.0	<2.25
26	50	0.2 - 0.5	<2.0	< 1.0	<2.25
26	55	< 0.2	<2.0	< 1.0	<2.25
26	60	< 0.2	<2.0	< 1.0	<2.25
27	2	0.5 - 1.0	<2.0	< 1.0	<2.25
27	4	> 1.5	351	5.77	352
27	6	> 1.5	116	39.2	126
27	8	> 1.5	4.29	3.92	5.27
27	10	> 1.5	<2.0	11.6	2.9-4.9
27	12	> 1.5	2.34	9.26	4.66
27	15	> 1.5	<2.0	48.7	12.2-14.2
27	20	0.5 - 1.0	<2.0	5.05	1.26-3.26
27	25	> 1.5	<2.0	12.6	3.15-5.15
27	30	> 1.5	<2.0	10.7	2.68-4.68
27	35	0.2 - 0.5	<2.0	< 1.0	<2.25

Well #	Depth	D TECH Range (ppm)	8330 TNT (ppm)	8330 TNB (ppm)	TNT Equivalent (ppm)
27	40	0.5 - 1.0	<2.0	< 1.0	<2.25
27	45	< 0.2	<2.0	< 1.0	<2.25
27	50	< 0.2	<2.0	< 1.0	<2.25
27	55	< 0.2	<2.0	< 1.0	<2.25
27	60	< 0.2	<2.0	< 1.0	<2.25
28	2	< 0.2	<2.0	< 1.0	<2.25
28	4	< 0.2	<2.0	< 1.0	<2.25
28	6	< 0.2	<2.0	< 1.0	<2.25
28	8	< 0.2	<2.0	< 1.0	<2.25
28	10	< 0.2	<2.0	< 1.0	<2.25
28	12	< 0.2	<2.0	< 1.0	<2.25
28	15	0.2 - 0.5	<2.0	< 1.0	<2.25
28	20	0.2 - 0.5	<2.0	< 1.0	<2.25
28	25	> 1.5	<2.0	11.1	2.78-4.78
28	30	> 1.5	<2.0	3.74	0.94-2.94
28	35	< 0.2	<2.0	1.88	0.47-2.47
28	40	0.2 - 0.5	<2.0	< 1.0	<2.25
28	45	< 0.2	<2.0	< 1.0	<2.25
28	50	< 0.2	<2.0	< 1.0	<2.25
28	55	< 0.2	<2.0	< 1.0	<2.25
28	60	< 0.2	<2.0	< 1.0	<2.25
29	2	< 0.2	<2.0	< 1.0	<2.25
29	4	> 1.5	<2.0	< 1.0	<2.25
29	6	> 1.5	4.24	< 1.0	4.24-4.49
29	8	> 1.5	<2.0	1.10	0.28-2.28
29	10	0.5 - 1.0	<2.0	1.28	0.32-2.32
29	12	1.0 - 1.5	<2.0	2.70	0.68-2.68
29	15	> 1.5	<2.0	10.5	2.63-4.63
29	20	> 1.5	<2.0	14.1	3.53-5.53
29	25	> 1.5	<2.0	18.4	4.6-6.6

Well #	Depth	D TECH Range (ppm)	8330 TNT (ppm)	8330 TNB (ppm)	TNT Equivalent (ppm)
29	30	0.5 - 1.0	<2.0	6.35	1.59-3.59
29	35	1.0 - 1.5	<2.0	6.66	1.67-3.67
29	40	0.5 - 1.0	<2.0	21.8	5.45-7.45
29	45	< 0.2	<2.0	< 1.0	<2.25
29	50	< 0.2	<2.0	< 1.0	<2.25
29	55	< 0.2	<2.0	< 1.0	<2.25
29	60	< 0.2	<2.0	< 1.0	<2.25
30	2	< 0.2	<2.0	< 1.0	<2.25
30	4	< 0.2	<2.0	< 1.0	<2.25
30	6	< 0.2	<2.0	< 1.0	<2.25
30	8	< 0.2	<2.0	< 1.0	<2.25
30	10	< 0.2	<2.0	< 1.0	<2.25
30	12	0.5 - 1.0	<2.0	5.29	1.32-3.32
30	15	0.5 - 1.0	<2.0	4.49	1.12-3.12
30	20	1.0 - 1.5	<2.0	16.3	4.08-6.08
30	25	> 1.5	<2.0	28.7	7.18-9.18
30	30	> 1.5	<2.0	17.7	4.43-6.43
30	35	> 1.5	<2.0	24.1	6.03-8.03
30	40	< 0.2	<2.0	< 1.0	<2.25
30	45	0.5 - 1.0	<2.0	< 1.0	<2.25
30	50	< 0.2	<2.0	< 1.0	<2.25
30	55	< 0.2	<2.0	< 1.0	<2.25
30	60	< 0.2	<2.0	< 1.0	<2.25
31	2	0.2 - 0.5	6.35	< 1.0	6.35-6.6
31	4	< 0.2	<2.0	< 1.0	<2.25
31	6	< 0.2	<2.0	< 1.0	<2.25
31	8	< 0.2	<2.0	2.52	0.63-2.63
31	10	0.5 - 1.0	<2.0	2.40	0.60-2.6
31	12	0.2 - 0.5	<2.0	4.70	1.18-3.18
31	15	0.5 - 1.0	<2.0	11.6	2.9-4.9

Well #	Depth	D TECH Range (ppm)	8330 TNT (ppm)	8330 TNB (ppm)	TNT Equivalent (ppm)
31	20	> 1.5	<2.0	56.9	14.2-16.2
31	25	> 1.5	<2.0	45.6	11.4-13.4
31	30	> 1.5	<2.0	67.7	16.9-18.9
31	35	0.5 - 1.0	<2.0	< 1.0	<2.25
31	40	0.2 - 0.5	<2.0	< 1.0	<2.25
31	45	< 0.2	<2.0	< 1.0	<2.25
31	50	< 0.2	<2.0	< 1.0	<2.25
31	55	< 0.2	<2.0	< 1.0	<2.25
31	60	< 0.2	<2.0	< 1.0	<2.25
32	2	< 0.2	<2.0	< 1.0	<2.25
32	4	< 0.2	<2.0	< 1.0	<2.25
32	6	< 0.2	<2.0	< 1.0	<2.25
32	8	< 0.2	<2.0	< 1.0	<2.25
32	10	< 0.2	<2.0	< 1.0	<2.25
32	12	< 0.2	<2.0	< 1.0	<2.25
32	15	< 0.2	<2.0	< 1.0	<2.25
32	20	< 0.2	<2.0	< 1.0	<2.25
32	25	< 0.2	<2.0	< 1.0	<2.25
32	30	0.2 - 0.5	<2.0	2.78	0.7-2.7
32	35	< 0.2	<2.0	< 1.0	<2.25
32	40	1.0 - 1.5	<2.0	< 1.0	<2.25
32	45	< 0.2	<2.0	< 1.0	<2.25
32	50	< 0.2	<2.0	< 1.0	<2.25
32	55	< 0.2	<2.0	< 1.0	<2.25
32	60	< 0.2	<2.0	< 1.0	<2.25
33	2	< 0.2	<2.0	< 1.0	<2.25
33	4	< 0.2	<2.0	< 1.0	<2.25
33	6	< 0.2	<2.0	< 1.0	<2.25
33	8	< 0.2	<2.0	< 1.0	<2.25
33	10	< 0.2	<2.0	< 1.0	<2.25

Well #	Depth	D TECH Range (ppm)	8330 TNT (ppm)	8330 TNB (ppm)	TNT Equivalent (ppm)
33	12	< 0.2	<2.0	< 1.0	<2.25
33	15	< 0.2	<2.0	1.61	0.4-2.4
33	20	< 0.2	<2.0	4.07	1.02-3.02
33	25	0.2 - 0.5	<2.0	3.12	0.78-2.78
33	30	0.2 - 0.5	<2.0	< 1.0	<2.25
33	35	0.2 - 0.5	<2.0	< 1.0	<2.25
33	40	< 0.2	<2.0	< 1.0	<2.25
33	45	< 0.2	<2.0	< 1.0	<2.25
33	50	< 0.2	<2.0	< 1.0	<2.25
33	55	0.2 - 0.5	<2.0	< 1.0	<2.25
33	60	< 0.2	<2.0	< 1.0	<2.25

TABLE 11
KIT COMPONENT STABILITY

METHOD: To determine the stability of the D TECH TNT reagents, kits were stored at 37°C and tested over the course of thirty-five (35) days. Two (2) test solutions were made in assay diluent on day 0 and run in these kits to determine the stability of the reagents at this temperature. The results are given below.

	Day 0 % Blue	Day 4 % Blue	Day 11 % Blue	Day 21 % Blue	Day 28 % Blue	Day 35 % Blue
0 ppb	60	60	50	50	55	55
10 ppb	30	20	20	20	20	20

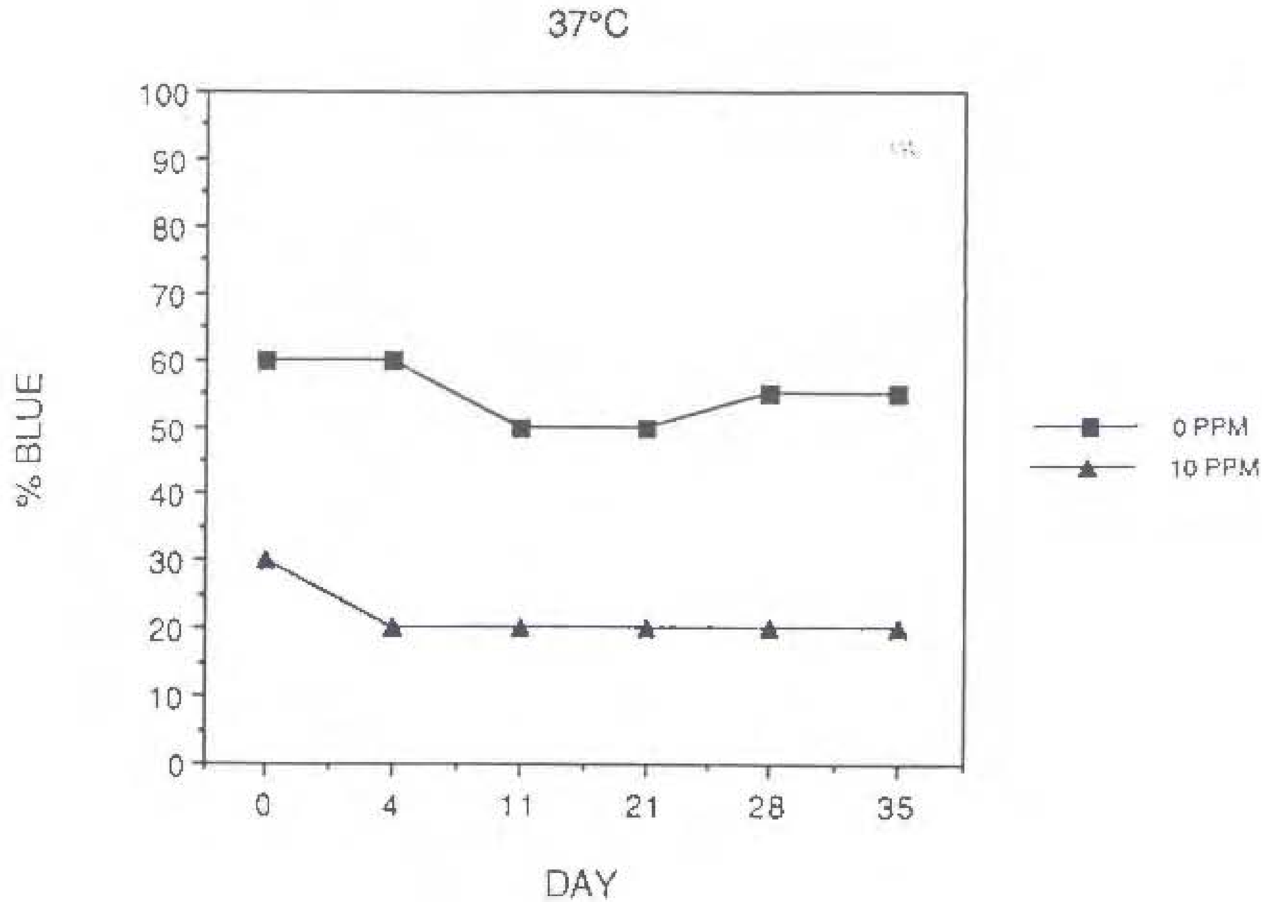


TABLE 12
KIT COMPONENT STABILITY

METHOD: To determine the stability of the D TECH TNT reagents, kits were stored at 22°C and tested over the course of one hundred twenty (120) days. Two (2) test solutions were made in assay diluent on day 0 and run in these kits to determine the stability of the reagents at this temperature. The results are given below.

	Day 0 % Blue	Day 30 % Blue	Day 60 % Blue	Day 90 % Blue	Day 120 % Blue
0 ppb	65	70	65	65	65
10 ppb	40	40	40	40	40

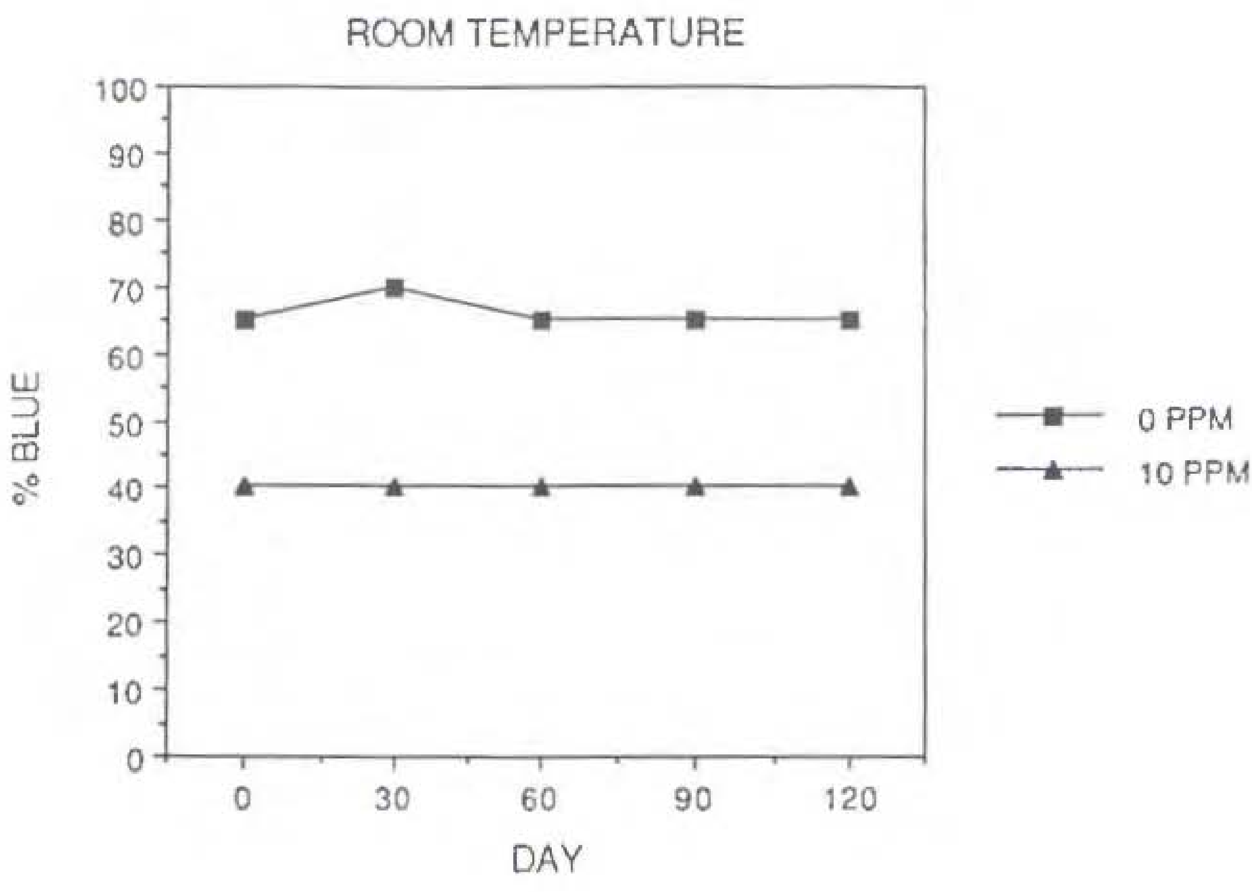


TABLE 13
ASSAY VARIABILITY

METHOD: Three (3) discrete real world water samples were spiked with TNT at different concentrations and run the same day by the same technician to determine the Inter-Assay Coefficient of Variation. Discrete sample concentrations were determined (for internal assay development purposes only) by running a TNT standard curve and using a point-to-point curve-fitting data reduction method.

	Sample 1	Sample 2	Sample 3
MEAN	9.8	16.7	28.6
SD	1.0	1.7	2.4
%CV	10.2	10.2	8.4

D TECH — TNT EXPLOSIVES TEST KIT INSTRUCTION GUIDE — TK-1004-1 — 800-222-0342

IMPORTANT
Read all instructions and handling procedures before using this kit. For assistance call the TECHNICAL SERVICE HOT LINE 1-800-222-0342.

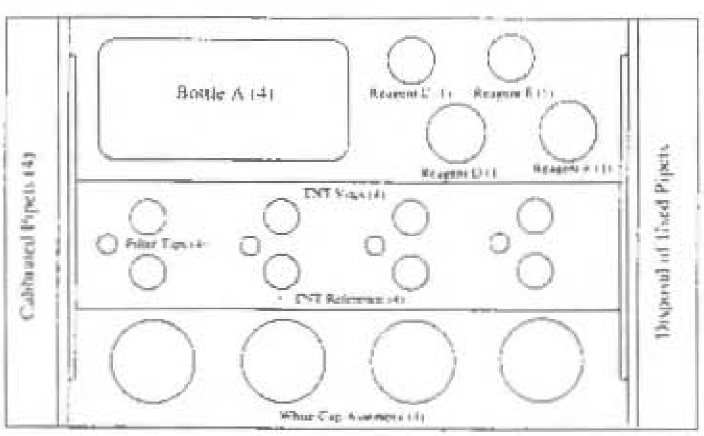
INTENDED USE
The D TECH™ TNT on-site and laboratory test kit is designed to provide quick, semiquantitative, and reliable test results for making environmental decisions.
The D TECH TNT Explosives Test Kit can be used on-site for identifying "hot spots", site mapping, monitoring of remediation processes and selecting site samples for laboratory analysis.
In the laboratory, the D TECH TNT Explosives Test can screen highly contaminated samples that require pre-dilution prior to instrumental analysis.

PRINCIPLE
The D TECH system for analyzing trace amounts of explosives is based on immunoassay technology.
An antibody specific for TNT and closely related compounds has been linked to solid particles which are collected on the membrane of the cup assembly.
A color developing solution added to the surface of the cup assembly develops a color inversely proportional to the concentration of TNT Equivalents in the sample (less color indicates more TNT present in sample).
TNT Equivalents are measured at parts per million (ppm) in soil and parts per billion (ppb) in water samples.

TEST KIT DESCRIPTION
The D TECH TNT Explosives Test Kit, Item #TK-1004-1, contains sufficient materials to perform four tests.
This kit can test water samples or be used with the D TECH TNT/RDX Soil Extraction Pac, Item #TK-1001S-1, to test soil samples.
The TNT/RDX Soil Extraction Pac contains only the materials needed to extract TNT from soil for semi-quantitation with this D TECH TNT Explosives Test Kit. The results can be obtained by using the enclosed Color Card or the DTECHTOR Meter, Item #TK-1001M-1.

STORAGE AND STABILITY
This kit has excellent stability at room temperature and under refrigeration. For expiration datin under these conditions, see the package label.

MATERIALS PROVIDED
See tray diagram below. This diagram includes the kit component names and quantity of each item.



Not shown in diagram

Used Kit Label (1)

Instruction Guide (1)

Color Card (1)

Data Labels (4) for Cup Assembly

Red Dot Labels (4) for identifying used Bottle A components

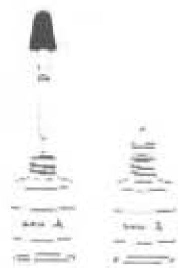
ACCESSORIES SUPPLIED BY USER
Timing Device (minutes)
D TECH TNT/RDX Soil Extraction Pac, Item #TK-1001S-1 (if testing soil samples)
the DTECHTOR Meter, Item #TK-1001M-1 (optional)

This package is designed to serve as a WORK STATION. At the conclusion of the test, the components can be left in the package for proper disposal.
Important: Read all Health/Safety Comments on page 4 prior to use.

Step 1: Choose corresponding sample source to determine the first step.

WATER SAMPLE: Using a new calibrated pipet, transfer **1 ml** of sample to **Bottle A**. Snap filter tip on **Bottle A**. Gently mix.

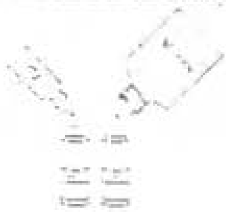
SOIL SAMPLE: Using a new calibrated pipet, transfer **1 ml** of **Bottle 2** solution from D TECH TNT/RDX Soil Extraction Pac, (Item #TK-10015-1) to **Bottle A**; snap filter tip on **Bottle A**. Gently mix. Re-cap **Bottle 2** and set aside.



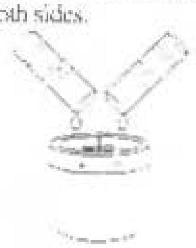
Note: The vials in the next two steps need to stand 2 minutes after dispensing the liquid. The solutions in these vials will remain hazy.

Step 2: Squeeze **Bottle A** filling the **TNT Vial** to a level between the two lines (approximately 13-14 drops). Gently mix.

Step 3: Squeeze the contents of **Reagent C** (white cap) to fill the **TNT Reference** vial to a level between the 2 lines. Gently mix.



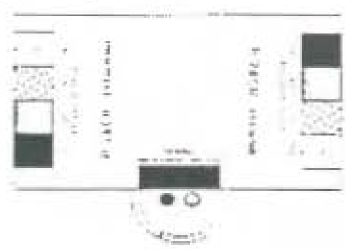
Step 4: After 2 minutes, pour contents of **TNT Vial** onto the T (test) side of the cup assembly. Pour the contents of the **Reference** vial onto the **R** side of the cup assembly. Allow liquid to drain completely through on both sides.



Step 5: Add approximately 8-12 drops of **Reagent D** solution (yellow cap) into each side of the cup assembly. Drain completely.

Step 6: Add approximately 5 drops of **Reagent E** solution (blue cap) to each side of the cup assembly. Be sure to add this solution immediately to the second well after addition to the first well. Drain completely.

Step 7: Read results when color of **R** (left) side of cup assembly matches the color of the reference bar of the **Color Card**. (The color development time is approximately 10 minutes at 70°F. More time is required at lower temperatures and less time is required at higher temperatures.)



COLOR CARD: Match the color on the **T** side of the cup assembly to the **Color Card**.
and/or
the DTECHTOR: Quantitate the result using *the* DTECHTOR Meter (see Instrument Operator's Guide for complete instructions).

See Interpretation of the Test section (page 3) to determine concentration of TNT Equivalents. Record result on a **Cup Assembly** label and apply to the cup.

Note: To preserve the color for up to 4 hours (optional), add approximately 8 drops of ***Reagent F*** *solution (red cap) into each side of the cup assembly. Drain completely.*

the DTECHTOR Meter Set Up

the DTECHTOR light sources must be calibrated whenever the meter is turned on. Calibrators are provided with the meter for this purpose. The **Calibrator** must be clean and white to insure valid results.

Step 1: Insert **Calibrator** into the **Meter Head** and hold firmly in place. (ZERO)

Step 2: Press the Square Button 1 time. When calibration is complete the meter will display........ (SET)

Step 3: Remove **Calibrator** and return it to its protective cannister. Display remains.............. (SET)

Step 4: Press the Square Button 1 time to select meter program #1 (Program to be used for this D TECH test kit). (SET #1)

Step 5: Insert Cup Assembly (test) into the Meter Head and firmly hold in place. (TEST #1)

Note: The #1 in the upper right corner of the display window in Steps 4 & 5 corresponds to the meter program number being used to obtain the meter reading.

Step 6: Press the Square Button 1 time. (- - -)

Note: If the meter displays "WAIT", remove Cup Assembly. Allow reference color to develop further and try again.

Obtain the meter reading.
For example............. (46%)
Use *the* DTECHTOR Table (see page 3) and the meter reading to determine the concentration of TNT.

Step 7: Record result then press Square Button 1 time while holding the **Cup Assembly** in place. (- - - -)

Step 8: Key in 4 digit Label. (Optional)

Step 9: Remove **Cup Assembly**. (SET #1)

Step 10: Insert next **Cup Assembly** (test) and repeat Steps 5 - 9.

PERFORMANCE CHARACTERISTICS

INTERPRETATION OF THE TEST The results from the D TECH TNT Explosives Test Kit can be interpreted using either the **Color Card** supplied with the kit or *the* DTECHTOR and the table provided below. If the color of the test does not exactly match a panel of the color card, user interpretation is required.

the DTECHTOR Table

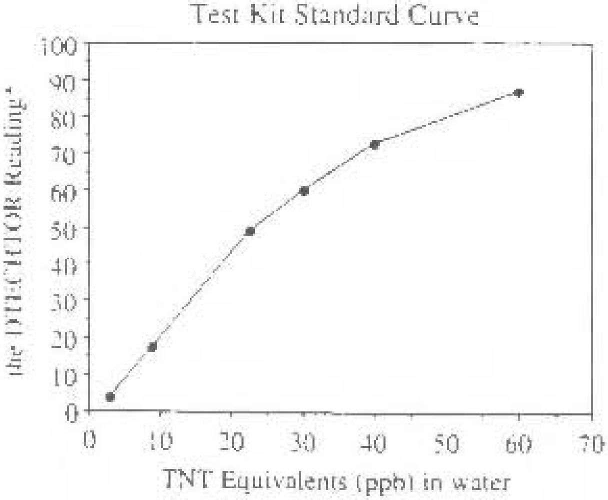
Sample	*the* DTECHTOR Reading	TNT Equivalents (ppb)
Water	LO	< 5
	1 - 30	5 - 15
	30 - 50	15 - 25
	50 - 75	25 - 45
	HI	> 45
		(ppm)
Soil	LO	<0.5
	1 - 15	0.5 - 1.5
	15 - 45	1.5 - 3.0
	45 - 60	3.0 - 4.0
	60 - 75	4.0 - 5.0
	HI	>5.0

SENSITIVITY The D TECH TNT Explosives Test Kit can be used to reliably measure TNT in the following ranges:

Sample	*the* DTECHTOR	Color Card
Water (ppb)	5 - 45	5 - 60
Soil (ppm)	0.5 - 5.0	0.5 - 5.0

The Minimum Detection Limit (MDL) of the test for TNT in a water sample is 5 ppb and in soil is 0.5 ppm. The graph below is a typical standard curve for the D TECH TNT Explosives Test Kit.

D TECH TNT Explosives
Test Kit Standard Curve



*Percent Reflectance Relative to Reference

SPECIFICITY The D TECH TNT Explosives Test Kit has been tested for cross-reactivity with analogues and degradation products of TNT and other explosives. The table below summarizes the cross-reactivity of these compounds in water samples using *the* DTECHTOR. A positive test result may be due to the presence of TNT, cross-reactants or mixtures of compounds (TNT Equivalents). Samples testing positive for TNT should be confirmed by standard methods. The D TECH TNT Explosives Test Kit has been designed to minimize the effect of environmental interferences. Sample pH, nitrate, nitrite and ammonium do not effect test results.

Compound	IC_{50}[a] (ppb)	MDL[b] (ppb)	Cross-reactivity[c]
TNT (2,4,6-trinitrotoluene)	22	5	NA
Tetryl[d]	65	15	+
1,3,5-trinitrobenzene	96	20	+
2-amino-4,6-dinitrotoluene	200	30	+
2,4-dinitrotoluene	>500	120	+
4-amino-2,6-dinitrotoluene	>500	>500	-
2,6-dinitrotoluene	>500	>500	-
2,6-diaminonitrotoluene	>500	>500	-
2-nitrophenol	>500	>500	-
4-nitrophenol	>500	>500	-
2,4-dinitrophenol	>500	>500	-
RDX[d]	>500	>500	-
HMX[d]	>500	>500	-

a The IC_{50} is defined as the concentration of compound required to produce a test response equivalent to 50% of the maximum response.

b The Minimum Detection Limit (MDL) is defined as the lowest concentration of compound that yields a positive test result.

c A compound is considered cross-reactive when a concentration 100 times the MDL of TNT (500 ppb) yields a positive test result.

d Chemical Names: Tetryl (methyl-2,4,6-trinitrophenyl-nitramine), RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine), HMX (octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine)

NA - Not Applicable

TESTING HIGHER TNT CONCENTRATIONS

TNT concentrations greater than the upper limit of the test may be determined by diluting the extract with acetone. For example, an extract from a 100 ppm soil sample, processed using the D TECHTNT/RDX Soil Extraction Pac, may be diluted 1:25 in acetone and run in the D TECH TNT Explosives Test Kit. The concentration of the undiluted sample (100 ppm) is determined by multiplying the TNT concentration of the diluted sample (4.0 ppm) by the dilution factor (25). For further information, please call our technical service hotline 1-800-222-0342

HEALTH/SAFETY

Material Safety Data Sheets (MSDS) have been supplied with the purchase of this product. The MSDS should be read before using this test. During the execution of the test, any excess TNT is absorbed into the **Cup Assembly** absorbant plug. It is not retained on the surface of the **Cup Assembly**.
In this section we have emphasized health and safety precautions that should be followed when handling these solutions.

PROTECT EYES WITH SAFETY GLASSES
PROTECT SKIN WITH PROTECTIVE GLOVES

Associated Hazards
May be irritating to skin, eyes, and mucous membranes.

Symptoms of Exposure
May be irritating on contact with skin, eyes, and mucous membranes.

First Aid Measures
GET MEDICAL ASSISTANCE FOR ALL CASES OF OVEREXPOSURE

Skin:	Wash thoroughly with soap and water.
Eyes:	Immediately flush with water for at least 15 minutes.
Inhalation:	Remove to fresh air; give artificial respiration if breathing has stopped.
Ingestion:	Get immediate medical attention; if conscious, give water freely.

QUALITY CONTROL

All D TECH Test Kits are thoroughly quality controlled and manufactured at Strategic Diagnostics Incorporated's GMP facility. All products undergo extensive validation and field testing to assure accuracy and reliability.
All lots of product are thoroughly quality controlled to consistently meet the published specification.

EM SCIENCE/Strategic Diagnostics Inc.
480 Democrat Road
P.O. Box 70
Gibbstown, N.J. 08027
(800) 222-0342

APPENDIX C

USEPA REGION III
RISK-BASED CONCENTRATION TABLE, JANUARY - JUNE 1995

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region III
841 Chestnut Street
Philadelphia, Pennsylvania 19107

March 7, 1995

SUBJECT: Risk-Based Concentration Table, January - June 1995

FROM: Roy L. Smith, Ph.D., Senior Toxicologist
Technical Support Section (3HW13)

TO: RBC Table Mailing List

Attached is the EPA Region III Risk-Based Concentration (RBC) table, which we have distributed quarterly to all interested parties since 1991. Please see below for some important announcements concerning changes in the Table and administrative issues with our mailing list.

Major Changes in this Issue of the RBC

1. IRIS and HEAST have matured, and EPA has revised them at a decreasing rate over the last few years. Lately, each quarterly RBC update has been virtually the same as its predecessor. Meanwhile, the mailing list for the RBC table has expanded exponentially and the quarterly mailings have become a substantial burden to the Region. Upon reflection, we've decided to change to semi-annual distribution. We think this change will extend our ability to keep producing the RBC table, while having little effect on the table's usefulness. (For example, there have been *no* changes to toxicity constants in IRIS or HEAST in the three months since the 4th quarter table was published.)

2. The RBC table now includes soil screening levels (SSLs) for protection of groundwater and air. Most of the new entries were taken directly from EPA/OSWER's newly proposed SSL guidance document. We've added some additional SSLs based on the same proposed methodology. Sources of SSLs are noted in the table. SSLs incorporate all the same exposure assumptions as RBCs, plus many additional assumptions needed for inter-media extrapolation. SSLs are therefore distinct from RBCs, and should be used only in the framework proposed in the OSWER document. If you have not yet seen this proposal, you can obtain it from NTIS (703-487-4650, as document numbers 9355.4-1, PB95-963530, or EPA540/R-94/105).

Administrative Issues

Our situation on the administrative front can be summarized in one word--"HELP"!! The RBC mailing list now includes more than 1300 recipients and we are experiencing significant problems with our current "delivery system." We would appreciate your suggestions for making our future mailings more efficient. We are also exploring the possibility of providing access to the RBC through an electronic bulletin board and would like your feedback on that idea. In the meantime, we will be examining our current mailing list and limiting future mailings to one individual per organization; we need your help in distributing the RBC within your organization if there are others who would like copies.

We have installed a new phone line to help with your questions about the RBC: 215-597-1116. This is Anna Poulton's number and it has a voice-mail system to take your calls if we're not available. Please limit your questions to RBC issues; if you have a question about applying the RBC to a site, please call the EPA Regional office handling the project.

Thanks for your patience and cooperation with these administrative issues!

Minor Changes

1. As many have requested, the soil ingestion rate for commercial/industrial exposure has been revised to include EPA's national default assumption that only 50% of ingested soil is associated with work. The worker soil exposure is now fully consistent with EPA's standard exposure factors for Superfund.

2. Many callers have complained about the lower case 'e' and 'o' notations on the table, which can't be easily distinguished. All such notations have been capitalized.

Still the Same

The table contains reference doses and carcinogenic potency slopes (obtained from IRIS through January 1, 1995, HEAST through March 1994, the Superfund Health Risk Technical Support Center, and other EPA sources) for nearly 600 chemicals. These toxicity constants have been combined with "standard" exposure scenarios to calculate RBCs - chemical concentrations corresponding to fixed levels of risk (*i.e.*, a hazard quotient of 1, or lifetime cancer risk of 10^{-6}, whichever occurs at a lower concentration) in water, air, fish tissue, and soil.

The Region III toxicologists use the table to screen sites not yet on the NPL, respond rapidly to citizen inquiries, and spot-check formal baseline risk assessments. The background materials provide the complete basis for all the calculations, with the intent of showing users exactly how the RBCs were developed. Simply put, RBCs are risk assessments run in reverse. For a single contaminant in a single medium, under standard default exposure assumptions, the RBC corresponds to the target risk or hazard quotient.

The RBCs also have several important limitations. Specifically excluded from consideration are (1) transfers from soil to air and groundwater, and (2) cumulative risk from multiple contaminants or media. Also, the toxicity information in the table has been assembled by hand, and (despite extensive checking and years of use) may contain errors. It's advisable to cross-check before relying on any RfDs or CPSs in the table. If you find any errors, please send me a note.

Many people want to know if the risk-based concentrations can be used as valid no-action levels or cleanup levels, especially for soils. The answer is a bit complex. First, it is important to realize that the RBC table does not constitute regulation or guidance, and should not be viewed as a substitute for a site-specific risk assessment. For sites where:

1. A single medium is contaminated;

2. A single contaminant contributes nearly all of the health risk;

3. Volatilization or leaching of that contaminant from soil is expected not to be significant;

4. The exposure scenarios used in the RBC table are appropriate for the site;

5. The fixed risk levels used in the RBC table are appropriate for the site; and

6. Risk to ecological receptors is expected not to be significant;

the risk-based concentrations would probably be protective as no-action levels or cleanup goals. However, to the extent that a site deviates from this description, as most do, the RBCs would not necessarily be appropriate.

To summarize, the table should generally not be used to (1) set cleanup or no-action levels at CERCLA or RCRA Corrective Action sites, (2) substitute for EPA guidance for preparing baseline risk assessments, or (3) determine if a waste is hazardous under RCRA.

Attachment

EPA Region III Risk-Based Concentration Table

Background Information

Roy L. Smith, Ph.D.
Senior Toxicologist
February 9, 1995

Development of Risk-Based Concentrations

General

Separate carcinogenic and non-carcinogenic risk-based concentrations were calculated for each compound for each pathway. The concentration in the table is the lower of the two, rounded to two significant figures. The following terms and values were used in the calculations:

Exposure variables	Value	Symbol
General:		
Carcinogenic potency slope oral (risk per mg/kg/d):	*	CPSo
Carcinogenic potency slope inhaled (risk per mg/kg/d):	*	CPSi
Reference dose oral (mg/kg/d):	*	RfDo
Reference dose inhaled (mg/kg/d):	*	RfDi
Target cancer risk:	1e-06	TR
Target hazard quotient:	1	THQ
Body weight, adult (kg):	70	BWa
Body weight, age 1-6 (kg):	15	BWc
Averaging time carcinogens (d):	25550	ATc
Averaging time non-carcinogens (d):	ED*365	ATn
Inhalation, adult (m3/d):	20	IRAa
Inhalation, child (m3/d):	12	IRAc
Inhalation factor, age-adjusted (m3-y/kg-d):	11.66	IFAadj
Tap water ingestion, adult (L/d):	2	IRWa
Tap water ingestion, age 1-6 (L/d):	1	IRWc
Tap water ingestion factor, age-adjusted (L-y/kg-d):	1.09	IFWadj
Fish ingestion (g/d):	54	IRF
Soil ingestion, adult (mg/d):	100	IRSa
Soil ingestion, age 1-6 (mg/d):	200	IRSc
Soil ingestion factor, age adjusted (mg-y/kg-d):	114.29	IFSadj
Residential:		
Exposure frequency (d/y):	350	EFr
Exposure duration, total (y):	30	EDtot
Exposure duration, age 1-6 (y):	6	EDc
Volatilization factor (L/m3):	0.5	K

Exposure variables	**Value**	**Symbol**
Occupational:		
Exposure frequency (d/y):	250	EFo
Exposure duration (y):	25	EDo
Fraction of contaminated soil ingested (unitless)	0.5	FC

*: Contaminant-specific toxicological constants. The priority among sources of toxicological constants was as follows: (1) IRIS, (2) HEAST, (3) HEAST alternative method, (4) EPA Superfund Health Risk Technical Support Center, (5) withdrawn from IRIS or HEAST, and (6) other EPA documents. Each source was used only if numbers from higher-priority sources were unavailable. The EPA Superfund Health Risk Technical Support Center, part of the Chemical Mixtures Branch of ECAO-Cincinnati, develops provisional RfDs and CPSs on request for contaminants not in IRIS or HEAST. These provisional values are labeled "E = EPA-ECAO provisional" in the table. It is possible they may be obsolete. If one of the "E" constants is important to a Superfund risk assessment, consider requesting, through a Regional risk assessor, a new provisional value.

Age-adjusted factors

Because contact rates with tap water, ambient air, and residential soil are different for children and adults, carcinogenic risks during the first 30 years of life were calculated using age-adjusted factors. These factors approximated the integrated exposure from birth until age 30 by combining contact rates, body weights, and exposure durations for two age groups - small children and adults. The age-adjusted factor for soil was obtained from RAGS IB; the others were developed by analogy.

Air inhalation

$$IFAadj\ \frac{m^3 \cdot y}{kg \cdot d} = \frac{EDc \cdot IRAc}{BWc} + \frac{(EDtot - EDc) \cdot IRAa}{BWa}$$

Tap water ingestion

$$IFWadj\ \frac{L \cdot y}{kg \cdot d} = \frac{EDc \cdot IRWc}{BWc} + \frac{(EDtot - EDc) \cdot IRWa}{BWa}$$

Soil ingestion

$$IFSadj\ \frac{mg \cdot y}{kg \cdot d} = \frac{EDc \cdot IRSc}{BWc} + \frac{(EDtot - EDc) \cdot IRSa}{BWa}$$

Residential water

Volatilization terms were calculated only for compounds with a mark in the "VOC" column. Compounds having a Henry's Law constant greater than 10^{-5} were considered volatile. The list may be incomplete, but is unlikely to include false positives. The equations and the volatilization factor (K, above) were obtained from RAGS IB. Oral potency slopes and reference doses were used for both oral and inhaled exposures for volatile compounds lacking inhalation values. Inhaled potency slopes were substituted for unavailable oral potency slopes only for volatile compounds; inhaled RfDs were substituted for unavailable oral RfDs for both volatile and non-volatile compounds. RBCs for carcinogens were based on combined childhood and adult exposure; for non-carcinogens RBCs were based on adult exposure.

Carcinogens

$$RBC\ \tfrac{\mu g}{L} = \frac{TR \cdot ATc \cdot 1000\ \frac{\mu g}{mg}}{EFr \cdot ([K \cdot IFAadj \cdot CPSi] + [IFWadj \cdot CPSo])}$$

Non-carcinogens

$$RBC\ \tfrac{\mu g}{L} = \frac{THQ \cdot BWa \cdot ATn \cdot 1000\ \frac{\mu g}{mg}}{EFr \cdot EDtot \cdot \left(\frac{K \cdot IRAa}{RfDi} + \frac{IRWa}{RfDo}\right)}$$

Ambient air

Oral potency slopes and references were used where inhalation values were not available. RBCs for carcinogens were based on combined childhood and adult exposure; for non-carcinogens RBCs were based on adult exposure.

Carcinogens

$$RBC\ \tfrac{\mu g}{m^3} = \frac{TR \cdot ATc \cdot 1000\ \frac{\mu g}{mg}}{EFr \cdot IFAadj \cdot CPSi}$$

Non-carcinogens

$$RBC\ \tfrac{\mu g}{m^3} = \frac{THQ \cdot RfDi \cdot BWa \cdot ATn \cdot 1000\ \frac{\mu g}{mg}}{EFr \cdot EDtot \cdot IRAa}$$

Edible fish

All RBCs were based on adult exposure.

Carcinogens

$$RBC\ \tfrac{mg}{kg} = \frac{TR \cdot BWa \cdot ATc}{EFr \cdot EDtot \cdot \frac{IRF}{1000\ \frac{g}{kg}} \cdot CPSo}$$

Non-carcinogens

$$RBC\ \tfrac{mg}{kg} = \frac{THQ \cdot RfDo \cdot BWa \cdot ATn}{EFr \cdot EDtot \cdot \frac{IRF}{1000\ \frac{g}{kg}}}$$

Commercial/industrial soil ingestion

RBCs were based on adult occupational exposure, including an assumption that only 50% of total soil ingestion is work-related.

Carcinogens

$$RBC\ \tfrac{mg}{kg} = \frac{TR \cdot BWa \cdot ATc}{EFo \cdot EDo \cdot \dfrac{IRSa}{10^6\ \frac{mg}{kg}} \cdot FC \cdot CPSo}$$

Non-carcinogens

$$RBC\ \tfrac{mg}{kg} = \frac{THQ \cdot RfDo \cdot BWa \cdot ATn}{EFo \cdot EDo \cdot \dfrac{IRSa}{10^6\ \frac{mg}{kg}} \cdot FC}$$

Residential soil ingestion

RBCs for carcinogens were based on combined childhood and adult exposure; RBCs for non-carcinogens were based on childhood exposure only.

Carcinogens

$$RBC\ \tfrac{mg}{kg} = \frac{TR \cdot ATc}{EFr \cdot \dfrac{IFSadj}{10^6\ \frac{mg}{kg}} \cdot CPSo}$$

Non-carcinogens

$$RBC\ \tfrac{mg}{kg} = \frac{THQ \cdot RfDo \cdot BWc \cdot ATn}{EFr \cdot EDc \cdot \dfrac{IRSc}{10^6\ \frac{mg}{kg}}}$$

Development of Soil Screening Levels

General

In December 1994 the EPA Office of Solid Waste and Emergency Response proposed Soil Screening Guidance (Document 9355.4-1, PB95-963530, EPA540/R-94/101, available through NTIS at 703-487-4650). This draft document provides (1) a framework in which soil screening levels are to be used, (2) a detailed methodology for calculating soil screening levels, and (3) soil screening levels for 107 substances.

Consistent with this new guidance, the risk-based concentration table now includes two columns of generic soil screening levels (SSLs). OSWER's 107 proposed soil screening levels have been added verbatim. In addition, the proposed SSL methodology has been used to calculate soil screening levels for more substances, which are also included in the new table. The table clearly distinguishes the OSWER SSLs from the "unofficial" ones.

These SSLs provide reasonable maximum estimates of transfers of contaminants from soil to other media. One column contains soil concentrations protective of groundwater quality; the other contains soil concentrations protective of air quality. "Protective" is defined in the same terms as the risk-based concentrations for tap water and air -- that residential contact scenarios will yield a fixed upper bound risk of 10^{-6} or a fixed hazard quotient of 1 (whichever occurs at the lower concentration).

OSWER's SSLs should be used only within the framework proposed in the guidance document. The additional SSLs included in the RBC table are intended for the same uses (although they obviously carry less weight than the formally proposed numbers).

The SSLs are based on the following assumptions:

Input variables	Value	Symbol*
Surface soil moisture content (g/g)	0.1	w_s
Vadose zone soil moisture content (kg/kg)	0.2	w_v
Surface soil bulk density (g/cm^3)	1.5	ρ_{bs}
Vadose zone soil bulk density (kg/L)	1.5	ρ_{bv}
Surface soil particle density (g/cm^3)	2.65	ρ_{ps}
Vadose zone soil particle density (g/cm^3)	2.65	ρ_{pv}
Total surface soil porosity (L pore /L soil)	0.43	N_s
Total vadose zone soil porosity (L pore/L soil)	0.43	N_v
Air-filled surface soil porosity (L air/L soil)	0.28	θ_{as}
Water-filled surface soil porosity (L water/L soil)	0.15	θ_{ws}
Air-filled vadose zone soil porosity (L air/L soil)	0.13	θ_{av}
Water-filled vadose zone soil porosity (L water/L soil)	0.30	θ_{wv}
Organic carbon fraction of surface soil (g/g)	0.006	FOC_s
Organic carbon fraction of vadose zone soil (g/g)	0.002	FOC_v
Dispersion factor for 0.5 acres (g/m^{2}s per kg/m^3)	35.1	Q/C
Particulate emission factor (m^3/kg)	6.79e+08	PEF
Exposure interval (s)	9.50e+08	T
Dilution-attenuation factor (unitless)	10	DAF

***: Symbols were adjusted, variables were rearranged, and derived and chemical-specific variables were omitted for simplicity and clarity. Presentation of the input variables in a single table using the same terms as in the OSWER SSL document would have been confusing. The terms used here are generally similar to OSWER's, and can easily be compared with the SSL guidance document.**

With two exceptions described in the following section, SSL calculations were based on the same algorithms presented in the OSWER draft SSL guidance document. For details of the calculations (and for general background information on SSLs), I strongly recommend consulting that document. The "unofficial" SSLs were developed under the following conditions:

Soil Screening Levels for Inhalation

Inhaled reference doses and potency slopes were used if available. If inhalation values were not available, oral RfDs and potency slopes were substituted. SSLs were calculated only for substances for which aqueous solubility, Koc, Henry's Law constant, and diffusivity in air were available. SSLs were calculated only for substances for which a volatilization factor could be calculated. This was done because OSWER's large proposed particulate emission factor rendered it pointless to estimate SSLs for particulate emissions alone. The final calculated SSL shown in the RBC table is the smaller of the risk-based SSL and the soil saturation concentration. All calculated SSLs were rounded to 2 significant figures.

The OSWER risk algorithms for inhalation were revised in order to be consistent with the rest of the RBC table. Only calculated SSLs were affected by this; SSLs proposed by OSWER are presented verbatim. Calculated SSLs for inhalation of carcinogens were based on an integrated lifetime exposure rather than adult exposure. SSLs for inhalation of noncarcinogens were based on adult exposure for 350 days per year rather than 365 days per year. The following algorithms were used to calculate inhalation SSLs:

Carcinogens

$$SSL\ \frac{mg}{kg} = \frac{TR \cdot ATc}{EFr \cdot IFAadj \cdot \left(\frac{1}{VF} + \frac{1}{PEF}\right) \cdot CPSi}$$

Non-carcinogens

$$SSL\ \frac{mg}{kg} = \frac{THQ \cdot BWa \cdot ATn \cdot RfDi}{EFr \cdot EDtot \cdot IRAa \cdot \left(\frac{1}{VF} + \frac{1}{PEF}\right)}$$

Soil Screening Levels for Groundwater Use

All algorithms were as proposed by OSWER. MCLs were used as target groundwater concentrations if available. If MCLs were unavailable the risk-based concentration in the "tap water" column of the RBC table was used as the target groundwater concentration. All SSLs for groundwater are based on a dilution-attenuation factor (DAF) of 10. Since these SSLs scale linearly with DAF, the SSLs for DAF=1 would be ten times lower. They were omitted to conserve space. All groundwater SSLs were rounded to 2 significant figures and capped at unity.

Sources: I=IRIS H=HEAST A=HEAST alternate W=Withdrawn from IRIS or HEAST E=EPA-ECAO Regional Support provisional value O=Other EPA documents

Basis: C=carcinogenic effects N=noncarcinogenic effects E=EPA draft Soil Screening Level S=soil saturation concentration

Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo kg-d/mg	CPSi kg-d/mg	VOC	Risk-Based Concentrations: Tap Water µg/L	Ambient Air µg/m3	Fish mg/kg	Soil Ingestion: Industrial mg/kg	Soil Ingestion: Residential mg/kg	Soil Screening Levels - Transfers from Soil to: Air mg/kg	Groundwater mg/kg
Acephate	30560191	4.00E-03 i		8.70E-03 i			7.7 c	0.72 c	0.56 c	660 c	73 c		
Acetaldehyde	75070		2.57E-03 i		7.70E-03 i		94 n	0.81 c					
Acetochlor	34256821	2.00E-02 i					730 n	73 n	27 n	41000 n	1600 n		
Acetone	67641	1.00E-01 i					3700 n	370 n	140 n	200000 n	7800 n	62000 s	8 e
Acetone cyanohydrin	75865	7.00E-02 h	4.00E-02 a				2600 n	150 n	95 n	140000 n	5500 n		
Acetonitrile	75058	6.00E-03 i	1.43E-02 a				220 n	52 n	8.1 n	12000 n	470 n		
Acetophenone	98862	1.00E-01 i	5.71E-06 w			■	0.042 n	0.021 n	140 n	200000 n	7800 n		
Acifluorfen	62476599	1.30E-02 i					470 n	47 n	18 n	27000 n	1000 n		
Acrolein	107028	2.00E-02 h	5.71E-06 i				730 n	0.021 n	27 n	41000 n	1600 n		
Acrylamide	79061	2.00E-04 i		4.50E+00 i	4.55E+00 i		0.015 c	0.0014 c	0.0007 c	1.3 c	0.14 c		
Acrylic acid	79107	5.00E-01 i	1.00E-03 i				18000 n	3.7 n	680 n	1E+06 n	39000 n		
Acrylonitrile	107131	1.00E-03 h	5.71E-04 i	5.40E-01 i	2.38E-01 i		0.12 c	0.026 c	0.0058 c	11 c	1.2 c		
Alachlor	15972608	1.00E-02 i		8.00E-02 h			0.84 c	0.078 c	0.039 c	72 c	8 c		
Alar	1596845	1.50E-01 i					5500 n	550 n	200 n	310000 n	12000 n		
Aldicarb	116063	1.00E-03 i					37 n	3.7 n	1.4 n	2000 n	78 n	570 s	0.036 n
Aldicarb sulfone	1646884	1.00E-03 i					37 n	3.7 n	1.4 n	2000 n	78 n		
Aldrin	309002	3.00E-05 i		1.70E+01 i	1.71E+01 i		0.004 c	0.00037 c	0.00019 c	0.34 c	0.038 c	0.5 e	0.005 e
Ally	74223646	2.50E-01 i					9100 n	910 n	340 n	510000 n	20000 n		
Allyl alcohol	107186	5.00E-03 i					180 n	18 n	6.8 n	10000 n	390 n		
Allyl chloride	107051	5.00E-02 w	2.86E-04 i				1800 n	1 n	68 n	100000 n	3900 n		
Aluminum	7429905	1.00E+00 e					37000 n	3700 n	1400 n	1E+06 n	78000 n		
Aluminum phosphide	20859738	4.00E-04 i					15 n	1.5 n	0.54 n	820 n	31 n		
Amdro	67485294	3.00E-04 i					11 n	1.1 n	0.41 n	610 n	23 n		
Ametryn	834128	9.00E-03 i					330 n	33 n	12 n	18000 n	700 n		
m-Aminophenol	591275	7.00E-02 h					2600 n	260 n	95 n	140000 n	5500 n		
4-Aminopyridine	504245	2.00E-05 h					0.73 n	0.073 n	0.027 n	41 n	1.6 n		
Amitraz	33089611	2.50E-03 i					91 n	9.1 n	3.4 n	5100 n	200 n		
Ammonia	7664417		2.86E-02 i				1000 n	100 n					
Ammonium sulfamate	7773060	2.00E-01 i					7300 n	730 n	270 n	410000 n	16000 n		
Aniline	62533		2.86E-04 i	5.70E-03 i			10 n	1 n	0.55 c	1000 c	110 c	45 n	0.031 n
Antimony and compounds	7440360	4.00E-04 i					15 n	1.5 n	0.54 n	820 n	31 n		
Antimony pentoxide	1314609	5.00E-04 h					18 n	1.8 n	0.68 n	1000 n	39 n		
Antimony potassium tartrate	304610	9.00E-04 h					33 n	3.3 n	1.2 n	1800 n	70 n		
Antimony tetroxide	1332316	4.00E-04 h					15 n	1.5 n	0.54 n	820 n	31 n		
Antimony trioxide	1309644	4.00E-04 h					15 n	1.5 n	0.54 n	820 n	31 n		
Apollo	74115245	1.30E-02 i					470 n	47 n	18 n	27000 n	1000 n		
Aramite	140578	5.00E-02 h		2.50E-02 i	2.49E-02 i		2.7 c	0.25 c	0.13 c	230 c	26 c		
Arsenic	7440382	3.00E-04 i					11 n	1.1 n	0.41 n	610 n	23 n	380 e	15 e
Arsenic (as carcinogen)	7440382			1.75E+00 i	1.51E+01 i		0.038 c	0.00041 c	0.0018 c	3.3 c	0.37 c	380 e	15 e
Arsine	7784421		1.43E-05 i				0.52 n	0.052 n					
Assure	76578148	9.00E-03 i					330 n	33 n	12 n	18000 n	700 n		

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Basis: C=carcinogenic effects N=noncarcinogenic effects
E=EPA draft Soil Screening Level S=soil saturation concentration

Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo kg-d/mg	CPSi kg-d/mg	VOC	Tap Water µg/L	Ambient Air µg/m3	Fish mg/kg	Soil Ingestion Industrial mg/kg	Soil Ingestion Residential mg/kg	Soil Screening Levels - Transfers from Soil to: Air mg/kg	Soil Screening Levels - Transfers from Soil to: Groundwater mg/kg
Atrazine	1912249	3.50E-02 i		2.22E-01 h			0.3 c	0.028 c	0.014 c	26 c	2.9 c		
Avermectin B1	65195553	4.00E-04 i					15 n	1.5 n	0.54 n	820 n	31 n		
Azobenzene	103333			1.10E-01 i	1.08E-01 i		0.61 c	0.038 c	0.029 c	52 c	5.8 c		
Barium and compounds	7440393	7.00E-02 i	1.43E-04 a				2600 n	0.52 n	95 n	140000 n	5500 n	350000 e	32 e
Baygon	114261	4.00E-03 i					150 n	15 n	5.4 n	8200 n	310 n		
Bayleton	43121433	3.00E-02 i					1100 n	110 n	41 n	61000 n	2300 n		
Baythroid	68359375	2.50E-02 i					910 n	91 n	34 n	51000 n	2000 n		
Benefin	1861401	3.00E-01 i					11000 n	1100 n	410 n	610000 n	23000 n		
Benomyl	17804352	5.00E-02 i					1800 n	180 n	68 n	100000 n	3900 n		
Bentazon	25057890	2.50E-03 i					91 n	9.1 n	3.4 n	5100 n	200 n		
Benzaldehyde	100527	1.00E-01 i				x	610 n	370 n	140 n	200000 n	7800 n		
Benzene	71432		1.71E-03 e	2.90E-02 i	2.90E-02 i	x	0.36 c	0.22 c	0.11 c	200 c	22 c	0.5 e	0.02 e
Benzenethiol	108985	1.00E-05 w					0.37 n	0.037 n	0.014 n	20 n	0.78 n		
Benzidine	92875	3.00E-03 i		2.30E+02 i	2.35E+02 i		0.00029 c	0.00003 c	0.00001 c	0.025 c	0.0028 c	1.3 e	1.100E-06 e
Benzoic acid	65850	4.00E+00 i					150000 n	15000 n	5400 n	1E+06 n	310000 n	320 s	280 e
Benzotrichloride	98077			1.30E+01 i			0.0052 c	0.00048 c	0.00024 c	0.44 c	0.049 c	0.012 c	0.000073 c
Benzyl alcohol	100516	3.00E-01 h					11000 n	1100 n	410 n	610000 n	23000 n		
Benzyl chloride	100447			1.70E-01 i		x	0.062 c	0.037 c	0.019 c	34 c	3.8 c	0.5 c	0.000116 e
Beryllium and compounds	7440417	5.00E-03 i		4.30E+00 i	8.40E+00 i		0.016 c	0.00075 c	0.00073 c	1.3 c	0.15 c	690 e	180 e
Bidrin	141662	1.00E-04 i					3.7 n	0.37 n	0.14 n	200 n	7.8 n		
Biphenthrin (Talstar)	82657043	1.50E-02 i					550 n	55 n	20 n	31000 n	1200 n		
1,1-Biphenyl	92524	5.00E-02 i					1800 n	180 n	68 n	100000 n	3900 n	9000 s	110 n
Bis(2-chloroethyl)ether	111444			1.10E+00 i	1.16E+00 i	x	0.0092 c	0.0054 c	0.0029 c	5.2 c	0.58 c	0.3 e	0.0003 e
Bis(2-chloroisopropyl)ether	39638329	4.00E-02 i		7.00E-02 h	3.50E-02 h	x	0.26 c	0.18 c	0.045 c	82 c	9.1 c		
Bis(chloromethyl)ether	542881			2.20E+02 i	2.17E+02 i	x	0.00005 c	0.00003 c	0.00001 c	0.026 c	0.0029 c	0.00004 e	1.000E-07 c
Bis(2-chloro-1-methylethyl)ether				7.00E-02 w	7.00E-02 w		0.96 c	0.089 c	0.045 c	82 c	9.1 c		
Bis(2-ethylhexyl)phthalate (DEHP)	117817	2.00E-02 i		1.40E-02 i			4.8 c	0.45 c	0.23 c	410 c	46 c	210 e	11 e
Bisphenol A	80057	5.00E-02 i					1800 n	180 n	68 n	100000 n	3900 n		
Boron (and borates)	7440428	9.00E-02 i	5.71E-03 h				3300 n	21 n	120 n	180000 n	7000 n		
Boron trifluoride	7637072		2.00E-04 h				7.3 n	0.73 n					
Bromodichloromethane	75274	2.00E-02 i		6.20E-02 i		x	0.17 c	0.1 c	0.051 c	92 c	10 c	1800 e	0.3 e
Bromoethene	593602				1.10E-01 h	x	0.096 c	0.057 c					
Bromoform (tribromomethane)	75252	2.00E-02 i		7.90E-03 i	3.85E-03 i	x	2.4 c	1.6 c	0.4 c	720 c	81 c	46 e	0.5 e
Bromomethane	74839	1.40E-03 i	1.43E-03 i			x	8.7 n	5.2 n	1.9 n	2900 n	110 n	2 e	0.1 e
4-Bromophenyl phenyl ether	101553	5.80E-02 o					2100 n	210 n	78 n	120000 n	4500 n		
Bromophos	2104963	5.00E-03 h					180 n	18 n	6.8 n	10000 n	390 n		
Bromoxynil	1689845	2.00E-02 i					730 n	73 n	27 n	41000 n	1600 n		
Bromoxynil octanoate	1689992	2.00E-02 i					730 n	73 n	27 n	41000 n	1600 n		
1,3-Butadiene	106990				9.80E-01 i	x	0.011 c	0.0064 c				0.0013 c	0.000072 c
1-Bu[illegible]	71363	1.00E-01 i					3700 n	370 n	140 n	200000 n	7800 n	9700 s	6 e
Buty[illegible]phthalate	85687	2.00E-01 i					7300 n	730 n	270 n	410000 n	16000 n		68 e
Butyla[illegible]	2008415	5.00E-02 i					1800 n	180 n	68 n	100000 n	3900 n		

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E=EPA draft Soil Screening Level S=soil saturation concentration

Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo kg-d/mg	CPSi kg-d/mg	VOC	Risk-Based Concentrations: Tap Water µg/L	Ambient Air µg/m3	Fish mg/kg	Soil Ingestion: Industrial mg/kg	Soil Ingestion: Residential mg/kg	Soil Screening Levels - Transfers from Soil to: Air mg/kg	Groundwater mg/kg
sec-Butylbenzene	135988	1.00E-02 E				X	61 N	37 N	14 N	20000 N	780 N	80 S	0.27 N
tert-Butylbenzene	104518	1.00E-02 E				X	61 N	37 N	14 N	20000 N	780 N		
Butylphthalyl butylglycolate	85701	1.00E+00 I					37000 N	3700 N	1400 N	1E+06 N	78000 N		
Cacodylic acid	75605	3.00E-03 H					110 N	11 N	4.1 N	6100 N	230 N		
Cadmium and compounds	7440439	5.00E-04 I			6.30E+00 I		18 N	0.00099 C	0.68 N	1000 N	39 N	920 E	6 E
Caprolactam	105602	5.00E-01 I					18000 N	1800 N	680 N	1E+06 N	39000 N		
Captafol	2425061	2.00E-03 I		8.60E-03 H			7.8 C	0.73 C	0.37 C	470 C	74 C		
Captan	133062	1.30E-01 I		3.50E-03 H			19 C	1.8 C	0.9 C	1600 C	180 C		
Carbaryl	63252	1.00E-01 I					3700 N	370 N	140 N	200000 N	7800 N	0.34 E	23 N
Carbofuran	1563662	5.00E-03 I					180 N	18 N	6.8 N	10000 N	390 N		
Carbon disulfide	75150	1.00E-01 I	2.86E-03 H			X	21 N	10 N	140 N	200000 N	7800 N	11 E	14 E
Carbon tetrachloride	56235	7.00E-04 I	5.71E-04 E	1.30E-01 I	5.25E-02 I	X	0.16 C	0.12 C	0.024 C	44 C	4.9 C	0.2 E	0.03 E
Carbosulfan	55285148	1.00E-02 I					370 N	37 N	14 N	20000 N	780 N		
Carboxin	5234684	1.00E-01 I					1700 N	370 N	140 N	200000 N	7800 N		
Chloral	75876	2.00E-03 I					73 N	7.3 N	2.7 N	4100 N	160 N		
Chloramben	133904	1.50E-02 I					550 N	55 N	20 N	31000 N	1200 N		
Chloranil	118752			4.03E-01 H			0.17 C	0.016 C	0.0078 C	14 C	1.6 C		
Chlordane	57749	6.00E-05 I		1.30E+00 I	1.29E+00 I		0.052 C	0.0049 C	0.0024 C	4.4 C	0.49 C	10 E	2 E
Chlorimuron-ethyl	90982324	2.00E-02 I					730 N	73 N	27 N	41000 N	1600 N		
Chlorine	7782505	1.00E-01 I					3700 N	370 N	140 N	200000 N	7800 N		
Chlorine dioxide	10049044		5.71E-05 I				2.1 N	0.21 N					
Chloroacetaldehyde	107200	6.90E-03 O					250 N	25 N	9.3 N	14000 N	540 N		
Chloroacetic acid	79118	2.00E-03 H					73 N	7.3 N	2.7 N	4100 N	160 N		
2-Chloroacetophenone	532274		8.57E-06 I				0.31 N	0.031 N					
4-Chloroaniline	106478	4.00E-03 I					150 N	15 N	5.4 N	8200 N	310 N	1200 S	0.3 E
Chlorobenzene	108907	2.00E-02 I	5.71E-03 A			X	39 N	21 N	27 N	41000 N	1600 N	94 E	0.6 E
Chlorobenzilate	510156	2.00E-02 I		2.70E-01 H	2.70E-01 H		0.25 C	0.025 C	0.012 C	21 C	2.4 C		
p-Chlorobenzoic acid	74113	2.00E-01 H					7300 N	730 N	270 N	410000 N	16000 N		
4-Chlorobenzotrifluoride	98566	2.00E-02 H					730 N	73 N	27 N	41000 N	1600 N	86 N	7.5 N
2-Chloro-1,3-butadiene	126998	2.00E-02 A	2.00E-03 H			X	14 N	7.3 N	27 N	41000 N	1600 N		
1-Chlorobutane	109693	4.00E-01 H				X	2400 N	1500 N	540 N	820000 N	31000 N		
Chlorodibromomethane	124481	2.00E-02 I		8.40E-02 I		X	0.13 C	0.075 C	0.038 C	68 C	7.6 C	1900 E	0.2 E
Chlorodifluoromethane	75456		1.43e+01 I			X	87000 N	52000 N					
Chloroethane	75003	4.00E-01 E	2.86E+00 I			X	8600 N	10000 N	540 N	820000 N	31000 N	2600 S	33 N
2-Chloroethyl vinyl ether	110758	2.50E-02 O				X	150 N	91 N	34 N	51000 N	2000 N		
Chloroform	67663	1.00E-02 I		6.10E-03 I	8.05E-02 I	X	0.15 C	0.078 C	0.52 C	940 C	100 C	0.2 E	0.3 E
Chloromethane	74873			1.30E-02 H	6.30E-03 H	X	1.4 C	0.99 C	0.24 C	440 C	49 C	0.063 C	0.0064 C
4-Chloro-2,2-methylaniline hydrochloride	3165933			4.60E-01 H			0.15 C	0.014 C	0.0069 C	12 C	1.4 C		
4-Chloro-2-methylaniline	95692			5.80E-01 H			0.12 C	0.011 C	0.0054 C	9.9 C	1.1 C		
beta-Chloronaphthalene	91587	8.00E-02 I					2900 N	290 N	110 N	160000 N	6300 N	2.8 S	140 N
o-Chloronitrobenzene	88733			2.50E-02 H		X	0.42 C	0.25 C	0.13 C	230 C	26 C		

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Basis: C=carcinogenic effects N=noncarcinogenic effects E=EPA draft Soil Screening Level S=soil saturation concentration

							Risk-Based Concentrations					Soil Screening Levels-Transfers from Soil to:	
							Tap Water	Ambient Air	Fish	Soil Ingestion			
Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo kg-d/mg	CPSi kg-d/mg	VOC	µg/L	µg/m3	mg/kg	Industrial mg/kg	Residential mg/kg	Air mg/kg	Groundwater mg/kg
2-Chlorophenol	95578	5.00E-03 i					180 n	18 n	6.8 n	10000 n	390 n	53000 s	2 i
2-Chloropropane	75296		2.86E-02 w			X	170 n	100 n				22 n	0.64 n
Chlorothalonil	1897456	1.50E-02 i		1.10E-02 h			6.1 c	0.57 c	0.29 c	320 c	58 c		
o-Chlorotoluene	95498	2.00E-02 i				X	120 n	73 n	27 n	41000 n	1600 n	1200 n	3.6 n
Chlorpropham	101213	2.00E-01 i					7300 n	730 n	270 n	410000 n	16000 n		
Chlorpyrifos	2921882	3.00E-03 i					110 n	11 n	4.1 n	6100 n	230 n		
Chlorpyrifos-methyl	5598130	1.00E-02 h					370 n	37 n	14 n	20000 n	780 n		
Chlorsulfuron	64902723	5.00E-02 i					1800 n	180 n	68 n	100000 n	3900 n		
Chlorthiophos	60238564	8.00E-04 h					29 n	2.9 n	1.1 n	1600 n	63 n		
Chromium III and compounds	16065831	1.00E+00 i	5.71E-07 w				37000 n	0.0021 n	1400 n	1E+06 n	78000 n		
Chromium VI and compounds	7440473	5.00E-03 i			4.20E+01 i		180 n	0.00015 c	6.8 n	10000 n	390 n	140 e	19 e
Coal tar	8001589				2.20E+00 o			0.0028 c					
Cobalt	7440484	6.00E-02 e					2200 n	220 n	81 n	120000 n	4700 n		
Coke Oven Emissions	8007452				2.17E+00 i			0.0029 c					
Copper and compounds	7440508	3.71E-02 h					1400 n	140 n	50 n	76000 n	2900 n		
Crotonaldehyde	123739	1.00E-02 w		1.90E+00 h	1.90E+00 w		0.035 c	0.0033 c	0.0017 c	3 c	0.34 c		
Cumene	98828	4.00E-02 i	2.57E-03 h				1500 n	9.4 n	54 n	87000 n	3100 n	81 n	65 n
Cyanides:													
Barium cyanide	542621	1.00E-01 h					3700 n	370 n	140 n	200000 n	7800 n		
Calcium cyanide	592018	4.00E-02 i					1500 n	150 n	54 n	82000 n	3100 n		
Copper cyanide	544923	5.00E-03 i					180 n	18 n	6.8 n	10000 n	390 n		
Cyanazine	21725462	2.00E-03 h		8.40E-01 h			0.08 c	0.0075 c	0.0038 c	6.8 c	0.76 c		
Cyanogen	460195	4.00E-02 i					1500 n	150 n	54 n	82000 n	3100 n		
Cyanogen bromide	506683	9.00E-02 i					3300 n	330 n	120 n	180000 n	7000 n		
Cyanogen chloride	506774	5.00E-02 i					1800 n	180 n	68 n	100000 n	3900 n		
Free cyanide	57125	2.00E-02 i					730 n	73 n	27 n	41000 n	1600 n		
Hydrogen cyanide	74908	2.00E-02 i	8.57E-04 i				730 n	3.1 n	27 n	41000 n	1600 n		
Potassium cyanide	151508	5.00E-02 i					1800 n	180 n	68 n	100000 n	3900 n		
Potassium silver cyanide	506616	2.00E-01 i					7300 n	730 n	270 n	410000 n	16000 n		
Silver cyanide	506649	1.00E-01 i					3700 n	370 n	140 n	200000 n	7800 n		
Sodium cyanide	143339	4.00E-02 i					1500 n	150 n	54 n	82000 n	3100 n		
Zinc cyanide	557211	5.00E-02 i					1800 n	180 n	68 n	100000 n	3900 n		
Cyclohexanone	108941	5.00E+00 i				X	30000 n	18000 n	6800 n	1E+06 n	390000 n		
Cyclohexlamine	108918	2.00E-01 i					7300 n	730 n	270 n	410000 n	16000 n		
Cyhalothrin/Karate	68085858	5.00E-03 i					180 n	18 n	6.8 n	10000 n	390 n		
Cypermethrin	52315078	1.00E-02 i					370 n	37 n	14 n	20000 n	780 n		
Cyromazine	66215278	7.50E-03 i					270 n	27 n	10 n	15000 n	590 n		
Dacthal	1861321	1.00E-02 i					370 n	37 n	14 n	20000 n	780 n		
Dalapon	75990	3.00E-02 i					1100 n	110 n	41 n	61000 n	2300 n		
Dan	39515418	2.50E-02 i					910 n	91 n	34 n	51000 n	2000 n		
DDD	72548			2.40E			0.28 c	0.026 c	0.013 c	24 c	2.7 c		0.7 e

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Basis: C=carcinogenic effects N=noncarcinogenic effects E=EPA draft Soil Screening Level S=soil saturation concentration

Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo kg-d/mg	CPSi kg-d/mg	VOC	Risk-Based Concentrations: Tap Water µg/L	Ambient Air µg/m3	Fish mg/kg	Soil Ingestion: Industrial mg/kg	Soil Ingestion: Residential mg/kg	Soil Screening Levels - Transfers from Soil to: Air mg/kg	Groundwater mg/kg
DDT	50293	5.00E-04 i		3.40E-01 i	3.40E-01 i		0.2 c	0.018 c	0.0093 c	17 c	1.9 c	80 e	1 e
Decabromodiphenyl ether	1163195	1.00E-02 i				x	61 n	37 n	14 n	20000 n	780 n		
Demeton	8065483	4.00E-05 i					1.5 n	0.15 n	0.054 n	82 n	3.1 n		
Diallate	2303164			6.10E-02 h		x	0.17 c	0.1 c	0.052 c	94 c	10 c		
Diazinon	333415	9.00E-04 h					33 n	3.3 n	1.2 n	1800 n	70 n	5400 s	2.8 n
Dibenzofuran	132649	4.00E-03 e					150 n	15 n	5.4 n	8200 n	310 n	120 s	170 n
1,4-Dibromobenzene	106376	1.00E-02 i				x	61 n	37 n	14 n	20000 n	780 n		
1,2-Dibromo-3-chloropropane	96128		5.71E-05 i	1.40E+00 h	2.42E-03 h	x	0.048 c	0.21 n	0.0023 c	4.1 c	0.46 c	1.9 n	0.00061 n
1,2-Dibromoethane	106934		5.71E-05 h	8.50E+01 i	7.70E-01 i	x	0.00075 c	0.0081 c	0.00004 c	0.067 c	0.0075 c	0.0058 c	0.00018 n
Dibutyl phthalate	84742	1.00E-01 i					3700 n	370 n	140 n	200000 n	7800 n	100 s	120 e
Dicamba	1918009	3.00E-02 i					1100 n	110 n	41 n	61000 n	2300 n		
1,2-Dichlorobenzene	95501	9.00E-02 i	4.00E-02 a			x	270 n	150 n	120 n	180000 n	7000 n	300 e	6 e
1,3-Dichlorobenzene	541731	8.90E-02 o				x	540 n	320 n	120 n	180000 n	7000 n		
1,4-Dichlorobenzene	106467		2.29E-01 i	2.40E-02 h		x	0.44 c	0.26 c	0.13 c	240 c	27 c	7700 e	1 e
3,3'-Dichlorobenzidine	91941			4.50E-01 i			0.15 c	0.014 c	0.007 c	13 c	1.4 c	52 e	0.01 e
1,4-Dichloro-2-butene	764410				9.30E+00 h	x	0.0011 c	0.00067 c					
Dichlorodifluoromethane	75718	2.00E-01 i	5.71E-02 a			x	390 n	210 n	270 n	410000 n	16000 n	37 n	7.5 n
1,1-Dichloroethane	75343	1.00E-01 h	1.43E-01 a			x	810 n	520 n	140 n	200000 n	7800 n	980 e	11 e
1,2-Dichloroethane (EDC)	107062		2.86E-03 e	9.10E-02 i	9.10E-02 i	x	0.12 c	0.069 c	0.035 c	63 c	7 c	0.3 e	0.01 e
1,1-Dichloroethylene	75354	9.00E-03 i		6.00E-01 i	1.75E-01 i	x	0.044 c	0.036 c	0.0053 c	9.5 c	1.1 c	0.04 e	0.01 e
1,2-Dichloroethylene (cis)	156592	1.00E-02 h				x	61 n	37 n	14 n	20000 n	780 n	1500 e	0.2 e
1,2-Dichloroethylene (trans)	156605	2.00E-02 i				x	120 n	73 n	27 n	41000 n	1600 n	3600 e	0.3 e
1,2-Dichloroethylene (mixture)	540590	9.00E-03 h				x	55 n	33 n	12 n	18000 n	700 n		
2,4-Dichlorophenol	120832	3.00E-03 i					110 n	11 n	4.1 n	6100 n	230 n	4800 s	0.5 e
2,4-Dichlorophenoxyacetic Acid (2,4-D)	94757	1.00E-02 i				x	61 n	37 n	14 n	20000 n	780 n	7000 s	1.7 n
4-(2,4-Dichlorophenoxy)butyric Acid	94826	8.00E-03 i					290 n	29 n	11 n	16000 n	630 n		
1,2-Dichloropropane	78875		1.14E-03 i	6.80E-02 h		x	0.16 c	0.092 c	0.046 c	84 c	9.4 c	11 e	0.02 e
2,3-Dichloropropanol	616239	3.00E-03 i					110 n	11 n	4.1 n	6100 n	230 n		
1,3-Dichloropropene	542756	3.00E-04 i	5.71E-03 i	1.75E-01 h	1.30E-01 h	x	0.077 c	0.048 c	0.018 c	33 c	3.7 c	0.1 e	0.001 e
Dichlorvos	62737	5.00e-04 i	1.43E-04 i	2.90E-01 i			0.23 c	0.022 c	0.011 c	20 c	2.2 c	55 c	0.00073 c
Dicofol	115322			4.40E-01 w			0.15 c	0.014 c	0.0072 c	13 c	1.5 c		
Dicyclopentadiene	77736	3.00E-02 h	5.71E-05 a			x	0.42 n	0.21 n	41 n	61000 n	2300 n		
Dieldrin	60571	5.00E-05 i		1.60E+01 i	1.61E+01 i		0.0042 c	0.00039 c	0.0002 c	0.36 c	0.04 c	2 e	0.001 e
Diesel emissions			1.43E-03 i				52 n	5.2 n					
Diethyl phthalate	84662	8.00E-01 i					29000 n	2900 n	1100 n	1E+06 n	63000 n	320 e	110 e
Diethylene glycol, monobutyl ether	112345		5.71E-03 h				210 n	21 n					
Diethylene glycol, monoethyl ether	111900	2.00E+00 h					73000 n	7300 n	2700 n	1E+06 n	160000 n		
Diethylformamide	617845	1.10E-02 h					400 n	40 n	15 n	22000 n	860 n		
Di(2-ethylhexyl)adipate	103231	6.00E-01 i		1.20E-03 i			56 c	5.2 c	2.6 c	4800 c	530 c		
Diethylstilbestrol	56531			4.70E+03 h			0.00001 c	1E-06 c	7E-07 c	0.0012 c	0.00014 c		
Difenzoquat (Average)	43222486	8.00E-02 i					2900 n	290 n	110 n	160000 n	6300 n		

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E=EPA draft Soil Screening Level S=soil saturation concentration

							Risk-Based Concentrations					Soil Screening Levels-Transfers from Soil to:	
						V	Tap	Ambient		Soil Ingestion			
		RfDo	RfDi	CPSo	CPSi	O	Water	Air	Fish	Industrial	Residential	Air	Groundwater
Contaminant	CAS	mg/kg/d	mg/kg/d	kg·d/mg	kg·d/mg	C	µg/L	µg/m3	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
1,1-Difluoroethane	75376		1.14E+01 i			x	69000 n	42000 n					
Diisopropyl methylphosphonate (DIMP)	1445756	8.00E-02 i					2900 n	290 n	110 n	160000 n	6100 n		
Dimethipin	55290647	2.00E-02 i					730 n	73 n	27 n	41000 n	1600 n		
Dimethoate	60515	2.00E-04 i					7.3 n	0.73 n	0.27 n	410 n	16 n		
3,3'-Dimethoxybenzidine	119904			1.40E-02 h			4.8 c	0.45 c	0.23 c	410 c	46 c		
Dimethylamine	124403		5.71E-06 w				0.21 n	0.021 n					
2,4-Dimethylaniline hydrochloride	21436964			5.80E-01 h			0.12 c	0.011 c	0.0054 c	9.9 c	1.1 c		
2,4-Dimethylaniline	95681			7.50E-01 h			0.09 c	0.0083 c	0.0042 c	7.6 c	0.85 c		
N-N-Dimethylaniline	121697	2.00E-03 i					73 n	7.3 n	2.7 n	4100 n	160 n		
3,3'-Dimethylbenzidine	119937			9.20E+00 h			0.0073 c	0.00068 c	0.00034 c	0.62 c	0.069 c	29 c	0.00039 c
N,N-Dimethylformamide	68122	1.00E-01 h	8.57E-03 i				3700 n	31 n	140 n	200000 n	7800 n		
1,1-Dimethylhydrazine	57147			2.60E+00 w	3.50E+00 w		0.026 c	0.0018 c	0.0012 c	2.2 c	0.25 c		
1,2-Dimethylhydrazine	540738			3.70E+01 w	3.70E+01 w		0.0018 c	0.00017 c	0.00009 c	0.15 c	0.017 c		
2,4-Dimethylphenol	105679	2.00E-02 i					730 n	73 n	27 n	41000 n	1600 n	5400 s	3 e
2,6-Dimethylphenol	576261	6.00E-04 i					22 n	2.2 n	0.81 n	1200 n	47 n		
3,4-Dimethylphenol	95658	1.00E-03 i					37 n	3.7 n	1.4 n	2000 n	78 n		
Dimethyl phthalate	131113	1.00E+01 h					370000 n	37000 n	14000 n	1E+06 n	780000 n	1600 e	1200 e
Dimethyl terephthalate	120616	1.00E-01 i					3700 n	370 n	140 n	200000 n	7800 n		
1,2-Dinitrobenzene	528290	4.00E-04 h					15 n	1.5 n	0.54 n	820 n	31 n		
1,3-Dinitrobenzene	99650	1.00E-04 i					3.7 n	0.37 n	0.14 n	200 n	7.8 n		
1,4-Dinitrobenzene	100254	4.00E-04 h					15 n	1.5 n	0.54 n	820 n	31 n		
4,6-Dinitro-o-cyclohexyl phenol	131895	2.00E-03 i					73 n	7.3 n	2.7 n	4100 n	160 n		
2,4-Dinitrophenol	51285	2.00E-03 i					73 n	7.3 n	2.7 n	4100 n	160 n	360 n	0.1 e
Dinitrotoluene mixture				6.80E-01 i			0.099 c	0.0092 c	0.0046 c	8.4 c	0.94 c		
2,4-Dinitrotoluene	121142	2.00E-03 i					73 n	7.3 n	2.7 n	4100 n	160 n	120 s	0.2 e
2,6-Dinitrotoluene	606202	1.00E-03 h					37 n	3.7 n	1.4 n	2000 n	78 n	370 s	0.1 e
Dinoseb	88857	1.00E-03 i					37 n	3.7 n	1.4 n	2000 n	78 n		
di-n-Octyl phthalate	117840	2.00E-02 h					730 n	73 n	27 n	41000 n	1600 n	1000000 s	1000000 e
1,4-Dioxane	123911			1.10E-02 i			6.1 c	0.57 c	0.29 c	520 c	58 c		
Diphenamid	957517	3.00E-02 i					1100 n	110 n	41 n	61000 n	2300 n		
Diphenylamine	122394	2.50E-02 i					910 n	91 n	34 n	51000 n	2000 n		
1,2-Diphenylhydrazine	122667			8.00E-01 i	7.70E-01 i		0.084 c	0.0081 c	0.0039 c	7.2 c	0.8 c		
Diquat	85007	2.20E-03 i					80 n	8 n	3 n	4500 n	170 n		
Direct black 38	1937377			8.60E+00 h			0.0078 c	0.00073 c	0.00037 c	0.67 c	0.074 c		
Direct blue 6	2602462			8.10E+00 h			0.0083 c	0.00077 c	0.00039 c	0.71 c	0.079 c		
Direct brown 95	16071866			9.30E+00 h			0.0072 c	0.00067 c	0.00034 c	0.62 c	0.069 c		
Disulfoton	298044	4.00E-05 i					1.5 n	0.15 n	0.054 n	82 n	3.1 n		
1,4-Dithiane	505293	1.00E-02 i					370 n	37 n	14 n	20000 n	780 n		
Diuron	330541	2.00E-03 i					73 n	7.3 n	2.7 n	4100 n	160 n		
Dod	2439103	4.00E-03 i					150 n	15 n	5.4 n	8200 n	310 n		
Endc.	115297	6.00E-03 i					220 n	22 n	8.1 n	12000 n	470 n		3 e
[illegible]	[illegible]	[illegible]					[illegible]	[illegible]	27 n	41000 n	1600 n		

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Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo kg·d/mg	CPSi kg·d/mg	VOC	Risk-Based Concentrations: Tap Water µg/L	Ambient Air µg/m3	Fish mg/kg	Soil Ingestion: Industrial mg/kg	Soil Ingestion: Residential mg/kg	Soil Screening Levels- Transfers from Soil to: Air mg/kg	Groundwater mg/kg
Endrin	72208	3.00E-04 I					11 N	1.1 N	0.41 N	610 N	23 N	16 E	0.4 E
Epichlorohydrin	106898	2.00E-03 H	2.86E-04 I	9.90E-03 I	4.20E-03 I		6.8 C	1 N	0.12 C	580 C	65 C		
1,2-Epoxybutane	106887		5.71E-03 I				210 N	21 N					
Ethephon (2-chloroethyl phosphonic acid)	16672870	5.00E-03 I					180 N	18 N	6.8 N	10000 N	390 N		
Ethion	563122	5.00E-04 I					18 N	1.8 N	0.68 N	1000 N	39 N		
2-Ethoxyethanol acetate	111159	3.00E-01 A					11000 N	1100 N	410 N	610000 N	23000 N		
2-Ethoxyethanol	110805	4.00E-01 H	5.71E-02 I				15000 N	210 N	540 N	820000 N	31000 N		
Ethyl acrylate	140885			4.80E-02 H			1.4 C	0.13 C	0.066 C	120 C	13 C		
EPTC (S-Ethyl dipropylthiocarbamate)	759944	2.50E-02 I					910 N	91 N	34 N	51000 N	2000 N		
Ethyl ether	60297	2.00E-01 I				X	1200 N	730 N	270 N	410000 N	16000 N		
Ethyl methacrylate	97632	9.00E-02 H					3300 N	330 N	120 N	180000 N	7000 N		
Ethyl acetate	141786	9.00E-01 I					33000 N	3300 N	1200 N	1E+06 N	70000 N		
Ethylbenzene	100414	1.00E-01 I	2.86E-01 I			X	1300 N	1000 N	140 N	200000 N	7800 N	260 E	5 E
Ethylene cyanohydrin	109784	3.00E-01 H					11000 N	1100 N	410 N	610000 N	21000 N		
Ethylene diamine	107153	2.00E-02 H					730 N	73 N	27 N	41000 N	1600 N		
Ethylene glycol	107211	2.00E+00 I					73000 N	7300 N	2700 N	1E+06 N	160000 N		
Ethylene glycol, monobutyl ether	111762		5.71E-03 H				210 N	21 N					
Ethylene oxide	75218			1.02E+00 H	3.50E-01 H		0.066 C	0.018 C	0.0031 C	5.6 C	0.63 C		
Ethylene thiourea (ETU)	96457	8.00E-05 I		1.19E-01 H			0.57 C	0.053 C	0.027 C	48 C	5.4 C		
Ethyl p-nitrophenyl phenylphosphorothioate	2104645	1.00E-05 I					0.37 N	0.037 N	0.014 N	20 N	0.78 N		
Ethylnitrosourea	759739			1.40E+02 W			0.00048 C	0.00005 C	0.00002 C	0.041 C	0.0046 C		
Ethylphthalyl ethyl glycolate	84720	3.00E+00 I					110000 N	11000 N	4100 N	1E+06 N	230000 N		
Express	10120	8.00E-03 I					290 N	29 N	11 N	16000 N	630 N		
Fenamiphos	22224926	2.50E-04 I					9.1 N	0.91 N	0.34 N	510 N	20 N		
Fluometuron	2164172	1.30E-02 I					470 N	47 N	18 N	27000 N	1000 N		
Fluoride	7782414	6.00E-02 I					2200 N	220 N	81 N	120000 N	4700 N		
Fluoridone	59756604	8.00E-02 I					2900 N	290 N	110 N	160000 N	6300 N		
Flurprimidol	56425913	2.00E-02 I					730 N	73 N	27 N	41000 N	1600 N		
Flutolanil	66332965	6.00E-02 I					2200 N	220 N	81 N	120000 N	4700 N		
Fluvalinate	69409945	1.00E-02 I					370 N	37 N	14 N	20000 N	780 N		
Folpet	133073	1.00E-01 I		3.50E-03 I			19 C	1.8 C	0.9 C	1600 C	180 C		
Fomesafen	72178020			1.90E-01 I			0.35 C	0.033 C	0.017 C	30 C	3.4 C		
Fonofos	944229	2.00E-03 I					73 N	7.3 N	2.7 N	4100 N	160 N		
Formaldehyde	50000	2.00E-01 I			4.55E-02 I		7300 N	0.14 C	270 N	410000 N	16000 N		
Formic Acid	64186	2.00E+00 H					73000 N	7300 N	2700 N	1E+06 N	160000 N		
Fosetyl-al	39148248	3.00E+00 I					110000 N	11000 N	4100 N	1E+06 N	230000 N		
Furan	110009	1.00E-03 I					37 N	3.7 N	1.4 N	2000 N	78 N		
Furazolidone	67458			3.80E+00 H			0.018 C	0.0016 C	0.00083 C	1.5 C	0.17 C		
Furfural	98011	3.00E-03 I	1.43E-02 A				110 N	52 N	4.1 N	6100 N	230 N		
Furium	531828			5.00E+01 H			0.0013 C	0.00013 C	0.00006 C	0.11 C	0.013 C		
Furmecyclox	60568050			3.00E-02 I			2.2 C	0.21 C	0.11 C	190 C	21 C		

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E=EPA draft Soil Screening Level S=soil saturation concentration

							Risk-Based Concentrations					Soil Screening Levels-Transfers from Soil to:	
							Tap Water	Ambient Air		Soil Ingestion			
		RfDo	RfDi	CPSo	CPSi	VOC			Fish	Industrial	Residential	Air	Groundwater
Contaminant	CAS	mg/kg/d	mg/kg/d	kg·d/mg	kg·d/mg		µg/L	µg/m3	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Glycidaldehyde	765344	4.00E-04 i	2.86E-04 h				15 n	1 n	0.54 n	820 n	31 n		
Glyphosate	1071836	1.00E-01 i					3700 n	370 n	140 n	200000 n	7800 n		
Haloxyfop-methyl	69806402	5.00E-05 i					1.8 n	0.18 n	0.068 n	100 n	3.9 n		
Harmony	79277273	1.30E-02 i					470 n	47 n	18 n	27000 n	1000 n		
HCH (alpha)	319846			6.30E+00 i	6.30E+00 i		0.011 c	0.00099 c	0.0005 c	0.91 c	0.1 c	0.9 i	0.0004 i
HCH (beta)	319857			1.80E+00 i	1.80E+00 i		0.037 c	0.0035 c	0.0018 c	3.2 c	0.35 c	16 e	0.002 e
HCH (gamma) Lindane	58899	3.00E-04 i		1.30E+00 h			0.052 c	0.0048 c	0.0024 c	4.4 c	0.49 c	4.2 c	0.006 e
HCH-technical	608731			1.80E+00 i	1.79E+00 i		0.037 c	0.0035 c	0.0018 c	3.2 c	0.35 c		
Heptachlor	76448	5.00E-04 i		4.50E+00 i	4.55E+00 i	x	0.0023 c	0.0014 c	0.0007 c	1.3 c	0.14 c	0.3 e	0.06 e
Heptachlor epoxide	1024573	1.30E-05 i		9.10E+00 i	9.10E+00 i	x	0.0012 c	0.00069 c	0.00035 c	0.63 c	0.07 c	1 e	0.03 e
Hexabromobenzene	87821	2.00E-03 i				x	12 n	7.3 n	2.7 n	4100 n	160 n		
Hexachlorobenzene	118741	8.00E-04 i		1.60E+00 i	1.61E+00 i	x	0.0066 c	0.0039 c	0.002 c	3.6 c	0.4 c	1 e	0.8 e
Hexachlorobutadiene	87683	2.00E-04 h		7.80E-02 i	7.70E-02 i	x	0.14 c	0.081 c	0.04 c	73 c	8.2 c	1 e	0.1 e
Hexachlorocyclopentadiene	77474	7.00E-03 i	2.00E-05 h			x	0.15 n	0.073 n	9.5 n	14000 n	550 n	2 e	10 e
Hexachlorodibenzo-p-dioxin mixture	19408743			6.20E+03 i	4.55E+03 i		0.00001 c	1E-06 c	5E-07 c	0.0009 c	0.0001 c		
Hexachloroethane	67721	1.00E-03 i		1.40E-02 i	1.40E-02 i	x	0.75 c	0.45 c	0.23 c	410 c	46 c	49 e	0.2 e
Hexachlorophene	70304	3.00E-04 i					11 n	1.1 n	0.41 n	610 n	23 n		
Hexahydro-1,3,5-trinitro-1,3,5-triazine	121824	3.00E-03 i		1.10E-01 i			0.61 c	0.057 c	0.029 c	52 c	5.8 c		
1,6-Hexamethylene diisocyanate	822060		2.86E-06 i				0.1 n	0.01 n					
n-Hexane	110543	6.00E-02 h	5.71E-02 i			x	350 n	210 n	81 n	120000 n	4700 n	32 n	13 n
Hexazinone	51235042	3.30E-02 i					1200 n	120 n	45 n	67000 n	2600 n		
Hydrazine, hydrazine sulfate	302012			3.00E+00 i	1.71E+01 i		0.022 c	0.00037 c	0.0011 c	1.9 c	0.21 c		
Hydrogen chloride	7647010		2.00E-03 i				73 n	7.3 n					
Hydrogen sulfide	7783064	3.00E-03 i	2.57E-04 i				110 n	0.94 n	4.1 n	4100 n	230 n		
Hydroquinone	123319	4.00E-02 h					1500 n	150 n	54 n	82000 n	3100 n		
Imazalil	35554440	1.30E-02 i					470 n	47 n	18 n	27000 n	1000 n		
Imazaquin	81335377	2.50E-01 i					9100 n	910 n	340 n	510000 n	20000 n		
Iprodione	36734197	4.00E-02 i					1500 n	150 n	54 n	82000 n	3100 n		
Isobutanol	78831	3.00E-01 i				x	1800 n	1100 n	410 n	610000 n	23000 n		
Isophorone	78591	2.00E-01 i		9.50E-04 i			71 c	6.6 c	3.3 c	6000 c	670 c	3400 e	0.2 e
Isopropalin	33820530	1.50E-02 i					550 n	55 n	20 n	31000 n	1200 n		
Isopropyl methyl phosphonic acid	1832548	1.00E-01 i					3700 n	370 n	140 n	200000 n	7800 n		
Isoxaben	82558507	5.00E-02 i					1800 n	180 n	68 n	100000 n	3900 n		
Kepone	143500			1.80E+01 e			0.0037 c	0.00035 c	0.00018 c	0.32 c	0.035 c		
Lactofen	77501634	2.00E-03 i					73 n	7.3 n	2.7 n	4100 n	160 n		
Linuron	330552	2.00E-03 i					73 n	7.3 n	2.7 n	4100 n	160 n		
Lithium	7439932	2.00E-02 e					730 n	73 n	27 n	41000 n	1600 n		
Londax	83056996	2.00E-01 i					7300 n	730 n	270 n	410000 n	16000 n		
Malathion	121755	2.00E-02 i					730 n	73 n	27 n	41000 n	1600 n		
Mal[illegible]ydride	108316	1.00E-01 i					3700 n	370 n	140 n	200000 n	7800 n		
Malei[illegible]de	123331	5.00E-01 i					18000 n	1800 n	680 n	1E+06 n	39000 n		
[illegible]							[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		

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Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo kg·d/mg	CPSi kg·d/mg	VOC	Risk-Based Concentrations: Tap Water µg/L	Ambient Air µg/m3	Fish mg/kg	Soil Ingestion: Industrial mg/kg	Soil Ingestion: Residential mg/kg	Soil Screening Levels - Transfers from Soil to: Air mg/kg	Groundwater mg/kg
Mancozeb	8018017	3.00E-02 h					1100 n	110 n	41 n	61000 n	2300 n		
Maneb	12427382	5.00E-03 i					180 n	18 n	6.8 n	10000 n	390 n		
Manganese and compounds	7439965	5.00E-03 i	1.43e-05 i				180 n	0.052 n	6.8 n	10000 n	390 n		
Mephosfolan	950107	9.00E-05 h					3.3 n	0.33 n	0.12 n	180 n	7 n		
Mepiquat chloride	24307264	3.00E-02 i					1100 n	110 n	41 n	61000 n	2300 n		
Mercury (inorganic)	7439976	3.00E-04 h	8.57E-05 h				11 n	0.31 n	0.41 n	610 n	23 n	7 s	3 e
Mercury (methyl)	22967926	3.00E-04 i					11 n	1.1 n	0.41 n	610 n	23 n		
Merphos	150505	3.00E-05 i					1.1 n	0.11 n	0.041 n	61 n	2.3 n		
Merphos oxide	78488	3.00E-05 i					1.1 n	0.11 n	0.041 n	61 n	2.3 n		
Metalaxyl	57837191	6.00E-02 i					2200 n	220 n	81 n	120000 n	4700 n		
Methacrylonitrile	126987	1.00E-04 i	2.00E-04 a				3.7 n	0.73 n	0.14 n	200 n	7.8 n		
Methamidophos	10265926	5.00E-05 i					1.8 n	0.18 n	0.068 n	100 n	3.9 n		
Methanol	67561	5.00E-01 i					18000 n	1800 n	680 n	1E+06 n	39000 n		
Methidathion	950378	1.00E-03 i					37 n	3.7 n	1.4 n	2000 n	78 n		
Methomyl	16752775	2.50E-02 i					910 n	91 n	34 n	51000 n	2000 n		
Methoxychlor	72435	5.00E-03 i					180 n	18 n	6.8 n	10000 n	390 n	41 s	62 e
2-Methoxyethanol acetate	110496	2.00E-03 a					73 n	7.3 n	2.7 n	4100 n	160 n		
2-Methoxyethanol	109864	1.00E-03 h	5.71E-03 i				37 n	21 n	1.4 n	2000 n	78 n		
2-Methoxy-5-nitroaniline	99592			4.60E-02 h			1.5 c	0.14 c	0.069 c	128 c	14 c		
Methyl acetate	79209	1.00E+00 h					37000 n	3700 n	1400 n	1E+06 n	78000 n		
Methyl acrylate	96333	3.00E-02 a					1100 n	110 n	41 n	61000 n	2300 n		
2-Methylaniline hydrochloride	636215			1.80E-01 h			0.37 c	0.035 c	0.018 c	32 c	3.5 c		
2-Methylaniline	95534			2.40E-01 h			0.28 c	0.026 c	0.013 c	24 c	2.7 c		
Methyl chlorocarbonate	79221	1.00E+00 w					37000 n	3700 n	1400 n	1E+06 n	78000 n		
4-(2-Methyl-4-chlorophenoxy) butyric acid	94815	1.00E-02 i					370 n	37 n	14 n	20000 n	780 n		
2-Methyl-4-chlorophenoxyacetic acid	94746	5.00E-04 i					18 n	1.8 n	0.68 n	1000 n	39 n		
2-(2-Methyl-14-chlorophenoxy)propionic aci	93652	1.00E-03 i					37 n	3.7 n	1.4 n	2000 n	78 n		
Methylcyclohexane	108872		8.57E-01 h				31000 n	3100 n				60 s	1500 n
Methylene bromide	74953	1.00E-02 a				x	61 n	37 n	14 n	20000 n	780 n		
Methylene chloride	75092	6.00E-02 i	8.57E-01 h	7.50E-03 i	1.64E-03 i	x	4.1 c	3.8 c	0.42 c	760 c	85 c	7 e	0.01 e
4,4'-Methylene bis(2-chloroaniline)	101144	7.00E-04 h		1.30E-01 h	1.30E-01 h		0.52 c	0.048 c	0.024 c	44 c	4.9 c		
4,4'-Methylenebisbenzenamine	101779			2.50E-01 w			0.27 c	0.025 c	0.013 c	23 c	2.6 c		
4,4'-Methylene bis(N,N'-dimethyl)aniline	101611			4.60E-02 i			1.5 c	0.14 c	0.069 c	129 c	14 c		
4,4'-Methylenediphenyl isocyanate	101688		5.71E-06 i			x	0.035 n	0.021 n					
Methyl ethyl ketone	78933	6.00E-01 i	2.86E-01 i			x	1900 n	1000 n	810 n	1E+06 n	47000 n		
Methyl hydrazine	60344			1.10E+00 w			0.061 c	0.0057 c	0.0029 c	5.2 c	0.58 c		
Methyl isobutyl ketone	108101	8.00E-02 h	2.29E-02 a				2900 n	84 n	110 n	160000 n	6300 n		
Methyl methacrylate	80626	8.00E-02 h					2900 n	290 n	110 n	160000 n	6300 n		
2-Methyl-5-nitroaniline	99558			3.30E-02 h			2 c	0.19 c	0.098 c	170 c	19 c		
Methyl parathion	298000	2.50E-04 i					9.1 n	0.91 n	0.34 n	510 n	20 n	29 s	0.041 n
2-Methylphenol (o-cresol)	95487	5.00E-02 i					1800 n	180 n	68 n	100000 n	3900 n	12000 s	8 e
[illegible]	[illegible]	[illegible]					[illegible]	[illegible]	[illegible]	[illegible]	3900 n		

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4-Methylphenol (p-cresol)	106445	5.00E-03 H					180 N	18 N	6.8 N	10000 N	390 N		
Methyl styrene (mixture)	25013154	6.00E-03 A	1.14E-02 A			x	60 N	42 N	8.1 N	12000 N	470 N		
Methyl styrene (alpha)	98839	7.00E-02 A				x	430 N	260 N	95 N	140000 N	5500 N	8.8 E	7.5 E
Methyl tertbutyl ether (MTBE)	1634044	5.00E-03 I	8.57E-01 I			x	180 N	3100 N	6.8 N	10000 N	390 N		
Metolaclor (Dual)	51218452	1.50E-01 H					5500 N	550 N	200 N	310000 N	12000 N		
Metribuzin	21087649	2.50E-02 I					910 N	91 N	34 N	51000 N	2000 N		
Mirex	2385855	2.00E-04 I		1.80E+00 W			0.037 C	0.0035 C	0.0018 C	3.2 C	0.35 C		
Molinate	2212671	2.00E-03 I					73 N	7.3 N	2.7 N	4100 N	160 N		
Molybdenum	7439987	5.00E-03 I					180 N	18 N	6.8 N	10000 N	390 N		
Monochloramine	10599903	1.00E-01 I					3700 N	370 N	140 N	200000 N	7800 N		
Naled	300765	2.00E-03 I					73 N	7.3 N	2.7 N	4100 N	160 N		
2-Naphthylamine	91598			1.30E+02 E			0.00052 C	0.00005 C	0.00002 C	0.044 C	0.0049 C		
Napropamide	15299997	1.00E-01 I					3700 N	370 N	140 N	200000 N	7800 N		
Nickel refinery dust					8.40E-01 I			0.0075 C					
Nickel and compounds	7440020	2.00E-02 I					730 N	73 N	27 N	41000 N	1600 N	6900 E	21 E
Nickel subsulfide	12035722				1.70E+00 I			0.0037 C					
Nitrapyrin	1929824	1.50E-03 W					55 N	5.5 N	2 N	3100 N	120 N		
Nitrate	14797558	1.60E+00 I					58000 N	5800 N	2200 N	1E+06 N	130000 N		
Nitric Oxide	10102439	1.00E-01 W					3700 N	370 N	140 N	200000 N	7800 N		
Nitrite	14797650	1.00E-01 I					3700 N	370 N	140 N	200000 N	7800 N		
2-Nitroaniline	88744	6.00E-05 W	5.71E-05 H				2.2 N	0.21 N	0.081 N	120 N	4.7 N		
3-Nitroaniline	99092	3.00E-03 O					110 N	11 N	4.1 N	6100 N	230 N		
4-Nitroaniline	100016	3.00E-03 O					110 N	11 N	4.1 N	6100 N	230 N		
Nitrobenzene	98953	5.00E-04 I	5.71E-04 A			x	3.4 N	2.1 N	0.68 N	1000 N	39 N	110 E	0.09 E
Nitrofurantoin	67209	7.00E-02 H					2600 N	260 N	95 N	140000 N	5500 N		
Nitrofurazone	59870			1.50E+00 H	9.40E+00 H		0.045 C	0.00067 C	0.0021 C	3.8 C	0.43 C		
Nitrogen dioxide	10102440	1.00E+00 W					37000 N	3700 N	1400 N	1E+06 N	78000 N		
Nitroguanidine	556887	1.00E-01 I					3700 N	370 N	140 N	200000 N	7800 N		
4-Nitrophenol	100027	6.20E-02 O					2300 N	210 N	84 N	130000 N	4800 N		
2-Nitropropane	79469		5.71E-03 I		9.40E+00 H		210 N	0.00067 C					
N-Nitrosodi-n-butylamine	924163			5.40E+00 I	5.60E+00 I		0.012 C	0.0011 C	0.00058 C	1.1 C	0.12 C		
N-Nitrosodiethanolamine	1116547			2.80E+00 I			0.024 C	0.0022 C	0.0011 C	2 C	0.23 C		
N-Nitrosodiethylamine	55185			1.50E+02 I	1.51E+02 I		0.00045 C	0.00004 C	0.00002 C	0.038 C	0.0043 C		
N-Nitrosodimethylamine	62759			5.10E+01 I	4.90E+01 I		0.0013 C	0.00013 C	0.00006 C	0.11 C	0.013 C		
N-Nitrosodiphenylamine	86306			4.90E-03 I			14 C	1.3 C	0.64 C	1200 C	130 C	29 C	0.2 E
N-Nitroso di-n-propylamine	621647			7.00E+00 I			0.0096 C	0.00089 C	0.00045 C	0.82 C	0.091 C	0.014 C	0.00002 E
N-Nitroso-N-methylethylamine	10595956			2.20E+01 I			0.0031 C	0.00028 C	0.00014 C	0.26 C	0.029 C		
N-Nitrosopyrrolidine	930552			2.10E+00 I	2.13E+00 I		0.032 C	0.0029 C	0.0015 C	2.7 C	0.3 C		
m-N[illegible]luene	99081	1.00E-02 H				x	61 N	37 N	14 N	20000 N	780 N	460 E	0.42 E
o-N[illegible]	88722	1.00E-02 H				x	61 N	37 N	14 N	20000 N	780 N	[illegible]	0.42 E
p-Nitr[illegible]	99990	1.00E-02 H				x	61 N	37 N	14 N	20000 N	780 N		0.42 E

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NuStar	85509199	7.00E-04 i					26 n	2.6 n	0.95 n	1400 n	55 n		
Octabromodiphenyl ether	32536520	3.00E-03 i					110 n	11 n	4.1 n	6100 n	230 n		
Octahydro-1357-tetranitro-1357-tetrazocine	2691410	5.00E-02 i					1800 n	180 n	68 n	100000 n	3900 n		
Octamethylpyrophosphoramide	152169	2.00E-03 h					73 n	7.3 n	2.7 n	4100 n	160 n		
Oryzalin	19044883	5.00E-02 i					1800 n	180 n	68 n	100000 n	3900 n		
Oxadiazon	19666309	5.00E-03 i					180 n	18 n	6.8 n	10000 n	390 n		
Oxamyl	23135220	2.50E-02 i					910 n	91 n	34 n	51000 n	2000 n		
Oxyfluorfen	42874033	3.00E-03 i					110 n	11 n	4.1 n	6100 n	230 n		
Paclobutrazol	76738620	1.30E-02 i					470 n	47 n	18 n	27000 n	1000 n		
Paraquat	1910425	4.50E-03 i					160 n	16 n	6.1 n	9200 n	350 n		
Parathion	56382	6.00E-03 h					220 n	22 n	8.1 n	12000 n	470 n	110 s	3.9 n
Pebulate	1114712	5.00E-02 h					1800 n	180 n	68 n	100000 n	3900 n		
Pendimethalin	40487421	4.00E-02 i					1500 n	150 n	54 n	82000 n	3100 n		
Pentabromo-6-chloro cyclohexane	87843			2.30E-02 h			2.9 c	0.27 c	0.14 c	250 c	28 c		
Pentabromodiphenyl ether	32534819	2.00E-03 i					73 n	7.3 n	2.7 n	4100 n	160 n		
Pentachlorobenzene	608935	8.00E-04 i				☒	4.9 n	2.9 n	1.1 n	1600 n	63 n	570 n	48 n
Pentachloronitrobenzene	82688	3.00E-03 i		2.60E-01 h		☒	0.041 c	0.024 c	0.012 c	22 c	2.5 c		
Pentachlorophenol	87865	3.00E-02 i		1.20E-01 i			0.56 c	0.052 c	0.026 c	48 c	5.3 c	7.9 c	0.2 [illegible]
Permethrin	52645531	5.00E-02 i					1800 n	180 n	68 n	100000 n	3900 n		
Phenmedipham	13684634	2.50E-01 i					9100 n	910 n	340 n	510000 n	20000 n		
Phenol	108952	6.00E-01 i					22000 n	2200 n	810 n	1E+06 n	47000 n	21000 s	49 n
m-Phenylenediamine	108452	6.00E-03 i					220 n	22 n	8.1 n	12000 n	470 n		
p-Phenylenediamine	106503	1.90E-01 h					6900 n	690 n	260 n	390000 n	15000 n		
Phenylmercuric acetate	62384	8.00E-05 i					2.9 n	0.29 n	0.11 n	160 n	6.3 n		
2-Phenylphenol	90437			1.94E-03 h			35 c	3.2 c	1.6 c	3000 c	330 c		
Phorate	298022	2.00E-04 h					7.3 n	0.73 n	0.27 n	410 n	16 n		
Phosmet	732116	2.00E-02 i					730 n	73 n	27 n	41000 n	1600 n		
Phosphine	7803512	3.00E-04 i	8.57E-06 h				11 n	0.031 n	0.41 n	610 n	23 n		
Phosphorus (white)	7723140	2.00E-05 i					0.73 n	0.073 n	0.027 n	41 n	1.6 n		
p-Phthalic acid	100210	1.00E+00 h					37000 n	3700 n	1400 n	1E+06 n	78000 n		
Phthalic anhydride	85449	2.00E+00 i	5.43E-02 h				73000 n	130 n	2700 n	1E+06 n	160000 n		
Picloram	1918021	7.00E-02 i					2600 n	260 n	95 n	140000 n	5500 n		
Pirimiphos-methyl	29232937	1.00E-02 i					370 n	37 n	14 n	20000 n	780 n		
Polybrominated biphenyls		7.00E-06 h		8.90E+00 h			0.0076 c	0.0007 c	0.00035 c	0.64 c	0.072 c		
Polychlorinated biphenyls (PCBs)	1336363			7.70E+00 i			0.0087 c	0.00081 c	0.00041 c	0.74 c	0.083 c		8.2 c
Aroclor 1016	12674112	7.00E-05 i					2.6 n	0.26 n	0.095 n	140 n	5.5 n		
Aroclor 1254	11097691	2.00E-05 i					0.73 n	0.073 n	0.027 n	41 n	1.6 n		
Polychlorinated terphenyls (PCTs)				4.50E+00 e			0.015 c	0.0014 c	0.0007 c	1.3 c	0.14 c		
Polynuclear aromatic hydrocarbons													
Acenaphthene	83329	6.00E-02 i					2200 n	220 n	81 n	120000 n	4700 n	120 n	200 n
Anthracene	120127	3.00E-01 i					11000 n	1100 n	410 n	610000 n	23000 n	6.8 n	4300 n
Benz[a]anthracene	56553			7.30E-01 e	6.10E-01 e		0.092 c	0.01 c	0.0043 c	7.8 c	0.88 c	27 n	0.7 n

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							Risk-Based Concentrations					Soil Screening Levels-Transfers from Soil to:	
										Soil Ingestion			
		RfDo	RfDi	CPSo	CPSi	VOC	Tap Water	Ambient Air	Fish	Industrial	Residential	Air	Groundwater
Contaminant	CAS	mg/kg/d	mg/kg/d	kg·d/mg	kg·d/mg		µg/L	µg/m3	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Benzo[b]fluoranthene	205992			7.30E-01 e	6.10E-01 e		0.092 c	0.01 c	0.0043 c	7.8 c	0.88 c	23 e	4 e
Benzo[k]fluoranthene	207089			7.30E-02 e	6.10E-02 e		0.92 c	0.1 c	0.043 c	78 c	8.8 c		4 e
Benzo[a]pyrene	50328			7.30E+00 i	6.10E+00 w		0.0092 c	0.001 c	0.00043 c	0.78 c	0.088 c	31 e	4 e
Carbazole	86748			2.00E-02 h			3.4 c	0.31 c	0.16 c	290 c	32 c	11 e	0.5 e
Chrysene	218019			7.30E-03 e	6.10E-03 e		9.2 c	1 c	0.43 c	780 c	88 c	36 e	1 e
Dibenz[ah]anthracene	53703			7.30E+00 e	6.10E+00 e		0.0092 c	0.001 c	0.00043 c	0.78 c	0.088 c	7.2 e	11 e
Fluoranthene	206440	4.00E-02 i					1500 n	150 n	54 n	82000 n	3100 n	68 e	980 e
Fluorene	86737	4.00E-02 i					1500 n	150 n	54 n	82000 n	3100 n	89 e	160 e
Indeno[1,2,3-cd]pyrene	193395			7.30E-01 e	6.10E-01 e		0.092 c	0.01 c	0.0043 c	7.8 c	0.88 c	280 e	35 e
Naphthalene	91203	4.00E-02 w					1500 n	150 n	54 n	82000 n	3100 n	180 e	30 e
Pyrene	129000	3.00E-02 i					1100 n	110 n	41 n	61000 n	2100 n	56 e	1400 e
Prochloraz	67747095	9.00E-03 i		1.50E-01 i			0.45 c	0.042 c	0.021 c	38 c	4.3 c		
Profluralin	26399360	6.00E-03 h					220 n	22 n	8.1 n	12000 n	470 n		
Prometon	1610180	1.50E-02 i					550 n	55 n	20 n	31000 n	1200 n		
Prometryn	7287196	4.00E-03 i					150 n	15 n	5.4 n	8200 n	310 n		
Pronamide	23950585	7.50E-02 i					2700 n	270 n	100 n	150000 n	5900 n		
Propachlor	1918167	1.30E-02 i					470 n	47 n	18 n	27000 n	1000 n		
Propanil	709988	5.00E-03 i					180 n	18 n	6.8 n	10000 n	390 n		
Propargite	2312358	2.00E-02 i					730 n	73 n	27 n	41000 n	1600 n		
Propargyl alcohol	107197	2.00E-03 i					73 n	7.3 n	2.7 n	4100 n	160 n		
Propazine	139402	2.00E-02 i					730 n	73 n	27 n	41000 n	1600 n		
Propham	122429	2.00E-02 i					730 n	73 n	27 n	41000 n	1600 n		
Propiconazole	60207901	1.30E-02 i					470 n	47 n	18 n	27000 n	1000 n		
Propylene glycol	57556	2.00E+01 h					730000 n	73000 n	27000 n	1E+06 n	1000000 n		
Propylene glycol, monoethyl ether	52125538	7.00E-01 h					26000 n	2600 n	950 n	1E+06 n	55000 n		
Propylene glycol, monomethyl ether	107982	7.00E-01 h	5.71E-01 i				26000 n	2100 n	950 n	1E+06 n	55000 n		
Propylene oxide	75569		8.57E-03 i	2.40E-01 i	1.29E-02 i		0.28 c	0.49 c	0.013 c	24 c	2.7 c		
Pursuit	81335775	2.50E-01 i					9100 n	910 n	340 n	510000 n	20000 n		
Pydrin	51630581	2.50E-02 i					910 n	91 n	34 n	51000 n	2000 n		
Pyridine	110861	1.00E-03 i					37 n	3.7 n	1.4 n	2000 n	78 n		
Quinalphos	13593038	5.00E-04 i					18 n	1.8 n	0.68 n	1000 n	39 n		
Quinoline	91225			1.20E+01 h			0.0056 c	0.00052 c	0.00026 c	0.48 c	0.053 c		
Resmethrin	10453868	3.00E-02 i					1100 n	110 n	41 n	61000 n	2300 n		
Ronnel	299843	5.00E-02 h					1800 n	180 n	68 n	100000 n	3900 n		
Rotenone	83794	4.00E-03 i					150 n	15 n	5.4 n	8200 n	310 n		
Savey	78587050	2.50E-02 i					910 n	91 n	34 n	51000 n	2000 n		
Selenious Acid	7783008	5.00E-03 i					180 n	18 n	6.8 n	10000 n	390 n		
Selenium	7782492	5.00E-03 i					180 n	18 n	6.8 n	10000 n	390 n		3 e
Sele[illegible]	630104	5.00E-03 h					180 n	18 n	6.8 n	10000 n	390 n		
Seth[illegible]	74051802	9.00E-02 i					3300 n	330 n	120 n	160000 n	7000 n		
Silver [illegible] pounds	7440224	5.00E-03 i					180 n	18 n	6.8 n	10000 n	390 n		

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							Risk-Based Concentrations					Soil Screening Levels-Transfers from Soil to:	
							Tap Water	Ambient Air	Fish	Soil Ingestion			
		RfDo	RfDi	CPSo	CPSi	VOC				Industrial	Residential	Air	Groundwater
Contaminant	CAS	mg/kg/d	mg/kg/d	kg·d/mg	kg·d/mg		µg/L	µg/m3	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Sodium azide	26628228	4.00E-03 i					150 n	15 n	5.4 n	8200 n	310 n		
Sodium diethyldithiocarbamate	148185	3.00E-02 i		2.70E-01 h			0.25 c	0.023 c	0.012 c	21 c	2.4 c		
Sodium fluoroacetate	62748	2.00E-05 i					0.73 n	0.073 n	0.027 n	41 n	1.6 n		
Sodium metavanadate	13718268	1.00E-03 h					37 n	3.7 n	1.4 n	2000 n	78 n		
Strontium, stable	7440246	6.00E-01 i					22000 n	2200 n	810 n	1E+06 n	47000 n		
Strychnine	57249	3.00E-04 i					11 n	1.1 n	0.41 n	610 n	23 n		
Styrene	100425	2.00E-01 i	2.86E-01 i			x	1600 n	1000 n	270 n	410000 n	16000 n	1400 s	2 e
Systhane	88671890	2.50E-02 i					910 n	91 n	34 n	51000 n	2000 n		
2,3,7,8-TCDD (dioxin)	1746016			1.56E+05 h	1.16E+05 h		4E-07 c	5E-08 c	c	4E-05 c	4E-06 c		
Tebuthiuron	34014181	7.00E-02 i					2600 n	260 n	95 n	140000 n	5500 n		
Temephos	3383968	2.00E-02 h					730 n	73 n	27 n	41000 n	1600 n		
Terbacil	5902512	1.30E-02 i					470 n	47 n	18 n	27000 n	1000 n		
Terbufos	13071799	2.50E-05 h					0.91 n	0.091 n	0.034 n	51 n	2 n		
Terbutryn	886500	1.00E-03 i					37 n	3.7 n	1.4 n	2000 n	78 n		
1,2,4,5-Tetrachlorobenzene	95943	3.00E-04 i				x	1.8 n	1.1 n	0.41 n	610 n	23 n	91 e	0.69 e
1,1,1,2-Tetrachloroethane	630206	3.00E-02 i		2.60E-02 i	2.59E-02 i	x	0.41 c	0.24 c	0.12 c	220 c	25 c		
1,1,2,2-Tetrachloroethane	79345			2.00E-01 i	2.03E-01 i	x	0.052 c	0.031 c	0.016 c	29 c	3.2 c	0.4 e	0.001 e
Tetrachloroethylene (PCE)	127184	1.00E-02 i		5.20E-02 e	2.03E-03 e	x	1.1 c	3.1 c	0.061 c	110 c	12 c	11 e	0.04 e
2,3,4,6-Tetrachlorophenol	58902	3.00E-02 i					1100 n	110 n	41 n	61000 n	2300 n		
p,a,a,a-Tetrachlorotoluene	5216251			2.00E+01 h		x	0.00053 c	0.00031 c	0.00016 c	0.29 c	0.032 c		
Tetrachlorovinphos	961115	3.00E-02 i		2.40E-02 h			2.8 c	0.26 c	0.13 c	240 c	27 c		
Tetraethyldithiopyrophosphate	3689245	5.00E-04 i					18 n	1.8 n	0.68 n	1000 n	39 n		
Lead (tetraethyl)	78002	1.00E-07 i					0.0037 n	0.00037 n	0.00014 n	0.2 n	0.0078 n	0.00068 e	0.000034 e
Thallic oxide	1314325	7.00E-05 w					2.6 n	0.26 n	0.095 n	140 n	5.5 n		
Thallium													0.4 e
Thallium acetate	563688	9.00E-05 i					3.3 n	0.33 n	0.12 n	180 n	7 n		
Thallium carbonate	6533739	8.00E-05 i					2.9 n	0.29 n	0.11 n	160 n	6.3 n		
Thallium chloride	7791120	8.00E-05 i					2.9 n	0.29 n	0.11 n	160 n	6.3 n		
Thallium nitrate	10102451	9.00E-05 i					3.3 n	0.33 n	0.12 n	180 n	7 n		
Thallium selenite	12039520	9.00E-05 w					3.3 n	0.33 n	0.12 n	180 n	7 n		
Thallium sulfate	7446186	8.00E-05 i					2.9 n	0.29 n	0.11 n	160 n	6.3 n		
Thiobencarb	28249776	1.00E-02 i					370 n	37 n	14 n	20000 n	780 n		
2-(Thiocyanomethylthio)-benzothiazole	21564170	3.00E-02 h					1100 n	110 n	41 n	61000 n	2300 n		
Thiofanox	39196184	3.00E-04 h					11 n	1.1 n	0.41 n	610 n	23 n		
Thiophanate-methyl	23564058	8.00E-02 i					2900 n	290 n	110 n	160000 n	6300 n		
Thiram	137268	5.00E-03 i					180 n	18 n	6.8 n	10000 n	390 n		
Tin and compounds		6.00E-01 h					22000 n	2200 n	810 n	1E+06 n	47000 n		
Toluene	108883	2.00E-01 i	1.14E-01 i			x	750 n	420 n	270 n	410000 n	16000 n	520 s	5 e
Toluene-2,4-diamine	95807			3.20E+00 h			0.021 c	0.002 c	0.00099 c	1.8 c	0.2 c		
Toluene-2,5-diamine	95705	6.00E-01 h					22000 n	2200 n	810 n	1E+06 n	47000 n		
Toluene-2,6-diamine	823405	2.00E-01 h					7300 n	730 n	270 n	410000 n	16000 n		

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E=EPA draft Soil Screening Level S=soil saturation concentration

							Risk-Based Concentrations					Soil Screening Levels-Transfers from Soil to:	
							Tap Water	Ambient Air	Fish	Soil Ingestion			
		RfDo	RfDi	CPSo	CPSi	VOC				Industrial	Residential	Air	Groundwater
Contaminant	CAS	mg/kg/d	mg/kg/d	kg·d/mg	kg·d/mg		µg/L	µg/m3	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Toxaphene	8001352			1.10E+00 i	1.12E+00 i		0.061 c	0.0056 c	0.0029 c	5.2 c	0.58 c	5 e	0.04 e
Tralomethrin	66841256	7.50E-03 i					270 n	27 n	10 n	15000 n	590 n		
Triallate	2303175	1.30E-02 i					470 n	47 n	18 n	27000 n	1000 n		
Triasulfuron	82097505	1.00E-02 i					370 n	37 n	14 n	20000 n	780 n		
1,2,4-Tribromobenzene	615543	5.00E-03 i				X	30 n	18 n	6.8 n	10000 n	390 n		
Tributyltin oxide (TBTO)	56359	3.00E-05 i					1.1 n	0.11 n	0.041 n	61 n	2.3 n		
2,4,6-Trichloroaniline hydrochloride	33663502			2.90E-02 h			2.3 c	0.22 c	0.11 c	200 c	22 c		
2,4,6-Trichloroaniline	634935			3.40E-02 h			2 c	0.18 c	0.093 c	170 c	19 c		
1,2,4-Trichlorobenzene	120821	1.00E-02 i	5.71e-02 h			X	190 n	210 n	14 n	20000 n	780 n	240 e	2 e
1,1,1-Trichloroethane	71556	9.00E-02 w	2.86E-01 w			X	1300 n	1000 n	120 n	180000 n	7000 n	980 e	0.9 e
1,1,2-Trichloroethane	79005	4.00E-03 i		5.70E-02 i	5.60E-02 i	X	0.19 c	0.11 c	0.055 c	100 c	11 c	0.8 e	0.01 e
Trichloroethylene (TCE)	79016	6.00E-03 e		1.10E-02 w	6.00E-03 e	X	1.6 c	1 c	0.29 c	520 c	58 c	3 e	0.02 e
Trichlorofluoromethane	75694	3.00E-01 i	2.00E-01 a			X	1300 n	730 n	410 n	610000 n	23000 n	790 n	13 n
2,4,5-Trichlorophenol	95954	1.00E-01 i					3700 n	370 n	140 n	200000 n	7800 n	8200 e	120 e
2,4,6-Trichlorophenol	88062			1.10E-02 i	1.09E-02 i		6.1 c	0.57 c	0.29 c	520 c	58 c	150 e	0.05 e
2,4,5-Trichlorophenoxyacetic acid	93765	1.00E-02 i					370 n	37 n	14 n	20000 n	780 n		
2-(2,4,5-Trichlorophenoxy)propionic acid	93721	8.00E-03 i					290 n	29 n	11 n	16000 n	630 n		
1,1,2-Trichloropropane	598776	5.00E-03 i				X	30 n	18 n	6.8 n	10000 n	390 n	13 n	0.14 n
1,2,3-Trichloropropane	96184	6.00E-03 i		7.00e+00 i		X	0.0015 c	0.00089 c	0.00045 c	0.82 c	0.091 c	0.00003 c	6.000E-06 c
1,2,3-Trichloropropene	96195	5.00E-03 h				X	30 n	18 n	6.8 n	10000 n	390 n		
1,1,2-Trichloro-1,2,2-trifluoroethane	76131	3.00E+01 i	8.57E+00 h			X	59000 n	31000 n	41000 n	1E+06 n	1000000 n	2400 s	1100 n
Tridiphane	58138082	3.00E-03 i					110 n	11 n	4.1 n	6100 n	230 n		
Triethylamine	121448		2.00E-03 i				73 n	7.3 n					
Trifluralin	1582098	7.50E-03 i		7.70E-03 i			8.7 c	0.81 c	0.41 c	740 c	83 c		
1,2,4-Trimethylbenzene	95636	5.00e-04 e				X	3 n	1.8 n	0.68 n	1000 n	39 n		
1,3,5-Trimethylbenzene	108678	4.00e-04 e				X	2.4 n	1.5 n	0.54 n	820 n	31 n	6.8 n	0.26 n
Trimethyl phosphate	512561			3.70E-02 h			1.8 c	0.17 c	0.085 c	150 c	17 c		
1,3,5-Trinitrobenzene	99354	5.00E-05 i					1.8 n	0.18 n	0.068 n	100 n	3.9 n		
Trinitrophenylmethylnitramine	479458	1.00E-02 h					370 n	37 n	14 n	20000 n	780 n		
2,4,6-Trinitrotoluene	118967	5.00E-04 i		3.00E-02 i			2.2 c	0.21 c	0.11 c	190 c	21 c		
Uranium (soluble salts)	7440611	3.00E-03 i					110 n	11 n	4.1 n	6100 n	230 n		
Vanadium	7440622	7.00E-03 h					260 n	26 n	9.5 n	14000 n	550 n		
Vanadium pentoxide	1314621	9.00E-03 i					330 n	33 n	12 n	18000 n	700 n		
Vanadium sulfate	36907423	2.00E-02 h					730 n	73 n	27 n	41000 n	1600 n		
Vernam	1929777	1.00E-03 i					37 n	3.7 n	1.4 n	2000 n	78 n		
Vinclozolin	50471448	2.50E-02 i					910 n	91 n	34 n	51000 n	2000 n		
Vinyl acetate	108054	1.00E+00 h	5.71E-02 i				37000 n	210 n	1400 n	1E+06 n	78000 n	370 e	84 e
Vinyl bromide	593602		8.57E-04 i			X	5.2 n	3.1 n				2 n	0.018 n
Vinyl chloride	75014			1.90E+00 h	3.00E-01 h	X	0.019 c	0.021 c	0.0017 c	3 c	0.34 c	0.002 e	0.01 e
War'	81812	3.00E-04 i					11 n	1.1 n	0.41 n	610 n	23 n		
m-X	108323	2.00E+00 h	2.00E-01 w			X	1400 n	730 n	2700 n	1E+06 n	160000 n		240 n
[illegible]	[illegible]	2.00E+00 h	2.00E-01 w			X	1400 n	730 n	2700 n	1E+06 n	160000 n		150 n

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E=EPA draft Soil Screening Level S=soil saturation concentration

Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo kg-d/mg	CPSi kg-d/mg	VOC	Risk-Based Concentrations: Tap Water µg/L	Ambient Air µg/m3	Fish mg/kg	Soil Ingestion: Industrial mg/kg	Soil Ingestion: Residential mg/kg	Soil Screening Levels-Transfers from Soil to: Air mg/kg	Groundwater mg/kg
p-Xylene	106423		8.57E-02 w			x	520 n	310 n				1000 s	220 e
Xylene (mixed)	1330207	2.00E+00 i				x	12000 n	7300 n	2700 n	1E+06 n	160000 n	320 s	74 e
Zinc	7440666	3.00E-01 i					11000 n	1100 n	410 n	610000 n	23000 n		42000 e
Zinc phosphide	1314847	3.00E-04 i					11 n	1.1 n	0.41 n	410 n	23 n		
Zineb	12122677	5.00E-02 i					1800 n	180 n	68 n	100000 n	1900 n		

APPENDIX D

FIELD TEST-KIT RESULTS

Brown & Root Environmental

MULTIPLE S LE LOG SHEET

- [x] SURFACE SOIL
- [x] SUBSURFACE SOIL
- [ ] SEDIMENT
- [ ] LAGOON/POND
- [x] OTHER - SURFACE WATER

SAMPLER(S) SIGNATURE [signature]

PROJECT NAME: INDIAN HEAD

PROJECT NUMBER: 5280

AREA DESIGNATION: AREA 8

Sample No	Sample Method	Depth (FT)	Date	Time	Sampled By	Concentration (L)Low (H)High	(G)Grab (C)Composite	LH	RDX	TNT				No of Cont. Total	Soil Description
08-WS-SD-1-05/06-B	SS Trowel	0-1'	9/15/95	1220	DY	L	G		3%	4%				1	CLAYEY SILT
08-WS-W-05/06-B	Direct			"	"				Lo	Lo				1	~WATER —
08-WS-SD-08/09-B	SS Trowel			1227	"				4%	Lo				1	SILTY FINE SAND w/ TR. CLAY
08-WS-W-08/09-B	Direct			"	"				5%	Lo				1	— WATER ~
08-WS-SD-24-B	SS Trowel			1234	"				3%	Lo				1	SILTY CLAY, TR. CLAY SAND
08-WS-W-24-B	Direct			"	"				7%	8%				1	— WATER —
08-WS-SD-20/23-B	SS Trowel			1238	"				2%	Lo				1	SILTY CLAY
08-WS-W-20/23-B	Direct			"	"				5%	23%				1	— WATER —
08-WS-SD-22-B	SS Trowel			1243	"				5%	Lo				1	SILT w/ FINE SAND
08-WS-SD-28-B	SS Trowel			1246	"				8%	Lo				1	SILTY FINE SAND w/ TR. CLAY
08-WS-W-28-B	Direct			1246	"				5%	1%				1	~ WATER ~
08-WS-SD-07/08-A	SS Trowel			1335	"				Lo	5%				1	SILTY FINE SAND
08-WS-W-07/08-A	Direct			"	"				5%	1%				1	~ WATER ~
08-WS-SD-29C-A	SS Trowel			1337	"				3%	Lo				1	SILTY FINE SAND
08-WS-W-29C-A	Direct			1337	"				Lo	Lo				1	~ WATER ~
08-WS-SD-17-A	SS Trowel			1346	RW				5%	Lo				1	CLAYEY SILT

REMARKS:

LAB:

COC NO:

ACAD: C:\FORMS\SAMPLOG.DWG 02/11/93

Brown & Root Environmental

MULTIPLE SAMPLE LOG SHEET

- SURFACE SOIL
- SUBSURFACE SOIL
- SEDIMENT
- [ ] LAGOON/POND
- [ ] OTHER

SAMPLER(S) SIGNATURE: [signature]

PROJECT NAME: INDIAN HEAD

PROJECT NUMBER: 5280

AREA DESIGNATION: AREA 8

Sample No.	Sample Method	Depth (FT)	Date	Time	Sampled By	Concentration (L)Low (H)High	(G)Grab (C)Composite	ANALYSES: TNT (LM)	ANALYSES: RDX	ANALYSES: TNT	No. of Cont. Total	Soil Description
08-WS-SD-18-A	SS Trowel	0-1'	9/15/95	1348	RW	L	G		4%	Lo	1	SILTY CLAY
08-WS-SD-21-A	"	"	"	1356	"	"	"		4%	2%	1	SILTY FINE SAND
08-WS-SD-20-A	"	"	"	1357	"	"	"		7%	Lo	1	SILTY CLAY
08-WS-SD-24-A	"	"	"	1404	"	"	"		4%	4%	1	CLAY w/TR. SAND
08-WS-SD-32-A	"	"	"	1408	"	"	"		5%	4%	1	CLAYEY SILT
08-WS-SD-11-A	"	"	"	1419	"	"	"		5%	1%	1	SILTY SAND
08-AS-SD-39/40-B	"	"	"	1426	"	"	"		1%	11%	1	SANDY SILT
08-AS-SD-32/33-B	"	"	"	1434	"	"	"		3%	Lo	1	FINE SAND w/TR. CLAY
08-AS-SD-11-B	"	"	"	1441	"	"	"		5%	Lo	1	CLAYEY FINE SAND

REMARKS:

LAB:

COC NO:

Brown & Root Environmental

MULTIPLE SAMPLE LOG SHEET

■ SURFACE SOIL
■ SUBSURFACE SOIL
☐ SEDIMENT
☐ LAGOON/POND
☐ OTHER

PAGE 1 OF 2

SAMPLER(S) SIGNATURE [signature]

PROJECT NAME: INDIAN HEAD

PROJECT NUMBER: 5280

AREA DESIGNATION ~~[illegible]~~ RANGE 6

Sample No.	SAMPLE METHOD	DEPTH (FT)	DATE	TIME	SAMPLED BY	CONCENTRATION (L)LOW (H)HIGH	(G)GRAB (C)COMPOSITE	ANALYSES: TNT	ANALYSES: RDX						NO OF CONT. TOTAL	SOIL DESCRIPTION
06-SS-13-0006	HAND AUGER	0-6"	9/16/95	1100	RN	HL	G	11%	30%						1	SILTY SAND w/TR. GRAVEL
06-SS-13-0612	"	6-12"	"	1105	"	"	"	48%	59%						1	" "
06-SS-13-1218	"	12-18"	"	1107	"	"	"	5%	17%						1	" "
06-SS-13-1824	"	18-~~24~~"	"	1111	"	"	"	Lo	12%						1	" "
06-SS-01	SS TROWEL	0-6"	"	1410	"	"	"	11%	3%						1	" "
06-SS-02	"	0-6"	"	1415	"	"	"	4%	3%						1	" "
06-SS-03	"	"	"	1417	"	"	"	8%	5%						1	" "
06-SS-04	"	"	"	1419	"	"	"	4%	15%						1	" "
06-SS-05	"	"	"	1423	"	"	"	3%	9%						1	SILTY SAND
06-SS-10	"	"	"	1426	"	"	"	Lo	4%						1	SILTY SAND TR GRAVEL
06-SS-09	"	"	"	1429	"	"	"	18%	8%						1	" " " SLIGHTLY DAMP
06-SS-08	"	"	"	1435	"	"	"	5%	17%						1	" " "
06-SS-07	"		"	1440	"	"	"	45%	25%						1	" " "
06-SS-06	"	"	"	1442	"	"	"	2%	3%						1	" " "
06-SS-11	"	"	"	1445	"	"	"	2%	16%						1	" " "
06-SS-12	HAND AUGER	0-12"	"	1450	"	"	"	5%	17%						1	SAND AND GRAVEL - WET

REMARKS:

LAB:

COC NO:

Brown & Root Environmental

MULTIPLE SAMPLE LOG SHEET

■ SURFACE SOIL ■ SUBSURFACE SOIL □ SEDIMENT □ LAGOON/POND □ OTHER

SAMPLER(S) SIGNATURE ____

PROJECT NAME: INDIAN HEAD

PROJECT NUMBER: 5280

AREA DESIGNATION: AREAS 8 & RANGE 6

Sample No.	Sample Method	Depth (FT)	Date	Time	Sampled By	Concentration (L)Low (H)High	(G)Grab (C)Composite	ANALYSES TNT	ANALYSES ROX						No. of Cont. Total	Soil Description
08-AS-SD-24-B	SS Trowel	0-1'	9/19/95	0847	RW	L	G	LB	Lo						1	SILTY SAND w/TR. CLAY
08-WS-SD-10-A	"	"	"	0852	"	"	"	Lo	Lo 9%						1	CLAYEY SILT
08-WS-SD-09-A	"	"	"	0853	"	"	"	Lo	4%						1	CLAYEY SILT
08-WS-SD-12-A	"	"	"	0903	"	"	"	Lo	Lo						1	SILTY CLAY w/TR. SAND
08-WS-SD-19-A	"	"	"	0906	"	"	"	1%	Lo						1	CLAYEY SILT w/TR. SAND
08-AS-SD-44-B	"	"	"	0914	"	"	"	10%	Lo						1	SILTY SAND w/TR. CLAY
08-AS-SD-43-B	"	"	"	0916	"	"	"	Lo	Lo						1	SILTY SAND w/CLAY
06-SS-23	"	"	"	1020	"	"	"	6%	3%						1	SILTY SAND
06-SS-24	"	"	"	1023	"	"	"	5%	3%						1	SILTY SAND

REMARKS:

LAB:

COC NO:

HALLIBURTON NUS
Environmental Corporation

SAMPLE LOG SHEET

- [x] SURFACE SOIL
- [ ] SUBSURFACE SOIL
- [ ] SEDIMENT
- [ ] LAGOON/POND
- [ ] OTHER

SAMPLERS SIGNATURE Robert P. Marshall

PAGE 1 OF 1

SITE NAME AREA8

SITE NUMBER

SAMPLE No.	SAMPLE METHOD	DEPTH (FT)	DATE	TIME	SAMPLED BY	CONCENTRATION (L)LOW (H)HIGH	(G)GRAB (C)COMPOSITE	ANALYSES: TNT	ANALYSES: RDX	ANALYSES: Diluted 10:1 10% solution	ANALYSES: X10				No. OF CONT TOTAL	SOIL DESCRIPTION
S25 - SW01	Direct	0-2'	9/22/95	1230	DY	L	G	Lo	Lo						1	WATER
S25 - SW02	"	"	9/21/95	1400	"	"	"	5%	Lo						1	WATER
S25 - SW03	"	"	9/22/95	1420	"	"	"	14%	2%						1	WATER
S25 - SW04	"	"	9/25/95	1030	"	"	"	Lo	Lo						1	WATER
S25 - SD01	"	"	9/22/95	1230	"	"	"	6%	3%						1	Silty Sand w/clay
S25 - SD02	"	"	9/21/95	1400	"	"	"	5%	4%						1	" " "
S25 - SD03	"	"	9/22/95	1420	"	"	"	4%	3%						1	" " "
S25 - SD04	"	"	9/25/95	1030	"	"	"	1%	Lo						1	" " "
S05 - SB19	"	"	9/16/95	1524	"	"	"	HI	5%	24%	240%				1	" " "
S25 - MW01	"	"	9/19/95	0925	"	"	"	2%	Lo						1	" " "
S25 - MW02	"	"	9/22/95	1020	"	"	"	Lo	4%						1	" " "
S25 - SB01	"	"	9/21/95	1405	"	"	"	4%	Lo						1	" " "
S25 - AS 44/48	"	"	9/25/95	1000	"	"	"	3%	Lo						1	" " "
S25 - AS 38/40	"	"	9/25/95	1005	"	"	"	4%	2%						1	" " "

REMARKS:

LAB:

Brown & Root Environmental

MULTIPLE SAMPLE LOG SHEET

- ☐ SURFACE SOIL
- ■ SUBSURFACE SOIL
- ☐ SEDIMENT
- ☐ LAGOON/POND
- ☐ OTHER

SAMPLER(S) SIGNATURE

PROJECT NAME: INDIAN HEAD

PROJECT NUMBER: 5280

AREA DESIGNATION

Sample No.	SAMPLE METHOD	DEPTH (FT)	DATE	TIME	SAMPLED BY	CONCENTRATION (L)LOW (H)HIGH	(G)GRAB (C)COMPOSITE	ANALYSES: TNT	ANALYSES: RDX						No. OF CONT. TOTAL	SOIL DESCRIPTION
AREA8-SB02	HAND AUGER	0-2'			DY	L	G	13%	LO							SILTY SAND w/CLAY
AREA8-SB03	"	0-2'			DY	L	G	LO	1%							

REMARKS:

LAB:

COC NO:

APPENDIX E

SAMPLE LOG SHEETS/COCs

E.1 - SURFACE WATER/SEDIMENT
E.2 - SOILS
E.3 - GROUNDWATER
E.4 - QA/QC
E.5 - CHAIN OF CUSTODIES (COCs)

E.1

SURFACE WATER/SEDIMENT

SINGLE SAMPLE LOG SHEET

Project Site Name: INDIAN HEAD

Sample ID No.: S25-SD001

Project No.: 5280

Sample Location:

Sampled By: [redacted] / YOST

C.O.C. No.: #5A

- ☐ Surface Soil
- ☐ Subsurface Soil
- ■ Sediment
- ☐ Other ______
- ☐ QA Sample Type: ______

Sample Method: S.S TROWEL

Depth Sampled: 0-6"

Sample Date and Time: 9-22-95 @ 1240

Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☒ Low Concentration

Composite Sample Data

Sample	Time	Color/Description
	NA	

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
BROWN-GRAY	CLAYEY SAND WITH SILT

Analysis	Container Requirements	Collected (✓)
8330, NC, NQ, NG, PETN	1 8OZ JGA	
TAL METALS SN CN	1 4OZ JAR	
TOC/NO2/NO3/NH3	1 8OZ JAR	
APPENDIX IX VOA	1 4OZ JAR	
APPENDIX IX SVOA	" "	
SPARE FOR OM.CHEM		
TEST KIT SAMPLE		

Map:

Observations/Notes:

SAMPLE COLLECTED AT WATER SHOT 5,6,7 - B

Circle if Applicable:		Signature(s):
MS/MSD	Duplicate ID No: FD05	David A. Yost

SINGLE SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: INDIAN HEAD

Sample ID No.: F005

Project No.: 5280

Sample Location:

☐ Surface Soil
☐ Subsurface Soil
■ Sediment
☐ Other ______
☐ QA Sample Type: ______

Sampled By: MARSHALL/YOST

C.O.C. No.: #5A

Sample Method:	S.S. TROWEL
Depth Sampled:	0-6"
Sample Date and Time:	9-20-95 @ 0000

Type of Sample
☒ Grab
☐ Composite
☐ Grab-Composite
☐ High Concentration
☒ Low Concentration

Composite Sample Data

Sample	Time	Color/Description
	N/A	

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
BROWN GRAY	CLAYEY SAND WITH SILT

Analysis	Container Requirements	Collected (✓)
8330, NG, NG, NQ, PETN	1-8OZ JAR	
TOC, NO_2, NO_3, NH_3	" "	
TAL METALS, SN, CN	1-4OZ JAR	
APPendix IX VOA	" "	
APPendix IX SVOA	" "	
S		

Map:

Observations/Notes:

Duplicate of S25-SD001

Circle if Applicable:		Signature(s):
MS/MSD	Duplicate ID No:	David A. Yost

SURFACE WATER
SAMPLING LOG SHEET

Project Site Name: INDIAN HEAD

Sample ID No.: SZS-SW001

Project No.: 5280

Sample Location:

☐ Spring ☐ Pond
☐ Stream ☐ Lake
☒ Other WATER SHOT LOCATION
☐ QA Sample Type:

Sampled By: [redacted] / YOST

C.O.C. No.: #5A

Sample Data							
Date and Time			Method			Depth	
9-22-95 @ 1230			DIRECT			0-6"	
pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD	TBD
5.69	0.216	21.5	124	BROWN			

Analysis	Preservative	Container Requirements	Collected (✓)
APPendix IX VOLATILES	HCL	3-40 ML VIAL	
APPendix IX SVOA	—	1 LT AMBER	
NC/NG	—	" "	
EXPLOSIVES, NG, PETN	—	" "	
METALS - TOTAL	HNO_3	1 LT POLY	
METALS - DISSOLVED	HNO_3	" "	
CYANIDE	NAOH	" "	
SO_4 / PO_4	—	250 ML POLY	
TOX	H_2SO_4	" "	
TKN	H_2SO_4	" "	
NO_2 / NO_3	H_2SO_4	50 ML POLY	

Observations/Notes:
TOC / NH_3 H_2SO_4 250 mL AMBER

WATER SHOT 5,6,7-B

Circle if Applicable:		Signature(s):
MS/MSD	Duplicate ID No.: FD05	David G. Yost

TBD: To Be Determined

SURFACE WATER
SAMPLING LOG SHEET

Page ___ of ___

Project Site Name: INDIAN HEAD

Sample ID No.: FD06

Project No.: 5280

Sample Location:

Sampled By: MARSHALL/YOST

☐ Spring ☐ Pond
☐ Stream ☐ Lake
☒ Other WATER SHOT LOCATION
☐ QA Sample Type:

C.O.C. No.: #5A

Sample Data

Date and Time	Method	Depth
9-22-95 @ 0000	DIRECT	0-6"

pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD	TBD
5.69	0.216	21.5	124	BROWN			

Analysis	Preservative	Container Requirements	Collected (✓)
APPENDIX IV VOA	HCL	3-40 ml VIAL	
APPENDIX IV SVOA	—	1 LT AMBER	
NC/NG	—	" "	
EXPLOSIVES, NG, PETN	—	" "	
METALS-TOTAL	HNO_3	1 LT POLY	
METALS DISSOLVED	HNO_3	" "	
CYANIDE	NAOH	" "	
SO_4 / PO_4	—	1 250ml POLY	
TOX	H_2SO_4	" "	
TKN	H_2SO_4	" "	
NO_2 / NO_3	H_2SO_4	1-500ml POLY	

Observations/Notes:

TOC / NH_3 H_2SO_4 1-250 ml AMBER

DUPLICATE OF S25-SW001

Circle if Applicable:

MS/MSD | Duplicate ID No.:

Signature(s): David A. Yost

TBD: To Be Determined

SURFACE WATER
SAMPLING LOG SHEET

Project Site Name: INDIAN HEAD

Sample ID No.: S25-SW002

Project No.: 5280

Sample Location:

Sampled By: MARSHALL/YOST

- ☐ Spring
- ☐ Pond
- ☐ Stream
- ☐ Lake
- ☒ Other WATER SHOT LOCATION
- ☐ QA Sample Type:

C.O.C. No.: #4 B&C

Sample Data

Date and Time	Method					Depth	
9-21-95 @ 1345	DIRECT					6"	
pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD	TBD
5.14	0.058	20.8	10	CLEAR			

Analysis	Preservative	Container Requirements	Collected (✓)
APPENDIX IX VOA	HCl	3-40ml VIAL	✓
APPENDIX IX SVOA	—	1 LT AMBER	✓
NC/NG	—	" "	✓
EXPLOSIVES, NG PETN	—	" "	✓
METALS - TOTAL	HNO_3	1 LT POLY	✓
METALS - DISSOLVED	HNO_3	" "	✓
CYANIDE	NAOH	" "	✓
SO_4/PO_4	—	1-250ml POLY	✓
TOX	H_2SO_4	" "	✓
TKN	H_2SO_4	" "	✓
NO_2/NO_3	H_2SO_4	1-50ML POLY	✓

Observations/Notes:

TOC/NH_3 — H_2SO_4 — 1-250ML AMBER ✓

Field test kit

WATER SHOT 20/23

Circle if Applicable:		Signature(s):
MS/MSD	Duplicate ID No.:	David Yost

04

TBD: To Be Determined

SINGLE SAMPLE LOG SHEET

Project Site Name: INDIAN HEAD

Sample ID No.: S25 · SD002

Project No.: 5280

Sample Location:

- ☐ Surface Soil
- ☐ Subsurface Soil
- ■ Sediment
- ☐ Other
- ☐ QA Sample Type:

Sampled By: MARSHALL/YOST

C.O.C. No.: 4A

Sample Method: S.S. TROWEL

Depth Sampled: 0-6"

Sample Date and Time: 9.21.95 @ 1400

Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☒ Low Concentration

Composite Sample Data

Sample	Time	Color/Description
	NA	

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
TAN-BROWN	CLAY TR SILT, Fine sand

Analysis	Container Requirements	Collected (✓)
8330 NC, NQ, NG, PETN	1- 8OZ JAR	✓
TOC, NO2, NO3, NH3	" "	✓
TAL METALS, SN, CN	1- 4OZ JAR	✓
APPENDIX IX VOA	" "	✓
APPENDIX IX SVOA	" "	✓
ON/CRON/Field Test		✓

Map:

Observations/Notes:

Sample collected at water SHOT 20/23 B

Circle if Applicable:

MS/MSD Duplicate ID No:

Signature(s): David G Yost

SURFACE WATER
SAMPLING LOG SHEET

Project Site Name: INDIAN HEAD

Sample ID No.: S25-SW003

Project No.: 5280

Sample Location:

☐ Spring ☐ Pond
☒ Stream ☐ Lake
☐ Other
☐ QA Sample Type:

Sampled By: MARSHALL/YOST

C.O.C. No.: #5A

Sample Data

Date and Time	Method	Depth
9-22-95 @ 1420	DIRECT	6"

pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD	TBD
5.78	0.51	22.6	53	Clear	9.43 - DO.		

Analysis	Preservative	Container Requirements	Collected (✓)
APPENDIX IX VOA	HCl	3-40 ml VIAL	
APPENDIX IX SVOA	—	1 LT AMBER	
NC/NQ	—	" "	
EXPLOSIVES, NG, PETN	—	" "	
METALS - TOTAL	HNO_3	1 LT POLY	
METALS - DISSOLVED	HNO_3	" "	
CYANIDE	NAOH	" "	
SO_4 / PO_4	—	1-250 ml POLY	
TOX	H_2SO_4	" "	
TKN	H_2SO_4	" "	
NO_2 / NO_3	H_2SO_4	1 80 ml POLY	

Observations/Notes:

TOC / NH_3 H_2SO_4 1-250 ml AMBER

Field Test Kit

Sample collected FROM STREAM NEAR WATER SHOT 7 A

Circle if Applicable:		Signature(s):
MS/MSD	Duplicate ID No.:	David G. Yost

TBD: To Be Determined

SINGLE SAMPLE LOG SHEET

Project Site Name: INDIAN HEAD

Sample ID No.: S25-SD003

Project No.: 5280

Sample Location:

Sampled By: MARSHALL/YOST

C.O.C. No.: #5A

- ☐ Surface Soil
- ☐ Subsurface Soil
- ■ Sediment
- ☐ Other
- ☐ QA Sample Type:

Sample Method: S.S. TROWEL

Depth Sampled: 0-6"

Sample Date and Time: 9-22-95 @ 1430

Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☒ Low Concentration

Composite Sample Data

Sample	Time	Color/Description
	NA	

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
BROWN	CLAY TRACE SILT, SAND

Analysis	Container Requirements	Collected (✓)
8330, NC, NG, NG, PETN	1-8OZ JAR	
TOC, NO_2, NO_3, NH_3	" "	
TAL METALS, SN, CN	1-4OZ JAR	
APPENDIX IX VOA	" "	
APPENDIX IX SVOA	" "	
OM.CRON / FELT PICKER		

Map:

Observations/Notes:

Sample collected FROM STREAM NEAR WATER SITE 7-A

Circle if Applicable:

MS/MSD Duplicate ID No:

Signature(s):

SURFACE WATER SAMPLING LOG SHEET

Project Site Name: INDIAN HEAD

Sample ID No.: S25-SW004

Project No.: 5280

Sample Location:

☐ Spring ☐ Pond
☒ Stream ☐ Lake
☐ Other
☐ QA Sample Type:

Sampled By: MARSHALL/YOST

C.O.C. No.: #7B

Sample Data							
Date and Time			Method			Depth	
9-25-95 @ 1000			Direct			6"	
pH	S.C.	Temp. (°C)	Turbidity	Color	TBD DO	TBD	TBD
6.87	267	16.5	7 NTU	Clear	6.47 -00		

Analysis	Preservative	Container Requirements	Collected (✓)
Appendix IX VOA	HCl	3-40 ml VIAL	✓
Appendix IX SVOA	—	1-LT AMBER	✓
NC/NG	—	" "	✓
EXPLOSIVES, NG, PETN	—	" "	✓
METALS - TOTAL	HNO_3	1-LT POLY	✓
METALS - DISSOLVED	HNO_3	" "	✓
CYANIDE	NaOH	" "	✓
SO_4 / PO_4	—	1-250ml POLY	✓
TOX	H_2SO_4	" "	✓
TKN	H_2SO_4	" "	✓
NO_2/NO_3	H_2SO_4	1-500 ml POLY	✓

Observations/Notes:

TOC/NH_3 — H_2SO_4 — 1-250 ml AMBER ✓

Circle if Applicable:		Signature(s):
MS/MSD	Duplicate ID No.:	David A. Yost

TBD: To Be Determined

SINGLE SAMPLE LOG SHEET

Project Site Name: INDIAN HEAD

Sample ID No.: S25 SD004

Project No.: 5280

Sample Location:

Sampled By: MARSHALL/YOST

C.O.C. No.: #7A

- ☐ Surface Soil
- ☐ Subsurface Soil
- ■ Sediment
- ☐ Other
- ☐ QA Sample Type:

Sample Method: S.S. TROWEL

Depth Sampled: 0-6"

Sample Date and Time: 9-25-95 @ 1030

Type of Sample

- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☒ Low Concentration

Composite Sample Data

Sample	Time	Color/Description
	N/A	

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
BROWN GRAY	SANDY, SILTY CLAY

Analysis	Container Requirements	Collected (✓)
8330 NG, NC, NQ, PETN	1-8OZ JAR	✓
TOC, NA, NO3, NH3	" "	✓
TAL METALS SN, CN	1-4OZ JAR	✓
APPENDIX IX VOA	" "	✓
APPENDIX IX SVOA	" "	✓

Map:

Observations/Notes:

Sample collected upstream of Area 8

Circle if Applicable:

MS/MSD | Duplicate ID No:

Signature(s): David Yost

E.2

SOILS

SINGLE SAMPLE LOG SHEET

Project Site Name: INDIAN HEAD

Project No.: 5280

- ■ Surface Soil
- ☐ Subsurface Soil
- ☐ Sediment
- ☐ Other
- ☐ QA Sample Type:

Sample ID No.: SOS-MW01-001

Sample Location: RANGE 6

Sampled By: MARSHALL/YUST

C.O.C. No.: 3A

Sample Method: SPLIT SPOON

Depth Sampled: 0-2'

Sample Date and Time: 9/20/95 1310

Type of Sample

- ■ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☐ Low Concentration

Composite Sample Data

Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
BROWN/REDSTAIN	SILTY SAND w/GRAVEL

Analysis	Container Requirements	Collected (✓)
APPEN IX VOA	8oz	✓
APPEN IX SVOA	"	✓
TOC, NO2/NO3/NH3	8oz	✓
8330, NG, PETN, NC, NG, TALMET, SN; CN	-8oz	✓

Map:

Observations/Notes:

Circle if Applicable:

MS/MSD	Duplicate ID No:
	F003

Signature(s):

SINGLE SAMPLE LOG SHEET

Project Site Name: INDIAN HEAD

Project No.: 5280

Sample ID No.: FD03

Sample Location: RANGE 6

Sampled By: MARSHALL/[illegible]

C.O.C. No.: 3A

- ■ Surface Soil
- ■ Subsurface Soil
- ☐ Sediment
- ☐ Other ______
- ☐ QA Sample Type: ______

Sample Method: FD03

Depth Sampled: 0–4"

Sample Date and Time: 9/20/05 ~~1517~~ 0000

Type of Sample
- ☐ Grab
- ■ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☐ Low Concentration

Composite Sample Data

Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)

FD04

Analysis	Container Requirements	Collected (✓)
~~APPEN IX VOA~~	~~4oz~~	~~✓~~
~~APPEN IX SVOA~~	~~"~~	~~✓~~
TOC, NO_3, NO_2, NH_3	8oz	✓
8330, NG, PETN, NC, NQ	MET, SVOC "	✓

Map: DY DY

Observations/Notes: FIELD DUPLICATE OF SO5 MW01-00

Circle if Applicable:

MS/MSD	Duplicate ID No:	Signature(s):

SINGLE SAMPLE LOG SHEET

Project Site Name: INDIAN HEAD

Project No.: 5280

- ■ Surface Soil
- ■ Subsurface Soil
- ☐ Sediment
- ☐ Other ____
- ☐ QA Sample Type: ____

Sample ID No.: SOS-MW01-002

Sample Location: RANGE 6

Sampled By: MARSHALL / [redacted]

C.O.C. No.: 3A

Sample Method: SPLIT SPOON

Depth Sampled: (4N) 4'-6'

Sample Date and Time: 9/20/95 1517

Type of Sample

- ■ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☐ Low Concentration

Composite Sample Data

Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
BROWN	SILTY SAND w/CLAY - MOIST

Analysis	Container Requirements	Collected (✓)
TOC, NO_2, NO_3, NH_4	8oz	✓
8330NG, PETN, NC, NO MET (NSA)	"	✓
APPEN IX SVOA	4oz	✓
APPEN IX VOA	"	✓
		✓

Map:

Observations/Notes:

Circle if Applicable:

MS/MSD	Duplicate ID No: FD04

Signature(s): [signature]

SINGLE SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: INDIAN HEAD

Sample ID No.: FD04

Project No.: 5280

Sample Location: ______

Sampled By: MARSHALL/YOST

C.O.C. No.: 3A

- ■ Surface Soil
- ☐ Subsurface Soil
- ☐ Sediment
- ☐ Other ______
- ☒ QA Sample Type: DUPLICATE

Sample Method: SPLIT SPOON / SS TROWEL

Depth Sampled: 4-6'

Sample Date and Time: 9-20-95 @ 0000

Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☒ Low Concentration

Composite Sample Data

Sample	Time	Color/Description
NA		

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)

Analysis	Container Requirements	Collected (✓)
APPENDIX IX VOA	4OZ JAR	
APPENDIX IX S-VOA	" "	

Map:

Observations/Notes:

Field Duplicate of SOS-MW01-02

Circle If Applicable:

MS/MSD	Duplicate ID No:

Signature(s):

SINGLE SAMPLE LOG SHEET

525 Page 1 of 2

Project Site Name: INDIAN HEAD

Sample ID No.: (IH)SBO MW01-01

Project No.: 5280

Sample Location: AREA 8

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

Sampled By: MARSHALL/[redacted]

C.O.C. No.: #7A

Sample Method: SPLIT SPOON

Depth Sampled: 0-2"

Sample Date and Time: 9/19/95 0925

Type of Sample
- [x] Grab
- [ ] Composite
- [ ] Grab-Composite
- [ ] High Concentration
- [ ] Low Concentration

Composite Sample Data

Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
TAN	SILTY SAND W/TR CLAY - MOIST

Analysis	Container Requirements	Collected (✓)
TOC, NO_2 NO_3/NH_3	8OZ	✓
8330, NG PETN, NC, NQ	"	✓
TAL MET, SN, CN	4OZ	✓
SPARE	"	✓
	~~4OZ~~	~~✓~~
	~~"~~	~~✓~~
	~~"~~	~~✓~~

Map: ECM

Observations/Notes:

Circle if Applicable:

MS/MSD: —

Duplicate ID No.: [redacted] FD07(IH)

Signature(s): [signature]

ECM

SINGLE SAMPLE LOG SHEET

Page 1 of ___

Project Site Name: INDIAN HEAD

Sample ID No.: F007(01)

Project No.: 5280

Sample Location: ___

- ■ Surface Soil
- ☐ Subsurface Soil
- ☐ Sediment
- ☐ Other ___
- ☐ QA Sample Type: ___

Sampled By: MARSHALL/YUST

C.O.C. No.: 2A

Sample Method: SPLIT SPOON / SS TROWEL

Depth Sampled: 0-2

Sample Date and Time: 9-8-95 @ 0000

Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☒ Low Concentration

Composite Sample Data

Sample	Time	Color/Description
	N/A	

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)

Analysis	Container Requirements	Collected (✓)
TOC, NO2, NO3/NH3	8OZ JAR	✓
8330, NG, PETN, NC, NQ	"	✓
TAL METALS, SN, CN	4OZ JAR	✓

Map:

Observations/Notes:

Circle if Applicable:

MS/MSD	Duplicate ID No: SZS-MW01-01

Signature(s): [signature]

SINGLE SAMPLE LOG SHEET

Project Site Name: INDIAN HEAD

Sample ID No.: (W) ~~SB~~ SS5 -MW01-02

Project No.: 5280

Sample Location: AREA 8

- ■ Surface Soil
- ■ Subsurface Soil
- ☐ Sediment
- ☐ Other ________
- ☐ QA Sample Type: ________

Sampled By: MARSHALL/[redacted]

C.O.C. No.: 2A

Sample Method: SPLIT SPOON

Depth Sampled: 4M [illegible] 7-11'

Sample Date and Time: 9/19/95 ~~0955~~ 1010

Type of Sample

- ■ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☐ Low Concentration

Composite Sample Data

Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)

Analysis	Container Requirements	Collected (✓)
8330 NG, PETN NC, NG + ALKET, SAP	8 OZ	—
TOC, NO_2, NO_3, NH_4	"	—
APPENDIX VOA	4 oz	—
APPENDIX SVOA	"	—

Map:

Observations/Notes:

Circle if Applicable:

MS/MSD

Duplicate ID No: ~~FD01(01)~~ FD02

Signature(s): [signature]

SINGLE SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: INDIAN HEAD

Sample ID No.: FD ~~02~~ 02 (01)

Project No.: 5280

Sample Location: ___

- ■ Surface Soil
- ☐ Subsurface Soil
- ☐ Sediment
- ☐ Other ___
- ☐ QA Sample Type: ___

Sampled By: MARSHALL/YOST

C.O.C. No.: 2A

Sample Method: SPLIT SPOON / S.S. TROWEL	**Composite Sample Data**		
	Sample	Time	Color/Description
Depth Sampled: 7-11 (01)	NA		
Sample Date and Time: 9-19-95 @ 0000			
Type of Sample ☑ Grab ☐ Composite ☐ Grab-Composite ☐ High Concentration ☑ Low Concentration	**Grab Sample Data**		
	Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)	

Analysis	Container Requirements	Collected (✓)
Appendix IX VOA	4 OZ JAR	✓
Appendix IX BNA	" "	✓

Map:

Observations/Notes:

Circle If Applicable:

MS/MSD	Duplicate ID No:
	5Z5-MW01-02

Signature(s):

SINGLE SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: INDIAN HEAD

Project No.: 5280

■ Surface Soil
☐ Subsurface Soil
☐ Sediment
☐ Other ______
☐ QA Sample Type: ______

Sample ID No.: S2S-MW02-001

Sample Location: AREA 8

Sampled By: MARSHALL/VOST

C.O.C. No.: 5A

Sample Method: SPLIT SPOON

Depth Sampled: 0-2'

Sample Date and Time: 9/22/95 1020

Type of Sample
■ Grab
☐ Composite
☐ Grab-Composite
☐ High Concentration
☐ Low Concentration

Composite Sample Data

Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
TAN	SILTY SAND - DRY

Analysis	Container Requirements	Collected (✓)
TOC/NO2/NO3/NH3	8oz	✓
8330/NG/PETN/NC/NQ	"	✓
TAL MET/SN/CN	4oz	✓

Map:

Observations/Notes:

Circle if Applicable:

MS/MSD	Duplicate ID No:

Signature(s):

SINGLE SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: INDIAN HEAD

Project No.: 5280

■ Surface Soil
■ Subsurface Soil
☐ Sediment
☐ Other ________
☐ QA Sample Type: ________

Sample ID No.: S2S-MW02-002

Sample Location: AREA 8

Sampled By: MARSHALL/YUST

C.O.C. No.: 5A

Sample Method: SPLIT SPOON

Depth Sampled:

Sample Date and Time: 9/22/95 1115

Type of Sample
■ Grab
☐ Composite
☐ Grab-Composite
☐ High Concentration
☐ Low Concentration

Composite Sample Data

Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
~~LN~~ RED/BROWN	SILTY SAND W/TR. CLAY

Analysis	Container Requirements	Collected (✓)
TOC/NO2/NO3/NH3	8oz	✓
8330/NG/PETN/NC/NQ	"	✓
APPEN IX VOA	4oz	✓
APPEN IX SVOA	"	✓
TAL MET/SN/CN	"	✓

Map:

Observations/Notes:

Circle if Applicable:

MS/MSD	Duplicate ID No:

Signature(s):

SINGLE SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: INDIAN HEAD

Project No.: 5280

- ■ Surface Soil
- ☐ Subsurface Soil
- ☐ Sediment
- ☐ Other ______
- ☐ QA Sample Type: ______

Sample ID No.: S25-MW03-001

Sample Location: AREA 8

Sampled By: MARSHALL/YUST

C.O.C. No.: 6A

Sample Method: SPLIT SPOON

Depth Sampled: 0-2'

Sample Date and Time: 9/25/95 0955

Type of Sample

- ■ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☐ Low Concentration

Composite Sample Data

Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
TAN	SILTY SAND

Analysis	Container Requirements	Collected (✓)
TOC, NO_2-NO_3 - NH_3	8oz	✓
8330/NG/PETN/NC/NQ	8oz	✓
TAL MET, SN, CN	4oz	✓

Map:

Observations/Notes:

Circle if Applicable:

MS/MSD	Duplicate ID No:

Signature(s): [signature]

SINGLE SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: INDIAN HEAD

Project No.: 5280

- ■ Surface Soil
- ■ Subsurface Soil
- ☐ Sediment
- ☐ Other ______
- ☐ QA Sample Type: ______

Sample ID No.: 52B-MW03-002

Sample Location: AREA 8

Sampled By: MARSHALL/YUST

C.O.C. No.: 6A

Sample Method: SPLIT SPOON

Depth Sampled: 3-5'

Sample Date and Time: 9/25/95 1008

Type of Sample

- ■ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☐ Low Concentration

Composite Sample Data

Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
BROWN	SILTY SAND

Analysis	Container Requirements	Collected (✓)
TOC/NO2-NO3/NH3	8oz	✓
8330-NG, PETN, NC, NG	8oz	✓
TAL MET, SU, CN	4oz	✓

Map:

Observations/Notes:

Circle If Applicable:

MS/MSD | Duplicate ID No:

Signature(s):

SINGLE SAMPLE LOG SHEET

Project Site Name: INDIAN HEAD

Project No.: 5280

■ Surface Soil
☐ Subsurface Soil
☐ Sediment
☐ Other ________
☐ QA Sample Type: ________

Sample ID No.: S26-MW01-001

Sample Location: IED

Sampled By: MARSHALL/YOST

C.O.C. No.: 2A

Sample Method: SPLIT SPOON

Depth Sampled: 0-2'

Sample Date and Time: 9/19/95 @ 1735

Type of Sample
■ Grab
☐ Composite
☐ Grab-Composite
☐ High Concentration
☐ Low Concentration

Composite Sample Data

Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
TAN	SILTY VERY FINE SAND

Analysis	Container Requirements	Collected (✓)
APPEN IX SVOA/PB	4oz	✓
TOC/NO2/NO3/NH3	8oz	✓
TAL MET/SN/CN/TPH	4oz	✓
APPEN IX VOA	"	✓

Map:

Observations/Notes:

Circle If Applicable:

MS/MSD | Duplicate ID No:

Signature(s):

SINGLE SAMPLE LOG SHEET

Project Site Name: INDIAN HEAD

Project No.: 5280

- ■ Surface Soil
- ■ Subsurface Soil
- ☐ Sediment
- ☐ Other ________
- ☐ QA Sample Type: ________

Sample ID No.: S26-MW01-002

Sample Location: IED

Sampled By: MARSHALL/YOST

C.O.C. No.: 2A

Sample Method: SPLIT SPOON

Depth Sampled: 4-6'

Sample Date and Time: 9/19/95 @ 1800

Type of Sample

- ☐ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☐ Low Concentration

Composite Sample Data

Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)

Analysis	Container Requirements	Collected (✓)
APPEN IX SVOA/PCB	8oz	
TOC/NO2/NO3/NH3	4oz	
TAL MET/SN/CN/TPH	"	
APPEN IX VOA	"	

Map:

Observations/Notes:

Circle If Applicable:

MS/MSD	Duplicate ID No:

Signature(s):

SINGLE SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: INDIAN HEAD

Sample ID No.: S26-MW02-001

Project No.: 5280

Sample Location: IED

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

Sampled By: MARSHALL/YUST

C.O.C. No.: 6A

Sample Method: SPLITSPOON

Depth Sampled: 0-2

Sample Date and Time: 9/23/95 1030

Type of Sample

- [x] Grab
- [ ] Composite
- [ ] Grab-Composite
- [ ] High Concentration
- [ ] Low Concentration

Composite Sample Data

Sample	Time	Color/Description
NA		

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
TAN	SILTY CLAY w/SAND

Analysis	Container Requirements	Collected (✓)
TOC/NO2/NO3/NH4/PCB	8oz	✓
APPEN IX VOA	4oz	✓
APPEN IX SVOA/TPH	"	✓
TALMET/SN/CN	"	✓

Map:

Observations/Notes:

Circle if Applicable:

MS/MSD	Duplicate ID No:

Signature(s): [signatures]

SINGLE SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: INDIAN HEAD

Project No.: 5280

■ Surface Soil
■ Subsurface Soil
☐ Sediment
☐ Other ______
☐ QA Sample Type: ______

Sample ID No.: S26-MW02-002

Sample Location: IED

Sampled By: MARSHALL/YUST

C.O.C. No.: 6A

Sample Method:
SPOOGN

Depth Sampled:
@ (W) 10-12'

Sample Date and Time:
9/23/95 1115

Type of Sample
■ Grab
☐ Composite
☐ Grab-Composite
☐ High Concentration
☐ Low Concentration

Composite Sample Data

Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
TAN	SILTY CLAY W/TRACE SAND

Analysis	Container Requirements	Collected (✓)
TOC/NO2/NO3/NH4/PCB	8 OZ	✓
APPEN IX VOA/	4 OZ	✓
APPEN IX SVOA/TPH	"	✓
TAL MET/SN/CN	"	✓

Map:

Observations/Notes:

Circle if Applicable:

MS/MSD | Duplicate ID No:

Signature(s): [signature]

SINGLE SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: INDIAN HEAD

Sample ID No.: S26-MWC3-001

Project No.: 5280

Sample Location: IED

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

Sampled By: MARSHALL/YUST

C.O.C. No.: GA

Sample Method: SPLIT SPOON

Depth Sampled: 0-2'

Sample Date and Time: 9/24/95 0827

Type of Sample

- [x] Grab
- [ ] Composite
- [ ] Grab-Composite
- [ ] High Concentration
- [x] Low Concentration

Composite Sample Data

Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
BROWN	SILTY SAND w/TR CLAY

Analysis	Container Requirements	Collected (✓)
APPENDIX IX VOA	4oz	/
APPENDIX IX SVOA, TPH	4oz	/
TAL METALS, SN, CN, PCBs	4oz	/
TOC, NO_2, NO_3, NH_3	8oz	/

Map:

Observations/Notes:

Circle if Applicable:

MS/MSD	Duplicate ID No:

Signature(s):

SINGLE SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: INDIAN HEAD

Project No.: 5280

Sample ID No.: S26-MW03-002

Sample Location: IED

Sampled By: MARSHALL/YUST

C.O.C. No.: 6A

- ☒ Surface Soil
- ☒ Subsurface Soil
- ☐ Sediment
- ☐ Other ______
- ☐ QA Sample Type: ______

Sample Method: SPLIT SPOON

Depth Sampled: 6-9'

Sample Date and Time: 9/24/95 0905

Type of Sample
- ☒ Grab
- ☒ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☒ Low Concentration

Composite Sample Data

Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
TAN	SILTY CLAY & SILTY SAND

Analysis	Container Requirements	Collected (✓)
APPENDIX IX SVOA/TPH	1-4oz JAR	✓
APPENDIX IX VOA	" "	✓
TAL METALS, SN, CN, PCBs	" "	✓
TOC, NH3, NO2, NO3	1-8oz JAR	✓

Map:

Observations/Notes:

Circle if Applicable:

MS/MSD ~~Duplicate~~ ID No:

Signature(s):

SINGLE SAMPLE LOG SHEET

Project Site Name: INDIAN HEAD

Project No.: 5280

- ■ Surface Soil
- ☐ Subsurface Soil
- ☐ Sediment
- ☐ Other ______
- ☐ QA Sample Type: ______

Sample ID No.: S2S-SB01-001

Sample Location: AREA 8

Sampled By: MARSHALL/YUST

C.O.C. No.: 4A

Sample Method: SPLIT SPOON

Depth Sampled: 0-2'

Sample Date and Time: 9/21/95 1405

Type of Sample
- ■ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☐ Low Concentration

8. S/NG/PETN/NC NG

Composite Sample Data

Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
TAN	FINE - MEDIUM SAND

Analysis	Container Requirements	Collected (✓)
~~S2S-SB01-001CM~~	8oz	✓
TOC/NO2/NO3/NH3	"	✓
TAL MET/SN/CN	4oz	✓

Map:

Observations/Notes:

Circle if Applicable:

MS/MSD | Duplicate ID No:

Signature(s): [signatures]

SINGLE SAMPLE LOG SHEET

Project Site Name: INDIAN HEAD

Sample ID No.: S2S-SB01-002

Project No.: 5280

Sample Location: AREA 8

- ■ Surface Soil
- ■ Subsurface Soil
- ☐ Sediment
- ☐ Other ________
- ☐ QA Sample Type: ________

Sampled By: MARSHALL/YUST

C.O.C. No.: 4A

Sample Method: SPLIT SPOON

Depth Sampled: 4-6'

Sample Date and Time: 9/21/95 1426

Type of Sample

- ■ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☐ Low Concentration

Composite Sample Data

Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
TAN	FINE-MEDIUM SAND

Analysis	Container Requirements	Collected (✓)
TOC/NO2/NO3/NH3	8oz	✓
8330/NG/PETN/NC/NQ	"	✓
TALMET/SN/CN	4oz	✓
APPEN IX VOA	"	✓
APPEN IX SVOA	"	✓

Map:

Observations/Notes:

Circle if Applicable:

MS/MSD | Duplicate ID No:

Signature(s): [signatures]

SINGLE SAMPLE LOG SHEET

Project Site Name: INDIAN HEAD

Project No.: 5280

- ■ Surface Soil
- ☐ Subsurface Soil
- ☐ Sediment
- ☐ Other ________
- ☐ QA Sample Type: ________

Sample ID No.: S25-SB02-001

Sample Location: ________

Sampled By: MARSHALL/YUST

C.O.C. No.: 8A

Sample Method: HAND AUGER

Depth Sampled: 0-2'

Sample Date and Time: 10-3-95 @ 1055

Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☒ Low Concentration

Composite Sample Data

Sample	Time	Color/Description
	N/A	

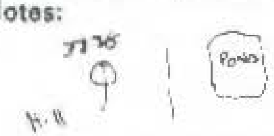
Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
BROWN	Fine medium sand

Analysis	Container Requirements	Collected (✓)
8330 NG, PETN, NC, NQ	1-8OZ JAR	✓
TOC, NO2, NO3, NH3	1-8OZ JAR	✓
TAL METALS, SN, CN	1-4OZ JAR	✓
Field test kit		✓

Map:

Observations/Notes:



LOOKS NATURAL
NO STAINING

Circle if Applicable:

MS/MSD	Duplicate ID No:

Signature(s): David G. Yust

SINGLE SAMPLE LOG SHEET

Project Site Name: INDIAN HEAD
Sample ID No.: S25-SB02-002
Project No.: 5280
Sample Location:
Sampled By: MARSHALL/YUST
C.O.C. No.: 84

- ☐ Surface Soil
- ☒ Subsurface Soil
- ☐ Sediment
- ☐ Other
- ☐ QA Sample Type:

Sample Method: HAND AUGER

Depth Sampled: 2-4'

Sample Date and Time: 10-3-95 @ 1100

Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☒ Low Concentration

Composite Sample Data

Sample	Time	Color/Description
	N.A.	

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
BROWN	Fine medium SAND WITH GRAVEL

Analysis	Container Requirements	Collected (✓)
APPENDIX IX VOA	1-4OZ JAR	
APPENDIX IX SVOA	" "	
TAL METALS, SN, CN	" "	
8330, NG, PETN, NC, NG	1-8OZ JAR	
TOC, NH_3, NO_2, NO_3	" "	

Map:

Observations/Notes:

Circle if Applicable:

MS/MSD	Duplicate ID No:

Signature(s): Dave A. Yust

SINGLE SAMPLE LOG SHEET

Project Site Name: INDIAN HEAD

Sample ID No.: S25-SB03-001

Project No.: 5280

Sample Location: AREA 8 ~~UPGRADIENT~~ (D9)

- ■ Surface Soil
- ☐ Subsurface Soil
- ☐ Sediment
- ☐ Other ______
- ☐ QA Sample Type: ______

Sampled By: MARSHALL/YUST

C.O.C. No.: 8A

Sample Method:	Composite Sample Data		
HAND AUGER	Sample	Time	Color/Description
Depth Sampled:			
0-2"		N.A.	
Sample Date and Time:			
10-3-95 1305			
Type of Sample			
☒ Grab			
☐ Composite			
☐ Grab-Composite	**Grab Sample Data**		
☐ High Concentration	Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)	
☒ Low Concentration	REDDISH BROWN	FINE-MEDIUM SAND	

Analysis	Container Requirements	Collected (✓)
8330 PETN, NG, NC, NQ	1-8OZ JAR	✓
TOC, NH_3, NO_2, NO_3	" "	✓
TAL METALS, SN, CN	1-4OZ JAR	✓
Field Test K.T OMICRON	" "	✓

Map:

Observations/Notes:

Circle if Applicable:		Signature(s):
MS/MSD	Duplicate ID No:	David A. Yust

SINGLE SAMPLE LOG SHEET

Project Site Name: INDIAN HEAD

Project No.: 5280

☐ Surface Soil
☒ Subsurface Soil
☐ Sediment
☐ Other ____
☐ QA Sample Type: ____

Sample ID No.: 525-SB03-002

Sample Location: AREA 8

Sampled By: MARSHALL/YUST

C.O.C. No.: 8A

Sample Method: HAND AUGER

Depth Sampled: 2-4'

Sample Date and Time: 10-3-95 @ 1310

Type of Sample
☒ Grab
☐ Composite
☐ Grab-Composite
☐ High Concentration
☒ Low Concentration

Composite Sample Data

Sample	Time	Color/Description
	N.A.	

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
REDDISH BROWN	FINE-MEDIUM SAND TR GRAVEL

Analysis	Container Requirements	Collected (✓)
APPENDIX IX VOA	1-4oz JAR	✓
APPENDIX IX SVOA	" "	✓
TAL Metals, SN, CN	" "	✓
8330, PETN, NG, NC, NQ	1-8oz JAR	✓
TOC, NH_3, NO_2, NO_3	" "	✓

Map: see sample log sheet for 525-SB03-001

Observations/Notes:

Circle if Applicable:

MS/MSD | Duplicate ID No:

Signature(s): David A. Yust

SINGLE SAMPLE LOG SHEET

Project Site Name: INDIAN HEAD

Project No.: 5280

☐ Surface Soil
■ Subsurface Soil
■ Sediment
☐ Other ______
☐ QA Sample Type: ______

Sample ID No.: SZ6-SB02-01

Sample Location: IED

Sampled By: MARSHALL/YUST

C.O.C. No.: #1B

Sample Method: SPLIT SPOON

Depth Sampled: 0-2'

Sample Date and Time: 9/18/95 1530

Type of Sample
■ Grab
☐ Composite
☐ Grab-Composite
☐ High Concentration
☐ Low Concentration

Composite Sample Data

Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
TAN	SILTY SAND W/TR CLAY + GRAVEL

Analysis	Container Requirements	Collected (✓)
TOC/NO2/NO3/NH3	8oz Clear	✓
8330/NG+2/PETN, NC, NQ	"	✓
APPEN IX VOA	4oz Clear	✓
TPH 418.1	"	✓
TALMET/BN/CN	"	✓
PCB	"	✓
APPEN IX SVOA	"	✓

Map:

Observations/Notes:

Circle if Applicable:

MS/MSD	Duplicate ID No:
—	—

Signature(s): [signature]

SINGLE SAMPLE LOG SHEET

Project Site Name: INDIAN HEAD

Project No.: 5280

- ☐ Surface Soil
- ■ Subsurface Soil
- ■ Sediment
- ☐ Other ______
- ☐ QA Sample Type: ______

Sample ID No.: S26-SB01-02

Sample Location: IED

Sampled By: MARSHALL/YOST

C.O.C. No.: #1B

Sample Method: SPLIT SPOON

Depth Sampled: 6-10'

Sample Date and Time: 9/18/95 1642 (PM)

Type of Sample

- ☐ Grab
- ■ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☐ Low Concentration

Composite Sample Data

Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
TAN/RUST-Mottled	SILTY SAND w/TR CLAY + GRAVEL

Analysis	Container Requirements	Collected (✓)
NH3/TOC/NO2/NO3	8oz Clear	✓
APPEN. IX VOA	4oz Clear	✓
PCB	"	✓
APPENIX SVOA	"	✓
TPH 418.1	"	✓
TAL MET/SN/CN	"	✓

Map:

Observations/Notes:

Circle if Applicable:

MS/MSD	Duplicate ID No:

Signature(s): [signatures]

SINGLE SAMPLE LOG SHEET

Project Site Name: INDIAN HEAD

Project No.: 5280

- ■ Surface Soil
- ☐ Subsurface Soil
- ☐ Sediment
- ☐ Other ______
- ☐ QA Sample Type: ______

Sample ID No.: S26-SB02-001

Sample Location: IED

Sampled By: MARSHALL/YUST

C.O.C. No.: 4A

Sample Method: SPLIT SPOON

Depth Sampled: 0-2'

Sample Date and Time: 9/21/95 1628

Type of Sample

- ● Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☐ Low Concentration

Composite Sample Data

Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
TAN w/BLACK	SILTY CLAY w/ FILL

Analysis	Container Requirements	Collected (✓)
~~TOC-SB02-001~~	~~8oz~~	~~✓~~
TOC, NO2, NO3, NH3, PCB	8oz	✓
8330/NG PETN, NC, NG	8oz	✓
APPEN ~~IX~~ VOA	4oz	✓
APPEN ~~IX~~ SVOA	4oz	✓
TALMET, SN, CN, TPH	4oz	✓

Map:

Observations/Notes:

Circle if Applicable:

MS/MSD | Duplicate ID No: FD07

Signature(s):

SINGLE SAMPLE LOG SHEET

Project Site Name: INDIAN HEAD

Sample ID No.: S2G-SB02-002

Project No.: 5280

Sample Location: IEP

- ■ Surface Soil
- ■ Subsurface Soil
- ☐ Sediment
- ☐ Other ______
- ☐ QA Sample Type: ______

Sampled By: MARSHILL/YUST

C.O.C. No.: 4A

Sample Method: SPLIT SPOON

Depth Sampled: 10-12'

Sample Date and Time: 9/2/95 1735

Type of Sample

- ■ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☐ Low Concentration

Composite Sample Data

Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
TAN/GRAY	SILTY SAND w/CLAY

Analysis	Container Requirements	Collected (✓)
APPENTX VOA	4oz	✓
APPENTX SVOA	"	✓
TAL MET/SN/CN/TPH	"	✓
TOC/NO2/NO3/NH3/PCB	8oz	✓

Map:

Observations/Notes:

Circle if Applicable:

MS/MSD	Duplicate ID No:
	FD07

Signature(s): [signature]

SINGLE SAMPLE LOG SHEET

Project Site Name: INDIAN HEAD

Project No.: 5280

Sample ID No.: FD07

Sample Location: IED

Sampled By: MARSHALL/YUST

C.O.C. No.: 4A

- ■ Surface Soil
- ☐ Subsurface Soil
- ☐ Sediment
- ☐ Other ______
- ☐ QA Sample Type: ______

Sample Method: SPLIT SPOON

Depth Sampled: 0-2'

Sample Date and Time: 9/2/95 ~~1628~~ 0000

Type of Sample

- ■ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☐ Low Concentration

Composite Sample Data

Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
TAN w/BLACK	SILTY CLAY w/FILL

Analysis	Container Requirements	Collected (✓)
TPH 418.1	4oz	✓
PCB	"	✓

Map:

Observations/Notes:

Duplicate of SZ6-SB02-001

Circle if Applicable:

MS/MSD	Duplicate ID No:

Signature(s): [signatures]

SINGLE SAMPLE LOG SHEET

Project Site Name: INDIAN HEAD

Project No.: 5280

- ■ Surface Soil
- ☐ Subsurface Soil
- ☐ Sediment
- ☐ Other ______
- ☐ QA Sample Type: ______

Sample ID No.: S26-SB03-001

Sample Location: ______

Sampled By: MARSHALL/YOST

C.O.C. No.: #6A

	Composite Sample Data		
Sample Method:	Sample	Time	Color/Description
HAND AUGER			
Depth Sampled:			
0-2'		NA	
Sample Date and Time:			
9-23-95 1130			
Type of Sample ☒ Grab ☐ Composite ☐ Grab-Composite ☐ High Concentration ☒ Low Concentration			
	Grab Sample Data		
	Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)	
	Yellow-Brown	Fine sand with some silt	

Analysis	Container Requirements	Collected (✓)
Appendix IX VOA	1-4oz JAR	
Appendix IX SVOA/TPH	" "	✓
TAL METALS/SN/CN/PCBs	" "	✓
TOC/NO_2/NO_3/NH_3	1-8oz JAR	✓
8330, NG, NQ, NC, PETN	" "	✓

Map:

Observations/Notes:

Circle if Applicable:		Signature(s):
MS/MSD	Duplicate ID No:	David A. Yost

SINGLE SAMPLE LOG SHEET

Project Site Name: INDIAN HEAD

Sample ID No.: S26-SB03-002

Project No.: 5280

Sample Location: IED

- ■ Surface Soil
- ■ Subsurface Soil
- ☐ Sediment
- ☐ Other ____
- ☐ QA Sample Type: ____

Sampled By: MARSHALL/YUST

C.O.C. No.: #6A

Sample Method: SPLIT SPOON

Depth Sampled: 8-10'

Sample Date and Time: 9/23/95 1730

Type of Sample
- ■ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☐ Low Concentration

Composite Sample Data

Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
TAN	SILTY SAND w/TR CLAY-MOIST

Analysis	Container Requirements	Collected (✓)
APPEN IX VOA,	4oz	✓
APPEN IX SVOA/TPH	"	✓
TAL MET/SN/CN/PCBs	"	✓
TOC, NO2/NO3/NH3	8oz	✓

Map:

Observations/Notes:

Circle if Applicable:

MS/MSD ~~Duplicate ID No:~~

Signature(s):

SINGLE SAMPLE LOG SHEET

Project Site Name: INDIAN HEAD

Sample ID No.: FD08

Project No.: 5280

Sample Location: ____________

Sampled By: MARSHALL/YOST

C.O.C. No.: #7A

- ■ Surface Soil
- ☐ Subsurface Soil
- ☐ Sediment
- ☐ Other ______
- ☐ QA Sample Type: ______

Sample Method: HAND AUGER

Depth Sampled: 0-2'

Sample Date and Time: 9-24-95 @ 0000

Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☒ Low Concentration

Composite Sample Data

Sample	Time	Color/Description
	NA	

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
BROWN	SILTY SAND TRACE GRAVEL

Analysis	Container Requirements	Collected (✓)
APPENDIX IX VOA	1-4OZ JAR	
APPENDIX IX S-VOA, TPH	" "	
TAL METALS, SN, CN, PCBs	" "	
8330, NG, PETN, NC, NG	1-8OZ JAR	
TOC, NO_2, NO_3, NH_3	" "	

Map:

Observations/Notes:

DUPLICATE OF S26-SB04-001

Circle If Applicable:

MS/MSD	Duplicate ID No:

Signature(s): David A. Yost

SINGLE SAMPLE LOG SHEET

Project Site Name: INDIAN HEAD

Project No.: 5280

- ■ Surface Soil
- ☐ Subsurface Soil
- ☐ Sediment
- ☐ Other ________
- ☐ QA Sample Type: ________

Sample ID No.: 526-SB04-001

Sample Location: ________

Sampled By: MARSHALL/YUST

C.O.C. No.: #7A

Sample Method:
HANDAUGER

Depth Sampled:
0-2'

Sample Date and Time:
9-24-95 @ 1215

Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☒ Low Concentration

Composite Sample Data

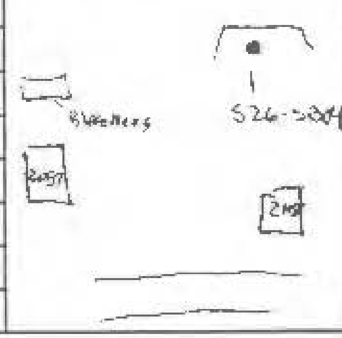
Sample	Time	Color/Description
	N.A.	

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
BROWN	SILTY SAND TRACE GRAVELS

Analysis	Container Requirements	Collected (✓)
APPENDIX IX VOA	1-4OZ JAR	
APPENDIX IX SVOA, TPH	" "	
TAL METALS, SN, CN, PCB,	" "	
8330, NG, PETN, NC, NQ	1-8OZ JAR	
TOC, NO2, NO3, NH3	" "	

Map:



Observations/Notes:

Circle If Applicable:

MS/MSD	Duplicate ID No: FD08

Signature(s): David A. Yust

SINGLE SAMPLE LOG SHEET

Project Site Name: INDIAN HEAD

Project No.: 5280

- ■ Surface Soil
- ■ Subsurface Soil
- ☐ Sediment
- ☐ Other ______
- ☐ QA Sample Type: ______

Sample ID No.: S26-SB04-002

Sample Location: IED

Sampled By: MARSHILL/YUST

C.O.C. No.: #7A

Sample Method: SPLIT SPOON - S.S. TROWEL

Depth Sampled: 8-10'

Sample Date and Time: 9/24/95 1445

Type of Sample

- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☒ Low Concentration

Composite Sample Data

Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
BROWN	SILTY SAND w/CLAY

Analysis	Container Requirements	Collected (✓)
APPENDIX IX ~~OX~~ VOA	1-4OZ JAR	
APPENDIX IX SVOA, TPH-418.1	" "	
TAL METALS, SN, CN, PCBs	" "	
~~8330 NG PETN~~ (DP)		
TOC, NO_2, NO_3, NH_3	1-8 OZ JAR	

Map:

Observations/Notes:

Circle if Applicable:

MS/MSD	Duplicate ID No:

Signature(s):

SINGLE SAMPLE LOG SHEET

Project Site Name: INDIAN HEAD

Project No.: 5280

■ Surface Soil
☐ Subsurface Soil
☐ Sediment
☐ Other ________
☐ QA Sample Type: ________

Sample ID No.: S27-SS-001

Sample Location: IOD

Sampled By: MARSHALL/[redacted]

C.O.C. No.: #1A

Sample Method: HAND AUGER

Depth Sampled: 0-2'

Sample Date and Time: 9/19/95 - 1205

Type of Sample
☐ Grab
■ Composite
☐ Grab-Composite
☐ High Concentration
☐ Low Concentration

Composite Sample Data

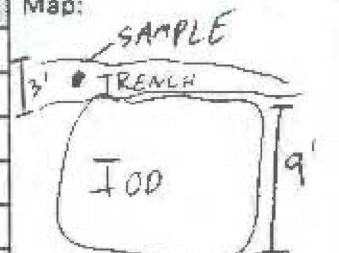
Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
BROWN	SILTY CLAY w/TR. SAND

Analysis	Container Requirements	Collected (✓)
TOC, NO2/NO3/NH3	8oz Clear	✓
8330 ~~AG~~ PETT, [illegible] NQ	"	✓
APPEN IX VOA	4oz Clear	✓
TAL MET/SM/CN	"	✓
APPEN IX SVOA	"	✓

Map:



Observations/Notes:

Circle if Applicable:

MS/MSD	Duplicate ID No:

Signature(s):

SINGLE SAMPLE LOG SHEET

Project Site Name: INDIAN HEAD

Sample ID No.: S27-SS-002

Project No.: 5280

Sample Location: IOD

- ■ Surface Soil
- ☐ Subsurface Soil
- ☐ Sediment
- ☐ Other ______
- ☐ QA Sample Type: ______

Sampled By: MARSHALL/[redacted]

C.O.C. No.: #1

Sample Method: HAND AUGER

Depth Sampled: 0-2'

Sample Date and Time: 9/18/95 - 1220

Type of Sample

- ☐ Grab
- ■ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☐ Low Concentration

Composite Sample Data

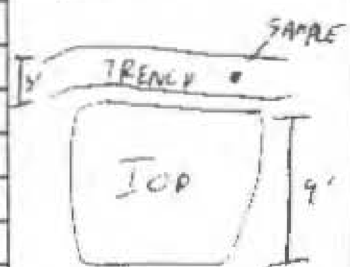
Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
BROWN	SILTY CLAY w/TR. SAND

Analysis	Container Requirements	Collected (✓)
TOC/NO2/NO3/NH3	8oz Clear	✓
8330 NG/PETN/NC/NG	"	✓
APPENDIX VOA	4oz Clear	✓
TAL MET/SN/CN	"	✓
APPENDIX SVOA	"	✓

Map:



Observations/Notes:

Circle If Applicable:

MS/MSD	Duplicate ID No:
—	—

Signature(s): [signature]

E.3

GROUNDWATER

GROUNDWATER
SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: INDIAN HEAD.
Project No.: 5280

☐ Domestic Well Data
☑ Monitoring Well Data
☐ Other Well Type: ________
☐ QA Sample Type: ________

Sample ID No.: 5MW01
Sample Location: RANGE 6
Sampled By: MARSHALL/YOST
C.O.C. No.: 9A, B

Sampling Data

	pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD	TBD
Date: 10/4/95 Time: 1650 Method: SS BAILER	6.9	.554	21.4	999	Brown	—		

Purge Data

	Volume	pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD
Date: 10/4/95								
Method: SS BAILER	Initial	5.87	.548	21.1	89	Clear		
Monitor Reading (ppm):	1	5.94	.559	21.9	999	Brown		
Well Casing Dia. & Material Type: 4"	(4) # 1½	6.01	.554	21.4	999	Brown		
	3							
Total Well Depth (TD): 18'	4							
Static Water Level (WL): 7.99	5							
TD-WL (ft.) = 10								
One Casing Volume: (gal/L) 25 gal		PURGED		DRY	@ 1½ VOLUME			
Start Purge (hrs.): 1230								
End Purge (hrs.): 1235								
Total Purge Time (min): 5								
Total Amount Purged (gal/L): 37 gal								

Analysis	Preservative	Container Requirements	Collected (✓)
APPENDIX IX VOA	HCl	3-40 ml VIAL	✓
APPENDIX IX SVOA	—	1-LT AMBER	✓
NG/NC	—	"	✓
EXPLOSIVES, NE, PETN	—	"	✓
METALS - TOTAL AND DISSOLVED	HNO_3	1 LT POLY	✓
CYANIDE	NAOH	"	✓
SO_4 / PO_4	—	250 ml POLY	✓
TKN	H_2SO_4	"	✓
TOX	H_2SO_4	"	✓
TOC / NH_3	H_2SO_4	250 ml AMBER	✓
NO_2/NO_3	H_2SO_4	1-8OZ POLY	✓

Observations/Notes:

Circle if Applicable:

MS/MSD	Duplicate ID No: FD09	Signature(s): [signature] / D Yost

TBD: To Be Determined

GROUNDWATER

SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: INDIAN HEAD

Project No.: 5280

☐ Domestic Well Data
☑ Monitoring Well Data
☐ Other Well Type:
☑ QA Sample Type: DUPLICATE

Sample ID No.: FD09

Sample Location: RANGE 6

Sampled By: MARSHALL/YOST

C.O.C. No.: 9A, B

Sampling Data

Date: 10-4-95 Time: 0000 Method: SS BAILER	pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD	TBD

Purge Data

Date:	Volume	pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD
Method:	Initial							
Monitor Reading (ppm):	1							
Well Casing Dia. & Material Type: 4"	2							
	3							
Total Well Depth (TD):	4							
Static Water Level (WL):	5							
TD-WL (ft.) =								
One Casing Volume: (gal/L)								
Start Purge (hrs.):								
End Purge (hrs.):								
Total Purge Time (min):								
Total Amount Purged (gal/L):								

Analysis	Preservative	Container Requirements	Collected (✓)
APPENDIX IX VOLATILES	HCl	~~30 40 ml~~ 3-40ML VIAL	✓
APPENDIX IX SEMIVOLATILES	—	1 LT AMBER	✓
NG/NC	—	" "	✓
EXPLOSIVES, NG PETN	—	" "	✓
METALS - TOTAL	HNO_3	1 LT POLY	✓
METALS - DISSOLVED	HNO_3	" "	✓
CYANIDE	CN	" "	✓
SO_4/PO_4	—	1-250 ML	✓
TKN	H_2SO_4	" "	✓
TOX	H_2SO_4	" "	✓
TOC/NH_3	H_2SO_4	1-250 ML AMBER	✓

Observations/Notes:
NO_2/NO_3 — H_2SO_4 — 1-500 ml POLY

DUPLICATE SAMPLE OF 5MW01 - SEE SAMPLE LOG SHEET

Circle If Applicable:		Signature(s):
MS/MSD	Duplicate ID No:	David A. Yost

TBD: To Be Determined

GROUNDWATER

SAMPLE LOG SHEET

Project Site Name: INDIAN HEAD

Project No.: 5280

- ☐ Domestic Well Data
- ☑ Monitoring Well Data
- ☐ Other Well Type:
- ☐ QA Sample Type:

Sample ID No.: 25MW01

Sample Location:

Sampled By: MARSHALL/YOST

C.O.C. No.: 9A,B

Sampling Data

	pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD	TBD
Date: 10/4/95 Time: 1100 Method: SS Bailer	5.74	.187	17.9	999	Brown	—		

Purge Data

	Volume	pH	S.C.	Temp.(°C)	Turbidity	Color	TBD	TBD
Date: 10/4/95								
Method: SS BAILER	Initial	5.50	.116	18.8	20	TAN		
Monitor Reading (ppm): 0	1	9.28	.107	18.3	999	"		
Well Casing Dia. & Material Type: 4"	2	5.90	.144	16.7		"		
	3							
Total Well Depth (TD): 17'	4							
Static Water Level (WL): 2'	5							
TD-WL (ft.) = 15'								
One Casing Volume: (gal/L) 3.72		Purged	Dry	After	2 Volumes			
Start Purge (hrs.): 0910								
End Purge (hrs.): 0920								
Total Purge Time (min): 10								
Total Amount Purged (gal/L): 7.4								

Analysis	Preservative	Container Requirements	Collected (✓)
APPENDIX IX VOA	HCl	3-40 ml VIAL	✓
APPENDIX IX SVOA	—	1 LT AMBER	✓
NC/NG	—	" "	✓
EXPLOSIVES, PETN NG	—	" "	✓
METALS TOTAL + DISSOLVED	HNO_3	1 LT POLY	✓
CYANIDE	NaOH	" "	✓
TOX	H_2SO_4	1-250 ml AMBER	✓
TOC, NH_3	H_2SO_4	" "	✓
TKN	H_2SO_4	1-250 ml POLY	✓
SO_4/PO_4	—	" "	✓
NO_2/NO_3	H_2SO_4	1-80 ml POLY	✓

Observations/Notes:

Circle if Applicable:		Signature(s):
MS/MSD	Duplicate ID No:	[signatures]

TBD: To Be Determined

GROUNDWATER

SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: INDIAN HEAD

Project No.: 5290

☐ Domestic Well Data
☑ Monitoring Well Data
☐ Other Well Type:
☐ QA Sample Type:

Sample ID No.: 25MW02

Sample Location:

Sampled By: MARSHALL/YOST

C.O.C. No.: 9A, B

Sampling Data

	pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD	TBD
Date: 10/4/95 Time: 1000 Method: SS Bailer	5.63	.184	17.0	999	TAN	—	—	—

Purge Data

	Volume	pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD
Date: 10/4/95								
Method: SS Bailer	Initial	5.67	.177	17.5	442	Olive		
Monitor Reading (ppm):	1	5.61	.178	17.8	999	TAN		
Well Casing Dia. & Material Type: 4"	2	5.60	.184	17.9	"	"		
	(W) 2 1/2	5.63	.183	17.0	"	"		
Total Well Depth (TD): 20.00	4							
Static Water Level (WL): 12.13	5							
TD-WL (ft.) = 7.9								
One Casing Volume: (gal/L) 2.0								
Start Purge (hrs.): 0435		PURGED DRY @ 2 1/2 VOLUMES						
End Purge (hrs.): 0445								
Total Purge Time (min): 10								
Total Amount Purged (gal/L): 5.0								

Analysis	Preservative	Container Requirements	Collected (✓)
APPENDIX IX VOA	HCl	3-40ml VIAL	✓
APPENDIX IX SVOA	—	1 LT AMBER	✓
EXPLOSIVES, PETN, NG	—	" "	✓
NC/NG	—	" "	✓
METALS - TOTAL + DISSOLVED	HNO_3	1 LT POLY	✓
CYANIDE	NAOH	" "	✓
TOX	H_2SO_4	1-250 ml AMBER	✓
TOC, NH_3	H_2SO_4	" "	✓
TKN	H_2SO_4	1-250 ml POLY	✓
SO_4, PO_4	—	" "	✓
NO_2, NO_3	H_2SO_4	1-80 mL POLY	✓

Observations/Notes:

Circle if Applicable:

MS/MSD | Duplicate ID No:

Signature(s): [signature]

TBD: To Be Determined

GROUNDWATER

SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: INDIAN HEAD

Project No.: 5280

- ☐ Domestic Well Data
- ☑ Monitoring Well Data
- ☐ Other Well Type: ______
- ☐ QA Sample Type: ______

Sample ID No.: 25 MW03

Sample Location: AREA 8

Sampled By: MARSHALL/YOST

C.O.C. No.: 9 A,B

Sampling Data

Date: 10/4/95 Time: 1330 Method: SS Bailer	pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD	TBD
	5.88	.110	18.1	999	Brown			

Purge Data

Date: 10/4/95 Method: SS Bailer	Volume	pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD
Monitor Reading (ppm): 0	Initial	5.50	.066	~~999~~ 14.8	999	Brown		
Well Casing Dia. & Material Type: 4"	1	5.82	.100	18.2	"	"		
	2	5.87	.109	18.1	"	"		
	3	5.88	.110	18.1				
Total Well Depth (TD): 48	4							
Static Water Level (WL): 34.90	5							
TD-WL (ft.) = 13								
One Casing Volume: (gal/L) 30 l								
Start Purge (hrs.): 1250								
End Purge (hrs.): 1325								
Total Purge Time (min): 35								
Total Amount Purged (gal/L): 40 l								

Analysis	Preservative	Container Requirements	Collected (✓)
APPENDIX IX VOA	HCl	3-40 ml VIAL	✓
APPENDIX IX SVOA	—	1 LT AMBER	✓
EXPLOSIVES, PETN, NG	—	" "	✓
NC/NQ	—	" "	✓
METALS Total and Dissolved	HNO_3	1-LT POLY	✓
CYANIDE	NAOH	" "	✓
TOX	H_2SO_4	1-250 ml AMBER	✓
TOC, NH_3	H_2SO_4	" "	✓
TKN	H_2SO_4	1-250 ml POLY	✓
SO_4 / PO_4	—	" "	✓
NO_2, NO_3	H_2SO_4	1-80 ml POLY	✓

Observations/Notes:

Circle if Applicable:

MS/MSD | Duplicate ID No:

Signature(s): [signature] / D. Yost

TBD: To Be Determined

GROUNDWATER
SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: INDIAN HEAD
Project No.: 5280
☐ Domestic Well Data
☑ Monitoring Well Data
☐ Other Well Type:
☐ QA Sample Type:

Sample ID No.: 26MW01
Sample Location: IED
Sampled By: MARSHALL/YOST
C.O.C. No.: 9A,B

Sampling Data

Date: 10/4/95
Time: 1410
Method: S.S BAILER

pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD	TBD
4.59	.602	18.4	999	Brown	—		

Purge Data

Date: 10/4/95
Method: BAILER
Monitor Reading (ppm): 0
Well Casing Dia. & Material Type: 4"
Total Well Depth (TD): 17.00
Static Water Level (WL): 8.89
TD-WL (ft.) = 9.11
One Casing Volume: (gal/L) 22.3
Start Purge (hrs.): 0730
End Purge (hrs.): 0750
Total Purge Time (min): 20
Total Amount Purged (gal/L): 78

Volume	pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD
Initial	4.43	.686	18.4	999	Brown		
1	4.56	.620	18.8	"	"		
2	4.61	.601	18.6	"	"		
3	4.57	.602	18.4	"	"		
4							
5							
PURGED DRY AFTER 3½ VOLUMES							
	4.59	.604	18.0	999	Brown		

Analysis	Preservative	Container Requirements	Collected (✓)
APPENDIX IX VOA	HCl	1 LT AMBER	✓
APPENDIX IX SVOA	—	" "	✓
PCBs	—	" "	✓
EXPLOSIVES / NG / PETN	—	" "	✓
NC/NQ	—	" "	✓
TPH	H_2SO_4	" "	✓
METALS-TOTAL AND DISSOLVED	HNO_3	1 LT POLY	✓
CYANIDE	NAOH	" "	✓
SO_4 / PO_4	—	1-250ml POLY	✓
TOX	H_2SO_4	" "	✓
TKN	H_2SO_4	" "	✓
Observations/Notes: TOC / NH_3	H_2SO_4	1-250ml AMBER	✓
NO_2/NO_3	H_2SO_4	1-50ml POLY	✓

Circle If Applicable: M3/M90 Duplicate ID No:

Signature(s): [signature] / D. Yost

TBD: To Be Determined

GROUNDWATER

SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: INDIAN HEAD

Project No.: 5290

☐ Domestic Well Data
☑ Monitoring Well Data
☐ Other Well Type:
☐ QA Sample Type:

Sample ID No.: FD 10

Sample Location:

Sampled By: MARSHALL/YOST

C.O.C. No.: 9A

Sampling Data

Date: / Time: 0000 / Method: S.S BAILER	pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD	TBD

Purge Data

	Volume	pH	S.C.	Temp.(°C)	Turbidity	Color	TBD	TBD
Date:								
Method: SS Bailer	Initial							
Monitor Reading (ppm):	1							
Well Casing Dia. & Material Type: 4"	2							
	3							
Total Well Depth (TD):	4							
Static Water Level (WL):	5							
TD-WL (ft.) =								
One Casing Volume: (gal/L)								
Start Purge (hrs.):								
End Purge (hrs.):								
Total Purge Time (min):								
Total Amount Purged (gal/L):								

Analysis	Preservative	Container Requirements	Collected (✓)
TPH - 418.1	H_2SO_4	1 LT AMBER	✓
PCBs		1 LT AMBER	✓

Observations/Notes:

DUPLICATE OF 26 MW01 - SEE SAMPLE LOG SHEET

Circle If Applicable:

MS/MSD	Duplicate ID No:

Signature(s): David G. Yost

TBD: To Be Determined

GROUNDWATER

SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: INDIAN HEAD

Project No.: 5290

☐ Domestic Well Data
☑ Monitoring Well Data
☐ Other Well Type: ___
☐ QA Sample Type: ___

Sample ID No.: 26MW02

Sample Location: IED

Sampled By: MARSHALL/YOST

C.O.C. No.: 9A,B

Sampling Data

	pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD	TBD
Date: 10/4/95 Time: 1620 Method: SS BAILER	5.51	.234	16.8	999	Brown	—		

Purge Data

	Volume	pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD
Date: 10/4/95								
Method: SS BAILER	Initial	5.3	.171	17.0	999	Brown	—	—
Monitor Reading (ppm): 0	1	5.51	.234	16.8	"	"		
Well Casing Dia. & Material Type: 4"	2							
	3							
Total Well Depth (TD): 24	4							
Static Water Level (WL): 21.22	5	DRY	AFTER		1st	VOLUME		
TD-WL (ft.) = 3								
One Casing Volume: (gal/L)								
Start Purge (hrs.): 0800								
End Purge (hrs.): 0803								
Total Purge Time (min): 3								
Total Amount Purged (gal/L): 7								

Analysis	Preservative	Container Requirements	Collected (✓)
APPENDIX IX VOA	HCl	3-40ml VIAL	✓
APPENDIX IX SVOA	—	1-LT AMBER	✓
PCBs	—	" "	✓
EXPLOSIVES, NG PETN	—	" "	✓
NC, NQ	—	" "	✓
TPH - 418.1	H_2SO_4	" "	✓
TOX	H_2SO_4	1-250 ML AMBER	✓
TOC, NH_3	H_2SO_4	" "	✓
METALS - TOTAL + DISSOLVED	HNO_3	1-LT POLY	✓
CN	NAOH	" "	✓
TKN	H_2SO_4	1-250-ml POLY	✓
Observations/Notes: SO_4 / PO_4	—	" "	✓
NO_2/NO_3	H_2SO_4	1-80 ml POLY	✓

Circle if Applicable:

MS/MSD	Duplicate ID No.: [redacted] (GM)	Signature(s): P Yost

TBD: To Be Determined

GROUNDWATER

SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: INDIAN HEAD

Project No.: 5290

Sample ID No.: 26MW03

Sample Location: IED

Sampled By: MARSHALL/YOST

C.O.C. No.: 9A,B

☐ Domestic Well Data
☑ Monitoring Well Data
☐ Other Well Type: ______
☐ QA Sample Type: ______

Sampling Data

	pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD	TBD
Date: 10/4/95 Time: 1550 Method: SS Bailer	5.82	.131	18.4	999	Brown	—		

Purge Data

	Volume	pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD
Date: 10/4/95								
Method: SS Bailer	Initial	5.86	.153	18.3	999	Brown	—	—
Monitor Reading (ppm):	1	5.72	.134	18.4	"	"	—	—
Well Casing Dia. & Material Type: 4"	2	5.82	.131	18.4	"	"		
Total Well Depth (TD): 20.00	3							
Static Water Level (WL): 14.67	4							
TD-WL (ft.) = 5.5	5							
One Casing Volume: (gal/L) 13.2		Dry After 2 Volumes						
Start Purge (hrs.): 0816								
End Purge (hrs.): 0830								
Total Purge Time (min): 14								
Total Amount Purged (gal/L): 26.4								

Analysis	Preservative	Container Requirements	Collected (✓)
Appendix IX VOA	HCl	3-40 ml vial	✓
Appendix IX SVOA	—	1-LT Amber	✓
PCBs	—	" "	✓
Explosives, PETN, NG	—	" "	✓
NC, NQ	—	" "	✓
TPH-418.1	H_2SO_4	" "	✓
Metals-Total + Dissolved	HNO_3	1 LT Poly	✓
~~Tot~~ Cyanide	NaOH	" "	✓
TOC NH3	H_2SO_4	1-250 ml amber	✓
TOX	H_2SO_4	" "	✓
TKN	H_2SO_4	1-250 ml Poly	✓
Observations/Notes: SO4/PO4	—	" "	✓
NO2, NO3	H_2SO_4	1-80 ml Poly	✓

Circle if Applicable:		Signature(s):
MS/MSD	Duplicate ID No:	[signature] / D Yost

TBD: To Be Determined

E.4

QA/QC

GROUNDWATER

SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: INDIAN HEAD

Project No.: 5280

☐ Domestic Well Data
☑ Monitoring Well Data
☐ Other Well Type:
● QA Sample Type: TRIP BLANK

Sample ID No.: S27-TB01

Sample Location: ———

Sampled By: MARSHALL/YOST

C.O.C. No.: #1A

Sampling Data

	pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD	TBD
Date: 9/18/95 Time: 1200 Method: DIRECT FILL - LAB								

Purge Data

	Volume	pH	S.C.	Temp.(°C)	Turbidity	Color	TBD	TBD
Date:								
Method:	Initial							
Monitor Reading (ppm):	1							
Well Casing Dia. & Material Type: 4"	2							
	3							
Total Well Depth (TD):	4							
Static Water Level (WL):	5							
TD-WL (ft.) =								
One Casing Volume: (gal/L)								
Start Purge (hrs.):								
End Purge (hrs.):								
Total Purge Time (min):								
Total Amount Purged (gal/L):								

Analysis	Preservative	Container Requirements	Collected (✓)
APPENDIX II VOA	HCl	40ml VIAL	✓

Observations/Notes:

Circle if Applicable:

MS/MSD	Duplicate ID No:	Signature(s): Robert P. Marshall

TBD: To Be Determined

GROUNDWATER

SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: INDIAN HEAD

Project No.: 5280

- ☐ Domestic Well Data
- ☒ Monitoring Well Data
- ☐ Other Well Type:
- ☐ QA Sample Type: TRIP BLANK

Sample ID No.: TB02

Sample Location:

Sampled By: MARSHALL/YOST

C.O.C. No.: ZA

Sampling Data

Date: 9/1995

Time: 0900

Method:

pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD	TBD

Purge Data

	Volume	pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD
Date:								
Method:	Initial							
Monitor Reading (ppm):	1							
Well Casing Dia. & Material Type: 4"	2							
	3							
Total Well Depth (TD):	4							
Static Water Level (WL):	5							
TD-WL (ft.) =								
One Casing Volume: (gal/L)								
Start Purge (hrs.):								
End Purge (hrs.):								
Total Purge Time (min):								
Total Amount Purged (gal/L):								

NA

NA

Analysis	Preservative	Container Requirements	Collected (✓)
Appendix IX Volatiles	HCl	2-40ml Vials	✓

Observations/Notes:

Circle if Applicable:		Signature(s):
MS/MSD	Duplicate ID No:	

TBD: To Be Determined

GROUNDWATER

SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: INDIAN HEAD

Project No.: 5280

☐ Domestic Well Data
☒ Monitoring Well Data
☐ Other Well Type:
☒ QA Sample Type: TRIP BLANK

Sample ID No.: TB03

Sample Location:

Sampled By: MARSHALL/YOST

C.O.C. No.: 3B

Sampling Data

Date: 9-20-95
Time: 1200
Method:

pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD	TBD
NA							

Purge Data

Date: NA
Method:
Monitor Reading (ppm):
Well Casing Dia. & Material Type: 4"
Total Well Depth (TD):
Static Water Level (WL):
TD-WL (ft.) =
One Casing Volume: (gal/L)
Start Purge (hrs.):
End Purge (hrs.):
Total Purge Time (min):
Total Amount Purged (gal/L):

Volume	pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD
Initial							
1							
2							
3							
4							
5		NA					

Analysis	Preservative	Container Requirements	Collected (✓)
Appendix IX Volatiles	HCl	2-40ml vials	✓

Observations/Notes:

Circle if Applicable:

MS/MSD | Duplicate ID No:

Signature(s): [signature]

TBD: To Be Determined

GROUNDWATER

SAMPLE LOG SHEET

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Project Site Name: INDIAN HEAD

Project No.: 5280

☐ Domestic Well Data
☑ Monitoring Well Data
☐ Other Well Type:
☒ QA Sample Type: TRPBLANK

Sample ID No.: S25-TB04-01

Sample Location:

Sampled By: MARSHALL/YOST

C.O.C. No.: 4B

Sampling Data

	pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD	TBD
Date: 9-21-95 Time: 1200 Method:	NA							

Purge Data

Date: NA	Volume	pH	S.C.	Temp.(°C)	Turbidity	Color	TBD	TBD
Method:	Initial							
Monitor Reading (ppm):	1							
Well Casing Dia. & Material Type: 4"	2							
	3							
Total Well Depth (TD):	4							
Static Water Level (WL):	5							
TD-WL (ft.) =								
One Casing Volume: (gal/L)		NA						
Start Purge (hrs.):								
End Purge (hrs.):								
Total Purge Time (min):								
Total Amount Purged (gal/L):								

Analysis	Preservative	Container Requirements	Collected (✓)
APPENDIX IX VOLATILES	HCL	2-40ML VOA	✓

Observations/Notes:

Circle if Applicable:		Signature(s):
MS/MSD	Duplicate ID No:	David C. Yost

TBD: To Be Determined

GROUNDWATER

SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: INDIAN HEAD

Project No.: 5280

- ☐ Domestic Well Data
- ☑ Monitoring Well Data
- ☐ Other Well Type:
- ☒ QA Sample Type: TRIP BLANK

Sample ID No.: TBOS

Sample Location:

Sampled By: MARSHALL/YOST

C.O.C. No.: 5B

Sampling Data

Date: 9/22/93 Time: 0800 Method:	pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD	TBD
	NA							

Purge Data

	Volume	pH	S.C.	Temp.(°C)	Turbidity	Color	TBD	TBD
Date: N/A								
Method:	Initial							
Monitor Reading (ppm):	1							
Well Casing Dia. & Material Type: 4"	2							
	3							
Total Well Depth (TD):	4			NA				
Static Water Level (WL):	5							
TD-WL (ft.) =								
One Casing Volume: (gal/L)								
Start Purge (hrs.):								
End Purge (hrs.):								
Total Purge Time (min):								
Total Amount Purged (gal/L):								

Analysis	Preservative	Container Requirements	Collected (✓)
APPENDIX IX VOLATILES	HCl	2-40ml VIAL	✓

Observations/Notes:

Circle If Applicable:		Signature(s):
MS/MSD	Duplicate ID No:	

TBD: To Be Determined

GROUNDWATER

SAMPLE LOG SHEET

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Project Site Name: INDIAN HEAD
Project No.: 5280

☐ Domestic Well Data
☑ Monitoring Well Data
☐ Other Well Type:
☑ QA Sample Type: TRIP BLANK

Sample ID No.: S26-TB06
Sample Location:
Sampled By: MARSHALL/YOST
C.O.C. No.: 6A

Sampling Data

Date: 9-28-95
Time: 1030
Method:

pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD	TBD
NA							

Purge Data

Date: NA

	Volume	pH	S.C.	Temp.(°C)	Turbidity	Color	TBD	TBD
Method:	Initial							
Monitor Reading (ppm):	1							
Well Casing Dia. & Material Type: 4"	2							
	3							
Total Well Depth (TD):	4							
Static Water Level (WL):	5							
TD-WL (ft.) =			NA					
One Casing Volume: (gal/L)								
Start Purge (hrs.):								
End Purge (hrs.):								
Total Purge Time (min):								
Total Amount Purged (gal/L):								

Analysis	Preservative	Container Requirements	Collected (✓)
APPENDIX IX VOA	HCl-pH<2	2-40ml VIAL	—

Observations/Notes:

Circle If Applicable:

MS/MSD	Duplicate ID No:

Signature(s): David A. Yost

TBD: To Be Determined

GROUNDWATER

SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: INDIAN HEAD

Project No.: 5280

☐ Domestic Well Data
☑ Monitoring Well Data
☐ Other Well Type:
☒ QA Sample Type: TRIP BLANK

Sample ID No.: S26-TB07

Sample Location:

Sampled By: MARSHALL/YOST

C.O.C. No.: 7B

Sampling Data

	pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD	TBD
Date: 9-24-95 Time: 0900 Method:	NA							

Purge Data

	Volume	pH	S.C.	Temp.(°C)	Turbidity	Color	TBD	TBD
Date: NA								
Method:	Initial							
Monitor Reading (ppm):	1							
Well Casing Dia. & Material Type: 4"	2							
	3							
Total Well Depth (TD):	4			NA				
Static Water Level (WL):	5							
TD-WL (ft.) =								
One Casing Volume: (gal/L)								
Start Purge (hrs.):								
End Purge (hrs.):								
Total Purge Time (min):								
Total Amount Purged (gal/L):								

Analysis	Preservative	Container Requirements	Collected (✓)
APPENDIX IX VOLATILES	HCl-pH<2	2-40ML VIAL	

Observations/Notes:

Circle If Applicable:		Signature(s):
MS/MSD	Duplicate ID No:	David Yost

TBD: To Be Determined

GROUNDWATER

SAMPLE LOG SHEET

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Project Site Name: INDIAN HEAD

Project No.: 5290

- ☐ Domestic Well Data
- ☒ Monitoring Well Data
- ☐ Other Well Type:
- ☒ QA Sample Type: TRIP BLANK

Sample ID No.: S25-TB08

Sample Location:

Sampled By: MARSHALL/YOST

C.O.C. No.: 8B

Sampling Data

Date: 10-3-95
Time: 1000
Method:

pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD	TBD
NA							

Purge Data

Date:	NA
Method:	
Monitor Reading (ppm):	
Well Casing Dia. & Material Type:	4"
Total Well Depth (TD):	
Static Water Level (WL):	
TD-WL (ft.) =	
One Casing Volume: (gal/L)	
Start Purge (hrs.):	
End Purge (hrs.):	
Total Purge Time (min):	
Total Amount Purged (gal/L):	

Volume	pH	S.C.	Temp.(°C)	Turbidity	Color	TBD	TBD
Initial							
1							
2							
3							
4							
5			NA				

Analysis	Preservative	Container Requirements	Collected (✓)
APPENDIX IX VOA	HCl	2-40ml Vial	

Observations/Notes:

TRIP BLANK

Circle If Applicable:

MS/MSD

Duplicate ID No:

Signature(s): David G. Yost

TBD: To Be Determined

GROUNDWATER

SAMPLE LOG SHEET

Project Site Name: INDIAN HEAD

Project No.: 5280

☐ Domestic Well Data

(04) ☒ Monitoring Well Data

☐ Other Well Type:

☒ QA Sample Type: TRIP BLANK

Sample ID No.: S26-TB09

Sample Location:

Sampled By: MARSHALL/YOST

C.O.C. No.: 9A

Sampling Data

	pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD	TBD
Date: 10-4-95 Time: 0800 Method:	NA							

Purge Data

	Volume	pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD
Date: NA								
Method:	Initial							
Monitor Reading (ppm):	1							
Well Casing Dia. & Material Type: 4"	2							
	3							
Total Well Depth (TD):	4			NA				
Static Water Level (WL):	5							
TD-WL (ft.) =								
One Casing Volume: (gal/L)								
Start Purge (hrs.):								
End Purge (hrs.):								
Total Purge Time (min):								
Total Amount Purged (gal/L):								

Analysis	Preservative	Container Requirements	Collected (✓)
APPENDIX IX VOA	HCl	2-40 ml VOA	

Observations/Notes:

TRIP BLANK GENERATED BY LAB

Circle If Applicable:		Signature(s):
MS/MSD	Duplicate ID No:	[signature]

TBD: To Be Determined

GROUNDWATER

SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: INDIAN HEAD

Project No.: 5280

☐ Domestic Well Data
☒ Monitoring Well Data
☐ Other Well Type:
☒ QA Sample Type: FIELD BLANK

Sample ID No.: ~~S27-FB01-01~~ (01)

Sample Location: S27-FB01-001

Sampled By: MARSHALL/YOST

C.O.C. No.: 1A / 1B

Sampling Data

Date: 9-16-95 Time: 1800 Method: DIRECT POUR	pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD	TBD
	NA	NA	NA	NA	NA	NA	NA	NA

Purge Data

	Volume	pH	S.C.	Temp.(°C)	Turbidity	Color	TBD	TBD
Date: NA								
Method:	Initial							
Monitor Reading (ppm):	1							
Well Casing Dia. & Material Type: 4"	2							
	3							
Total Well Depth (TD):	4							
Static Water Level (WL):	5			NA				
TD-WL (ft.) =								
One Casing Volume: (gal/L)								
Start Purge (hrs.):								
End Purge (hrs.):								
Total Purge Time (min):								
Total Amount Purged (gal/L):								

Analysis	Preservative	Container Requirements	Collected (✓)
APPendix IX VOA	HCl	3 - 40ML VIAL	✓
APPendix IX SVOA	—	1 LT GLASS AmbER	✓
NO_2 / NO_3	—	80 ml PLSTIC	✓
SO_4 / PO_4	—	500 ML PLASTIC	✓
TOX	—	" " "	✓
TPH - 418.1	—	1 LT AmbER	✓
NC/NG	—	" "	✓
EXPLOSIVES NG + PeT	—	" "	✓
TOC / NH_3	H_2SO_4	500 ML AmbER	✓
TKN	H_2SO_4	"	✓
PCBs	—	1LT AmbER	✓
Observations/Notes: CN	NAOH	1LT POLY	✓
METALS - UNFILTERED	—	" "	✓
METALS - FILTERED	—	" "	✓

FB01 CONSISTS OF DI WATER - LOT # B220

Circle If Applicable:		Signature(s):
MS/MSD	Duplicate ID No:	David Yost

TBD: To Be Determined

GROUNDWATER

SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: INDIAN HEAD

Project No.: 5280

☐ Domestic Well Data
☑ Monitoring Well Data
☐ Other Well Type:
☑ QA Sample Type: Field BLANK

Sample ID No.: 527-FB02-001

Sample Location:

Sampled By: MARSHALL/YOST

C.O.C. No.: 1A/1B

Sampling Data

Date: 9-15-95 / Time: 1805 / Method: DIRECT POUR	pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD	TBD
	NA							

Purge Data

	Volume	pH	S.C.	Temp.(°C)	Turbidity	Color	TBD	TBD
Date: NA								
Method:	Initial							
Monitor Reading (ppm):	1							
Well Casing Dia. & Material Type: 4"	2							
	3							
Total Well Depth (TD):	4							
Static Water Level (WL):	5							
TD-WL (ft.) =			NA					
One Casing Volume: (gal/L)								
Start Purge (hrs.):								
End Purge (hrs.):								
Total Purge Time (min):								
Total Amount Purged (gal/L):								

Analysis	Preservative	Container Requirements	Collected (✓)
APPENDIX IX VOA	HCl	3-40 ml VIAL	✓
APPENDIX IX SVOA	—	1 LT AMBER	✓
NO_2/NO_3	—	50 ml PLASTIC	✓
SO_4/PO_4	—	500 ml PLASTIC	✓
TOX	—	" "	✓
TPH 418.1	—	1 LT AMBER	✓
NC/NG	—	" "	✓
EXPLOSIVES NG + PET	—	" "	✓
TOC/NH_3	H_2SO_4	500 ml PLASTIC	✓
TKN	H_2SO_4	" "	✓
PCBs	—	1 LT AMBER	✓
Observations/Notes: CN	NAOH	1 LT POLY	✓
METALS UNFILTERED	—	" "	✓
METALS FILTERED	—	" "	✓

FB02 IS POTABLE WATER TAKEN FROM Building 2087

Circle If Applicable:		Signature(s):
MS/MSD	Duplicate ID No:	David A. Yost

TBD: To Be Determined

SINGLE SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: INDIAN HEAD

Sample ID No.: S27-R301-01

Project No.: 5280

Sample Location:

Sampled By: MARSHALL/YOST

C.O.C. No.: 1A / 1B

07 ■ Surface Soil
☐ Subsurface Soil
☐ Sediment
☐ Other ________
☒ QA Sample Type: Rinsate Blank

Sample Method:
Pour over mixing Bowl

Depth Sampled:
NA

Sample Date and Time:
9-18-95 @ 1835

Type of Sample
☒ Grab
☐ Composite
☐ Grab-Composite
☐ High Concentration
☒ Low Concentration

Composite Sample Data

Sample	Time	Color/Description
	NA	

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)

Analysis	Container Requirements	Collected (✓)
Appendix IX VOA	3-40-mL VIAL	✓
Appendix IX SVOA	1LT AMBER	✓
PCBs	" "	✓
TPH - 418.1	" "	✓
Explosives + NG + PET	1LT Amber	✓
NC/NG	" "	✓
Metals unfiltered	1 LT POLY	✓
CN	NAOH - 1LT PLT	✓
TKN	500-mL PLT H_2SO_4	
TOC/NH_3	H_2SO_4 500-mL PLT	
NO_2/NO_3	80-mL Poly	

Map:

Observations/Notes:

Circle If Applicable:

MS/MSD | Duplicate ID No:

Signature(s):
David A. Yost

GROUNDWATER

SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: INDIAN HEAD

Project No.: 5280

☐ Domestic Well Data
☒ Monitoring Well Data
☐ Other Well Type:
☒ QA Sample Type: Rinsate Blank

Sample ID No.: S25-RB02-01

Sample Location:

Sampled By: RAY WILLOUGHBY ~~MARSHALL/YOST~~

C.O.C. No.: 2A1B

Sampling Data

Date: 9-19-95
Time: 1615
Method:

pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD	TBD
NA							

Purge Data

	Volume	pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD
Date: NA								
Method:	Initial							
Monitor Reading (ppm):	1							
Well Casing Dia. & Material Type: 4"	2							
	3							
Total Well Depth (TD):	4							
Static Water Level (WL):	5							
TD-WL (ft.) =								
One Casing Volume: (gal/L)		NA						
Start Purge (hrs.):								
End Purge (hrs.):								
Total Purge Time (min):								
Total Amount Purged (gal/L):								

Analysis	Preservative	Container Requirements	Collected (✓)
Volatiles appendix IX	HCL	3-40 ml VIAL	
Appendix IX Semi VOA	None	1 LT AMBER	
TAL METALS, SN	"	1 LT POLY	
CYANIDE	NAOH	"	
PCBs	1LT Amber	None	
TPH	"	"	
NC/NG	"	"	
Explosives, NG, PETN	"	"	
TOC / NH_3	H_2SO_4	500 ml Amber	
NO_2 / NO_3	None	50 ml VIAL	

Observations/Notes:

sample collected by pouring of water over a decontaminated Trowel

HOLD - Do NOT analyze

Circle if Applicable:

MS/MSD	Duplicate ID No:

Signature(s): [signature]

TBD: To Be Determined

GROUNDWATER

SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: INDIAN HEAD

Project No.: 5280

☐ Domestic Well Data
☑ Monitoring Well Data
☐ Other Well Type:
☑ QA Sample Type: RINSATE BLANK

Sample ID No.: SOS-RB03-01

Sample Location:

Sampled By: MARSHALL/YOST

C.O.C. No.: 3B

Sampling Data

Date: 9-20-95
Time: 1840
Method:

pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD	TBD
NA							

Purge Data

	Volume	pH	S.C.	Temp.(°C)	Turbidity	Color	TBD	TBD
Date: NA	Initial							
Method:	1							
Monitor Reading (ppm):	2							
Well Casing Dia. & Material Type: 4"	3							
Total Well Depth (TD):	4							
Static Water Level (WL):	5							
TD-WL (ft.) =			NA					
One Casing Volume: (gal/L)								
Start Purge (hrs.):								
End Purge (hrs.):								
Total Purge Time (min):								
Total Amount Purged (gal/L):								

Analysis	Preservative	Container Requirements	Collected (✓)
APPENDIX IX VOLATILES	HCL	3-40ML VOA	✓
APPENDIX IX SEMIVOLATILES	—	1 LT AMBER	✓
NC/NG	—	" "	✓
EXPLOSIVES, NG, PET	—	" "	✓
METALS, SN	HNO_3	1 LT POLY	✓
CYANIDE	NAOH	" "	✓
TKN	H_2SO_4	250 ML POLY	✓
NO_2/NO_3	H_2SO_4	50ML POLY	✓
TOC/ NH_3	H_2SO_4	250 ML AMBER	✓

Observations/Notes:

RINSATE COLLECTED BY POURING DI WATER OVER A DECONNED SPLIT SPOON

Circle if Applicable:		Signature(s):
MS/MSD	Duplicate ID No:	David A. Yost

TBD: To Be Determined

GROUNDWATER

SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: INDIAN HEAD

Project No.: 5280

☐ Domestic Well Data
☑ Monitoring Well Data
☐ Other Well Type:
☒ QA Sample Type:

Sample ID No.: 526 RB0440

Sample Location:

Sampled By: MARSHALL/YOST

C.O.C. No.: 4B

Sampling Data

Date: 9-21-95
Time: 1800
Method:

pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD	TBD
NA →							

Purge Data

Date: NA
Method:
Monitor Reading (ppm):
Well Casing Dia. & Material Type: 4"
Total Well Depth (TD):
Static Water Level (WL):
TD-WL (ft.) =
One Casing Volume: (gal/L)
Start Purge (hrs.):
End Purge (hrs.):
Total Purge Time (min):
Total Amount Purged (gal/L):

Volume	pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD
Initial							
1							
2							
3							
4							
5	N.A.						

Analysis	Preservative	Container Requirements	Collected (✓)
VOLATILE ORGANICS APPENDIX IX	HCl	3-40ML VIAL	✓
APPENDIX IX SVOA	—	1 LT AMBER	✓
NC/NG	—	" "	✓
EXPLOSIVES, NG, PETN	—	" "	✓
TPH - 418.1	H_2SO_4	" "	✓
PCBs	—	" "	✓
METALS - TOTAL	HNO_3	1 LT POLY	✓
CYANIDE	NaOH	" "	✓
TOC / NH_3	H_2SO_4	1 - 250ML Amber	✓
NO_2/NO_3	H_2SO_4	1 80ML POLY	✓

Observations/Notes:

Rinsate Collected by Pouring DI Water over a Deconned Trial

HOLD - Do NOT ANALYZE

Circle if Applicable:

MS/MSD	Duplicate ID No:	Signature(s): David A. Yost

TBD: To Be Determined

GROUNDWATER

SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: INDIAN HEAD

Project No.: 5280

Sample ID No.: 526-RB05

Sample Location:

Sampled By: MARSHALL/YOST

C.O.C. No.: 5A

- ☐ Domestic Well Data
- ☑ Monitoring Well Data
- ☐ Other Well Type:
- ☑ QA Sample Type: RINSATE BLANK

Date: 4/22/95

Time: 1630

Method:

Sampling Data

pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD	TBD
NA							

Purge Data

Date:

Method:

Monitor Reading (ppm):

Well Casing Dia. & Material Type: 4"

Total Well Depth (TD):

Static Water Level (WL):

TD-WL (ft) =

One Casing Volume: (gal/L)

Start Purge (hrs.):

End Purge (hrs.):

Total Purge Time (min):

Total Amount Purged (gal/L):

Volume	pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD
Initial							
1							
2							
3							
4			N/A				
5							

Analysis	Preservative	Container Requirements	Collected (✓)
APPEN IX VOA	HCl	3-40ml VOA	✓
APPEN IX SVOA	—	1 l AMBER	✓
TAL MET, SN	HNO_3	1 l POLY	✓
EXPLOSIVES, NG, PETN	—	1 l AMBER	✓
TOC, NH_3	H_2SO_4	250 ml AMBER	✓
NO_2/NO_3	H_2SO_4	50 ml POLY	✓
~~SN~~, CN	NaOH	1 l POLY	✓
NC/NG	—	1 LT AMBER	

Observations/Notes:

RINSATE BLANK COLLECTED BY RUNNING DI WATER OVER A STAINLESS STEEL MIXING BOWL

Circle if Applicable:

MS/MSD	Duplicate ID No:

Signature(s):

TBD: To Be Determined

GROUNDWATER SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: INDIAN HEAD
Project No.: 5280

Sample ID No.: S2G-RB06-001
Sample Location:
Sampled By: MARSHALL/YOST
C.O.C. No.: 6A

☐ Domestic Well Data
☑ Monitoring Well Data
☐ Other Well Type:
☒ QA Sample Type: Rinsate Blank

Sampling Data

Date: 9-23-95
Time: 1730
Method:

pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD	TBD
NA							

Purge Data

Date: NA
Method:
Monitor Reading (ppm):
Well Casing Dia. & Material Type: 4"
Total Well Depth (TD):
Static Water Level (WL):
TD-WL (ft.) =
One Casing Volume: (gal/L)
Start Purge (hrs.):
End Purge (hrs.):
Total Purge Time (min):
Total Amount Purged (gal/L):

Volume	pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD
Initial							
1							
2							
3							
4							
5			NA				

Analysis	Preservative	Container Requirements	Collected (✓)
Appendix IX VOA	HCl	3- 40ml vials	✓
Appendix IX SVOA	→	1 LT Amber	✓
PCBs	—	" "	✓
NC/NG	—	" "	✓
Explosives, PETN, NG	—	" "	✓
TPH - 418.1	H_2SO_4	" "	✓
METALS, SN	HNO_3	1 LT POLY	✓
CYANIDE	NAOH	" "	✓
NO_2, NO_3	H_2SO_4	1 BCml POLY	✓
TOC / NH_3	H_2SO_4	1-250 ml Amber	✓

Observations/Notes:
Rinsate collected by pouring DI water over decontaminated S. S. Trowel

HOLD - DO NOT ANALYZE

Circle if Applicable:
MS/MSD
Duplicate ID No:

Signature(s): David A. Yost

TBD: To Be Determined

GROUNDWATER SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: INDIAN HEAD

Project No.: 5280

☐ Domestic Well Data
☒ Monitoring Well Data
☐ Other Well Type:
☒ QA Sample Type: RINSATE BLANK

Sample ID No.: S26-RB07

Sample Location:

Sampled By: MARSHALL/YOST

C.O.C. No.: 7B

Sampling Data

	pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD	TBD
Date: 9-24-95 Time: 1430 Method:	NA							

Purge Data

	Volume	pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD
Date: NA								
Method:	Initial							
Monitor Reading (ppm):	1							
Well Casing Dia. & Material Type: 4"	2							
	3							
Total Well Depth (TD):	4							
Static Water Level (WL):	5							
TD-WL (ft.) =								
One Casing Volume: (gal/L)								
Start Purge (hrs.):								
End Purge (hrs.):								
Total Purge Time (min):								
Total Amount Purged (gal/L):								

NA

Analysis	Preservative	Container Requirements	Collected (✓)
APPENDIX IX VOA	HCl	3-40ml VIAL	
APPENDIX IX SVOA	—	1 LT AMBER	
PCBs	—	" "	
EXPLOSIVES, NG, PETN	—	" "	
NC/NG	—	" "	
TPH - 418.1	H_2SO_4	" "	
METALS	HNO_3	1 LT POLY	
CN	NAOH	" "	
TOC / NH_3	H_2SO_4	1-250 ml AMBER	
NO_2 / NO_3	H_2SO_4	1-8OZ POLY	

Observations/Notes:

RINSATE BLANK COLLECTED BY POURING DI WATER OVER A DECONNED SS TROWEL

Circle if Applicable:		Signature(s):
MS/MSD	Duplicate ID No:	David G Yost

TBD: To Be Determined

GROUNDWATER

SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: INDIAN HEAD.

Project No.: 5280

Sample ID No.: S25-RB08

Sample Location:

Sampled By: MARSHALL/YOST

C.O.C. No.: 7B

- ☐ Domestic Well Data
- ☑ Monitoring Well Data
- ☐ Other Well Type:
- ☑ QA Sample Type: RINSATE BLANK

Sampling Data

Date: 9-25-95 / Time: 1400 / Method:	pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD	TBD
	NA							

Purge Data

	Volume	pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD
Date: NA								
Method:	Initial							
Monitor Reading (ppm):	1							
Well Casing Dia. & Material Type: 4"	2							
	3							
Total Well Depth (TD):	4			NA				
Static Water Level (WL):	5							
TD-WL (ft.) =								
One Casing Volume: (gal/L)								
Start Purge (hrs.):								
End Purge (hrs.):								
Total Purge Time (min):								
Total Amount Purged (gal/L):								

Analysis	Preservative	Container Requirements	Collected (✓)
APPENDIX IX VOA	HCl	40-ml VIAL	✓
APPENDIX IX SVOA	—	1 LT AMBER	✓
EXPLOSIVES NG, PETN, ~~NQ, NC(S)~~	—	" "	✓
~~TOC, NQ~~ (S) NQ/NC	—	" "	✓
METALS	HNO_3	1 LT POLY	✓
CN	NAOH	" "	✓
TOC/NH_3	H_2SO_4	1-250ml AMBER	✓
NO_2, NO_3	H_2SO_4	1-500ml POLY	✓

Observations/Notes:

RINSATE BLANK COLLECTED BY POURING D.I WATER OVER A DECONNED S.S. TROWEL.

HOLD DO NOT ANALYZE

Circle if Applicable:		Signature(s):
MS/MSD	Duplicate ID No:	Dave A. Yost

TBD: To Be Determined

GROUNDWATER

SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: INDIAN HEAD

Project No.: 5290

☐ Domestic Well Data
☐ Monitoring Well Data
☐ Other Well Type:
☒ QA Sample Type: RINSATE BLANK

Sample ID No.: 25RB09

Sample Location:

Sampled By: MARSHALL/YOST

C.D.C. No.: 8B

Sampling Data

Date: 10-3-95
Time: 1430
Method:

pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD	TBD
NA							

Purge Data

Date: NA
Method:
Monitor Reading (ppm):
Well Casing Dia. & Material Type: 4"
Total Well Depth (TD):
Static Water Level (WL):
TD-WL (ft.) =
One Casing Volume: (gal/L)
Start Purge (hrs.):
End Purge (hrs.):
Total Purge Time (min):
Total Amount Purged (gal/L):

Volume	pH	S.C.	Temp.(°C)	Turbidity	Color	TBD	TBD
Initial							
1							
2							
3							
4			NA				
5							

Analysis	Preservative	Container Requirements	Collected (✓)
APPENDIX IX VOA	HCl	3 40ml VIAL	✓
APPENDIX IX SVOA	—	1 LT AMBER	✓
TAL METALS, SN	HNO_3	1 LT POLY	✓
CYANIDE	NAOH	" " "	✓
EXPLOSIVES PETN, NG	—	1 LT AMBER	✓
NC/NQ	—	" " "	✓
TOC, NH_3	H_2SO_4	1-250 ml AMBER	✓
NO_2, NO_3	H_2SO_4	1-80 ml POLY	✓

Observations/Notes:

RINSATE BLANK COLLECTED BY POURING DI WATER OVER A DECONNED S.S TROWEL

Circle if Applicable:

MS/MSD | Duplicate ID No:

Signature(s): David A. Yost

TBD: To Be Determined

GROUNDWATER

SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: INDIAN HEAD

Project No.: 5280

☐ Domestic Well Data
☑ Monitoring Well Data
☐ Other Well Type:
☐ QA Sample Type:

Sample ID No.: 26RB10

Sample Location:

Sampled By: MARSHALL/YOST

C.O.C. No.: 9B

Sampling Data

	pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD	TBD
Date: 10-4-95 Time: 1930 Method:	NA							

Purge Data

Date: NA	Volume	pH	S.C.	Temp.(°C)	Turbidity	Color	TBD	TBD
Method:	Initial							
Monitor Reading (ppm):	1							
Well Casing Dia. & Material Type: 4"	2							
	3							
Total Well Depth (TD):	4							
Static Water Level (WL):	5		NA					
TD-WL (ft.) =								
One Casing Volume: (gal/L)								
Start Purge (hrs.):								
End Purge (hrs.):								
Total Purge Time (min):								
Total Amount Purged (gal/L):								

Analysis	Preservative	Container Requirements	Collected (✓)
APPENDIX IX VOA	HCl	1-LT AMBER	✓
APPENDIX IX SVOA	—	" " "	✓
~~8330~~ EXPLOSIVES, NG, PETN	—	" " "	✓
NC, NQ	—	" " "	✓
PCBs	—	" " "	✓
TPH - 418.1	H_2SO_4	" " "	✓
TOTAL + DISSOLVED METALS, SN	HNO_3	1-LT POLY	✓
CYANIDE	NAOH	" "	✓
TOC, NH_3	H_2SO_4	250 ml AMBER	✓
TOX	H_2SO_4	" "	✓
TKN	H_2SO_4	250 ml POLY	✓
Observations/Notes: SO_4 / PO_4	—	" " "	✓
NO_2 / NO_3	H_2SO_4	80 ml POLY	✓

RINSATE BLANK COLLECTED BY POURING DI WATER THROUGH A DECONNED BAILER

Circle if Applicable:

MS/MSD	Duplicate ID No:	Signature(s): David A. Yost

TBD: To Be Determined

E.5

CHAIN OF CUSTODIES (COCs)

COC # 1 A

CHAIN OF CUSTODY RECORD

PROJECT NO.: 5780	SITE NAME: INDIAN Head - STUMPNECK
SAMPLERS (SIGNATURE): [signature]	

STATION NO.	DATE	TIME	COMP	GRAB	STATION LOCATION	NO. OF CONTAINERS	8330 NG, PETN / AK, NO - 8082 clear	Metals CN 4oz clear	Appendix IX 4oz jar VOA	Appendix IX Semi VOA	TOC, NO2, NO3, NH3	Appendix IX VOA 40 ml VIAL	R8 H2O	TOX	SO4/PO4	R8 soil	TPH soil	REMARKS
TB01	9/18/95	1200		X	S27-TB01	2						2						TRIP BLANK
IHD	9/19/95	1205	X		S27-SS-001	5	1	1	1	1	1							
IHD	9/19/95	1220	X		S27-SS-002	5	1	1	1	1	1							
IHD	9/19/95	1530		X	S26-SB01-01	7	1	1	1	1	1					1	1	
IHD	9/19/95	1642	X		S26-SB01-02	7	1	1	1	1	1					1	1	
FB01	↓	1800		X	S27-FB01-001	6						3	1	1	1			
FB02	↓	1805		X	S27-FB02-001	6						3	1	1	1			
RB01	↓	1835		X	S27-RB01-001	4						3	1					

RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY (SIGNATURE):	RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY (SIGNATURE):
David A. Yost	9-19-95 1015	[signature] 9-19-95 10:15			
RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY (SIGNATURE):	RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY (SIGNATURE):
RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED FOR LABORATORY BY (SIGNATURE):	DATE / TIME:	REMARKS:	

Order No. 70440 (0693)

COC # 2A

GP ENVIRONMENTAL SERVICES, INC.

202 Perry Parkway
Gaithersburg, Maryland 20877
(301) 926-6802

Contract #/Billing Reference: ____

____ of ____ Pgs.

Project: INDIAN HEAD - STUMP NECK

Client:

Send Results To: Lee Ann Sinagoga

Address:

Phone: (412) 921-7090

	TOC, NO2, NO3, NH3	8330, NG, PETN, NC, NQ	TAL METALS, SN, CN	APPENDIX IX VOA	APPENDIX IX SEMI-VOA	8330, NG, PETN, NC, NQ, TAL METALS, SN, CN	APPENDIX IX SEMI-VOA, PCBs	TAL METALS, SN, CN, TPH	APPENDIX IX VOA	Lab Cooler No.
Turnaround Time										
# of Containers	1	1	1	1	1	1	1	1		
Container Type	8 oz	8 oz	4 oz	4 oz	4 oz	8 oz	4 oz	4 oz	40 ml	
Preservative Used	NONE	NONE	NONE	NONE	NAR	NONE	NONE	NONE		

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	TOC, NO2, NO3, NH3	8330, NG, PETN, NC, NQ	TAL METALS, SN, CN	APPENDIX IX VOA	APPENDIX IX SEMI-VOA	8330, NG, PETN, NC, NQ, TAL METALS, SN, CN	APPENDIX IX SEMI-VOA, PCBs	TAL METALS, SN, CN, TPH	APPENDIX IX VOA	CLIENT COMMENTS
S25-MW01-01	9-19-95	0925	SOIL	LM	X	X	X							
F001	↓	0000	↓	↓	X	X	X							
F002	↓	0000	↓	↓				X	X					
S25-MW01-02	↓	1010	↓	↓	X			X	X	X				
S26-MW01-01	↓	1735	↓	DAY	X			X			X	X		
S26-MW01-02	↓	1800	↓	DAY	X			X			X	X		
TR-02	↓	0900	AQ	LM									XX	
S25-RB02-01	↓	1815	↓	RW									XXX	HOLD - Do Not Analyze

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
[signature]	9-20-95 1033	[signature] 9-20-95 10:33			
Relinquished By:	Date/Time	Received By:	Date/Time / Shipper:	Airbill No.:	
Relinquished By:	Date/Time	Received By:	Lab Comments:		Temp:

G.P. W.O. ____

COC # 20

GP ENVIRONMENTAL SERVICES, INC.

202 Perry Parkway
Gaithersburg, Maryland 20877
(301) 926-6802

Contract #/Billing Reference: ______

______ of ______ Pgs.

Project: INDIAN Head - STUMP NECK
Client:
Send Results To: Lee Ann Sinagoga
Address:
Phone: (412) 921-7090

	TAL metals, SN	CYANIDE	PCBs	APPENDIX IX semiVOA	TPH	NO2/NO3	NH3	TOC/NH3	Explosives 8330 PET	Lab Cooler No.
Turnaround Time										
# of Containers	1	1	1	1	1	1	1	1	1	
Container Type	1-LT Btl	1 LT	LT Amber	LT Amb	LT Amb	80 mL	LT Amber	Amber 500 mL	LT Amber	
Preservative Used	—	NaOH	—	—	—	—	—	H_2SO_4	—	

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	TAL metals, SN	CYANIDE	PCBs	APPENDIX IX semiVOA	TPH	NO2/NO3	NH3	TOC/NH3	Explosives 8330 PET	Lab Cooler No.	CLIENT COMMENTS
S25-RB02-01	9-19-95	1815	AQ	RW	X	X	X	X	X	X	X	X	X		HOLD DO NOT ANALYZE

Relinquished By:	Date/Time	Received By:	Relinquished By:		Received for Laboratory By:	Date/Time
David A. Yard	9-20-95 1033	[illegible] 9-20-95 10:33				
Relinquished By:	**Date/Time**	**Received By:**	**Date/Time**	**Shipper:**	**Airbill No.:**	
Relinquished By:	**Date/Time**	**Received By:**	**Lab Comments:**			**Temp:**

G.P. W.O. ______

COC 3A

GP ENVIRONMENTAL SERVICES, INC.

202 Perry Parkway
Gaithersburg, Maryland 20877
(301) 926-6802

Contract #/Billing Reference: ____________

______ of ______ Pgs.

Project: INDIAN HEAD - STUMP NECK

Client:

Send Results To: LEE ANN SINAGOGA

Address:

Phone: (412) 421-7090

	APPENDIX IX VOA	APPENDIX IX SVOA	TOC, NO2, NO3, NH3	8330, N6, PETN, NC, N6, (AL MET, CU, CN)	Lab Cooler No.
Turnaround Time					
# of Containers	1	1	1	1	
Container Type	4 oz	4 oz	8 oz	8 oz	
Preservative Used	—	—	—	—	

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	APPENDIX IX VOA	APPENDIX IX SVOA	TOC, NO2, NO3, NH3	8330, N6, PETN, NC, N6, (AL MET, CU, CN)						CLIENT COMMENTS
FD03	9-20-95	0000	Soil	LM			X	X						
FD04	↓	0000	↓	↓	X	X								
SOS-MW01-01	↓	1310	↓	↓	X	X	X	X						
SOS-MW01-02	↓	1517	↓	↓	X	X	X	X						

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
David A. Yost [signature]	9-21-95 1019	[signature] 9-21-95 10:19			

Relinquished By:	Date/Time	Received By:	Date/Time	Shipper:	Airbill No.:

Relinquished By:	Date/Time	Received By:	Lab Comments:	Temp:

G.P. W.O. ____________

COC 3B

GPL ENVIRONMENTAL SERVICES, INC.

202 Perry Parkway
Gaithersburg, Maryland 20877
(301) 926-6802

Contract #/Billing Reference ______

______ of ______ Pgs.

Project: INDIAN HEAD - STUMP NECK

Client

Send Results To: LEE ANN SINAGOGA

Address:

Phone: (412) 921-7090

				Turnaround Time											
				# of Containers											
				Container Type	1LT	1LT	1LT	1LT	250ml	1LT AMBER	1LT PLAST	60ml	550		
				Preservative Used	HCL	—	—	—	H_2SO_4	HNO_3	NAOH	H_2SO_4	H_2SO_4		
				Type of Analysis	APPENDIX IX VOLATILES	APPENDIX IX VOA	EXPLOSIVES, NG, PETN	NC/NG	TKN	TAL METALS, SN	CYANIDE	NO_2/NO_3	TOC/NH_3	Lab Cooler No.	
Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials											CLIENT COMMENTS
TBo3	9-20-95	1200	AQ	LM	XX										
05RR03-01	↓	1840	↓	DY	XXX	X	X	X	X	X	X	X	X		

Relinquished By:	Date/Time	Received By:	Relinquished By:		Received for Laboratory By:	Date/Time
David G Yost	9-21-95 1019	[signature] 9-21-95 10:19				
Relinquished By:	Date/Time	Received By:	Date/Time	Shipper:	Airbill No.:	
Relinquished By:	Date/Time	Received By:	Lab Comments:			Temp:

G.P. W.O. ______

COC # 4A

GP ENVIRONMENTAL SERVICES, INC.

202 Perry Parkway
Gaithersburg, Maryland 20877
(301) 926-6802

Contract #/Billing Reference: ______

______ of ______ Pgs.

Project: INDIAN HEAD STUMP NECK
Client:
Send Results To: LEE ANN SINAGOGA
Address:

Phone: (412) 921-7090

Type of Analysis	8330 NG, NQ, NC, PCTN	TOC, NO2, NO3, NH3	TAL METALS, SN, CN	APPENDIX IX VOA	APPENDIX IX S-VOA	TPH	PCBs	TOC, NO2, NO3, NH3, PCBs	TAL METALS, SN, CN, TPH	Lab Cooler No.
Turnaround Time										
# of Containers	1	1	1	1	1	1	1	1	1	
Container Type	8oz	8oz	4oz	4oz	4oz	4oz	4oz	8oz	8oz	
Preservative Used	—	—	—	—	—	—	—	—	—	

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	8330 NG, NQ, NC, PCTN	TOC, NO2, NO3, NH3	TAL METALS, SN, CN	APPENDIX IX VOA	APPENDIX IX S-VOA	TPH	PCBs	TOC, NO2, NO3, NH3, PCBs	TAL METALS, SN, CN, TPH	Lab Cooler No.	CLIENT COMMENTS
S25-SD002	9-22-95	1400	SOIL	LM	XX	XX*	XX	XX	XX						MS/MSD
FD07	↓	0000	↓	DAY						X	X				
S25-SB01-001	↓	1405	↓	DAY	X	X	X								
S25-SB01-002	↓	1426	↓	LM	X	X	X	X	X						
S26-SB02-001	↓	1628	↓	DAY	X			X	X			X	X		
S26-SB02-002	↓	1735	↓	LM				X	X			X	X		

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
David A. [illegible]	9-22-95 1119	[illegible] 9-22-95 11:19			

Relinquished By:	Date/Time	Received By:	Date/Time	Shipper:	Airbill No.:

Relinquished By:	Date/Time	Received By:	Lab Comments:	Temp:

G.P. W.O. ______

COC # 43

GP ENVIRONMENTAL SERVICES, INC.

202 Perry Parkway
Gaithersburg, Maryland 20877
(301) 926-6802

Contract #/Billing Reference ______

______ of ______ Pgs.

Project: INDIAN HEAD · STUMPNECK

Client:

Send Results To: LEE ANN SINAGOGA

Address:

Phone: (412) 921-7040

Turnaround Time	
# of Containers	
Container Type	1 LT Amb / 40 mL VOA / 1 LT Amber / 1 LT Amber / 1 LT Poly / 1 LT Poly / 1 LT Poly / 250 mL Poly / 250 mL Poly
Preservative Used	
Type of Analysis	

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	APPENDIX IX SVOA	APPENDIX IX VOA	NC/NG	EXPLOSIVES, NC, PETN	METALS TOTAL	METALS FILTERED	CYANIDE	SO4/PO4	TOX	Lab Cooler No.	CLIENT COMMENTS
S-25-TB04-01	92195	1200	AQ	DY/LAS		XX*									
S25-SW002	↓	1345	↓	DAY	X	XXX	X	X	X	X	X	X	X		
S26-RB04-01	↓	1400	↓	DAY	X	XXX	X	X	X		X				HOLD - DO NOT ANALYZE

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
David A. Yost	9-22-95 1119	[illegible] 9-22-95 11:19			
Relinquished By:	Date/Time	Received By:	Date/Time	Shipper:	Airbill No.:
Relinquished By:	Date/Time	Received By:	Lab Comments:		Temp:

G.P. W.O. ______

LOC #42

GP ENVIRONMENTAL SERVICES, INC.

202 Perry Parkway
Gaithersburg, Maryland 20877
(301) 926-6802

Contract #/Billing Reference ______________

______ of ______ Pgs.

Project: INDIAN HEAD- STUMP NECK

Client

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Address:

Phone: (412) 921-7090

	TKN	NO_2/NO_3	TOC / NH_3	TPH 418.1	PCBs					
Turnaround Time										
# of Containers										
Container Type	250 ml BAT	80 ml BLT	250 ml BAT	1 LT AMBER	1 LT AMBER					
Preservative Used	H_2SO_4	H_2SO_4	H_2SO_4	H_2SO_4	—					

Lab Cooler No.

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	TKN	NO_2/NO_3	TOC / NH_3	TPH 418.1	PCBs						CLIENT COMMENTS
S25-SW002	9.22.95	1345	AQ	DAY	X	X	X								
S26-RB04-01	↓	1800	↓	DAY		X	X	X	X						HOLD- DO NOT ANALYZE

Relinquished By:	Date/Time	Received By:	Relinquished By:		Received for Laboratory By:	Date/Time
David A. Yost	9.22.95 1119	[signature] 9-22-95 11:19				
Relinquished By:	Date/Time	Received By:	Date/Time	Shipper:	Airbill No.:	
Relinquished By:	Date/Time	Received By:	Lab Comments:			Temp:

G.P. W.O. ______________

COC 5A

GP ENVIRONMENTAL SERVICES, INC.

202 Perry Parkway
Gaithersburg, Maryland 20877
(301) 926-6802

Contract #/Billing Reference

_____ of _____ Pgs.

Project: INDIAN HEAD - STUMPNECK

Client

Send Results To:

Address: LEE ANN SINAGOGA

Phone: (412) 921-7090

					Turnaround Time										
					# of Containers										
					Container Type	1 8oz	8OZ	4OZ	4OZ	4OZ	1-2.5gal POLY	1 gal POLY	1-2.5gal Amber		
					Preservative Used	—	—	—	—	—	H_2SO_4	H_2SO_4	H_2SO_4		
Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	Type of Analysis	TOC/NO_2/NO_3	NH_3 8330/NG/PETN NC/NG	TAL METALS, SN, CN	APPENDIX IX VOA	APPENDIX IX SVOA	TKN	NO_2/NO_3	TOC/NH_3	Lab Cooler No.	CLIENT COMMENTS
S25-MW02-001	9-22-95	1020	SOIL	LM		X	X	X							
S25-MW02-002	↓	1115	↓	LM		X	X	X	X	X					
S25-SD001	↓	1240	↓	DAY		X	X	X	X	X					
S25-SD003	↓	1430	↓	DAY		X	X	X	X	X					
FD05	↓	0000	↓	DAY		X	X	X	X	X					
FD06	9-22-95	0000	AQ	DAY							X	X	X		
S25-SW001		1230		DAY							X	X	X		
S25-SW003		1420		DAY							X	X	X		
S25 RB05W01		1630		DAY								X	X		

Relinquished By:	Date/Time	Received By:	Relinquished By:		Received for Laboratory By:	Date/Time
David A Yost	9-23-95 1003	Billy Ollie 9-23-95 10:03				
Relinquished By:	Date/Time	Received By:	Date/Time	Shipper:	Airbill No.:	
Relinquished By:	Date/Time	Received By:	Lab Comments:			Temp:

G.P. W.O. __________

COC # 5B

GP ENVIRONMENTAL SERVICES, INC.

202 Perry Parkway
Gaithersburg, Maryland 20877
(301) 926-6802

Contract #/Billing Reference

____ of ____ Pgs.

Project: IND-ANHEAD- STUMPNECK

Client

Send Results To: LEE ANN SINAGOGA

Address:

Phone: (412) 921-7090

	APPENDIX IX VOA	APPENDIX IX SVOA	NC/NG	EXPLOSIVES, NG PETN	METALS- TOTAL	METALS- DISSOLVED	CYANIDE	SO4 / PO4	TOX	Lab Cooler No.
Turnaround Time										
# of Containers										
Container Type	40-ml	1LT	1LT AMBER	1LT AMBER	1LT POLY	1LT POLY	1LT POLY	1-250ml POLY	1-1L AMBER	
Preservative Used	HCL	—	—	—	HNO3	HNO3	NAOH	—	H2SO4	

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	APPENDIX IX VOA	APPENDIX IX SVOA	NC/NG	EXPLOSIVES, NG PETN	METALS- TOTAL	METALS- DISSOLVED	CYANIDE	SO4 / PO4	TOX	Lab Cooler No.	CLIENT COMMENTS
TB05	9-22-95	0800	AQUEOUS	LAB	XX										
FD06		0000			XXY	X	X	X	X	Y	X	X	X		
S25-SW001		1230			XXX	X	X	X	X	X	X	X	X		
S25-SW003		1420			XXX	X	X	X	X	X	X	X	X		
S25-BR05001		1630			XXY	X	X	X	X		X				

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
[signature]	9-23-95 1003	[signature] 9-23-95 10:03			
Relinquished By:	Date/Time	Received By:	Date/Time / Shipper:	Airbill No.:	
Relinquished By:	Date/Time	Received By:	Lab Comments:		Temp:

G.P. W.O. ________

COC # 6A

GP ENVIRONMENTAL SERVICES, INC.

202 Perry Parkway
Gaithersburg, Maryland 20877
(301) 926-6802

Contract #/Billing Reference ______

______ of ______ Pgs

Project: INDIAN HEAD - STUMP NECK

Client:

Send Results To: LEE ANN SINAGOGA

Address:

Phone: (412) 921-8887

Turnaround Time				
# of Containers				
Container Type	1-8oz	1-4oz	1-4oz	1-4oz	1-8oz	1-4oz	40 ml
Preservative Used	—	—	—	—	—	—	HCl

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	TOC, NH3, NO2, NO3	PCB, APPENDIX IX	VOA APPENDIX IX	SVOA, TPH-418.1, TAL METALS, SN CN	TOC, NH3, NO2, NO3	TAL METALS, SN, CN, PCB	APPENDIX IX VOA AQUEOUS				Lab Cooler No. / CLIENT COMMENTS
S26-MW02-001	9-23-95	1030	SOIL	LM	X	X	X	X							
S26-MW02-002	↓	1115	↓	LM	X	X	X	X							
S26-SB03-001	↓	1130	↓	DAY		XX	XX		XX	XX					MS/MSD
S26-TB06	↓	1030	AQ	DAY							XXV				
S26-RB06	↓	1730	↓	DAY							XVX				Hold Do Not Analyze
S26-SB03-002	↓	1730	SOIL	LM		X	X		X	X					
S26-MW03-001	9-24-95	0827	↓	LM		X	X		X	X					
S26-MW03-002	↓	0905	↓	LM		X	X		X	X					

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
[signature]	9-24-95 0952	[signature] 9-24-95 09:52			
Relinquished By:	Date/Time	Received By:	Date/Time / Shipper:	Airbill No.:	
Relinquished By:	Date/Time	Received By:	Lab Comments:		Temp:

G.P. W.O. ______

COC # 6

GP ENVIRONMENTAL SERVICES, INC.

202 Perry Parkway
Gaithersburg, Maryland 20877
(301) 926-6802

Contract #/Billing Reference ____________

______ of ______ Pgs.

Project: INDIAN HEAD STUMP NECK

Client:

Send Results To: LEE ANN SINAGOGA

Address:

Phone: (412) 921 8887

	Appendix IX SVOA	PCBs	NG/NC	Explosives, NE, PETN	TPH 418.1	Metals	Cyanide	TOC, NH3	NO2 NO3	Lab Cooler No.
Turnaround Time										
# of Containers										
Container Type	1 LT Amber	1 LT Amber	1 LT Amber	1 LT Amber	1 LT Amber	1 LT Poly	1 LT Poly	2 L Amber	500 ml Poly	
Preservative Used	—	—	—	—	H_2SO_4	HNO_3	NaOH	H_2SO_4	H_2SO_4	

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	Appendix IX SVOA	PCBs	NG/NC	Explosives, NE, PETN	TPH 418.1	Metals	Cyanide	TOC, NH3	NO2 NO3	Lab Cooler No.	Client Comments
LEE BROOK-EW1	9/23/95	1730	AQ	DAY	X	X	X	X	X	X	X	X	X		Hold - do not analyze

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
[signature]	9/24/95 0952	[signature] 9-24-95 09:52			
Relinquished By:	Date/Time	Received By:	Date/Time	Shipper:	Airbill No.:
Relinquished By:	Date/Time	Received By:	Lab Comments:		Temp:

G.P. W.O. ____________

CoC # 7A

GP Environmental Services, Inc.

202 Perry Parkway
Gaithersburg, Maryland 20877
(301) 926-6802

Contract #/Billing Reference: ______

______ of ______ Pgs.

Project: INDIAN HEAD - STUMP NECK

Client:

Send Results To: LEEANN SINAGOGA

Address:

Phone: (412) 921-8887

	APPENDIX IX VOA	APPENDIX IX SVOA/TPH	TAL METALS, CN, PCBs	8330, NG, PETN, NC, NG	TOC, NO2, NO3, NH3	TAL METALS, CN	APPENDIX IX SVOA			Lab Cooler No.
Turnaround Time										
# of Containers	1	1	1	1	1	1	1			
Container Type	1-4oz	4oz	4oz	8oz	8oz	4oz	4oz			
Preservative Used	—	—	—	—	—					

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	APPENDIX IX VOA	APPENDIX IX SVOA/TPH	TAL METALS, CN, PCBs	8330, NG, PETN, NC, NG	TOC, NO2, NO3, NH3	TAL METALS, CN	APPENDIX IX SVOA			CLIENT COMMENTS
S26-SB04-001	9-24-95	1215	SOIL	DAY	X	X	X	X	X					
S26-SB04-002	↓	1445	SOIL	LM	X	X	X		X					
FD08	↓	0000	↓	DAY	X	X	X	X	X					
S25-MW03B-001	9-25-95	0955	SOIL	LM				X	X	X				
S25-MW03-002	↓	1008	SOIL	LM				X	X	X				
S25-SD004	↓	1030	SEDIMENT	DAY	X			X	X	X				

Relinquished By:	Date/Time	Received By:	Relinquished By:		Received for Laboratory By:	Date/Time
[signature]	9-25-95 1547	[signature] 9-25-95 15:47				
Relinquished By:	Date/Time	Received By:	Date/Time	Shipper:	Airbill No.:	
Relinquished By:	Date/Time	Received By:	Lab Comments:			Temp:

G.P. W.O. ______

COC # 7B

GP Environmental Services, Inc.

202 Perry Parkway
Gaithersburg, Maryland 20877
(301) 926-6802

Contract #/Billing Reference: ____________

____________ of ______ Pgs.

Project: INDIAN HEAD · STUMP NECK

Client

Send Results To: LEE ANN SINAGOGA

Address:

Phone: (412) 921-8887

Turnaround Time															
# of Containers															
Container Type					40-ml VIAL	1LT AMBER	1LT AMBER	1LT AMBER	1LT AMBER	1LT AMBER	1LT AMBER	1LT PLY	1-LT PLY	1-LT PLY	
Preservative Used					HCl	—	—	—	—	H2SO4	HNO3	HNO3	NaOH		
Type of Analysis					APPENDIX IX VOA	APPENDIX IX SVOA	EXPLOSIVES, NO. PETN	NG/NC	PCBs	TPH - 418.1	METALS - TOTAL	METALS - DISSOLVED	CYANIDE	Lab Cooler No.	
Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials											CLIENT COMMENTS
S26-TB07	9-24-95	0800	AQ	DAY	XX										
S26-RB07	↓	1430	↓	DAY	XXX	X	X	X	X	X	X		X		
S25-SW004	9-25-95	1000	AQ	DAY	XXX	X	X	X			X	X	X		
S25-RB08	↓	1400	↓	DAY	XX	X	X	X			X		X		HOLD DO NOT ANALYZE

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
[signature]	9-25-95 1547	[signature] 9-25-95 15:47			

Relinquished By:	Date/Time	Received By:	Date/Time	Shipper:	Airbill No.:

Relinquished By:	Date/Time	Received By:	Lab Comments:	Temp:

G.P. W.O. ____________

COC # 7C

GP ENVIRONMENTAL SERVICES, INC.

202 Perry Parkway
Gaithersburg, Maryland 20877
(301) 926-6802

Contract #/Billing Reference ______

______ of ______ Pgs.

Project: INDIAN HEAD - STUMP NECK

Client:

Send Results To: LEE ANN SINAGOGA

Address:

Phone: (412) 971-8887

Turnaround Time										
# of Containers										
Container Type						250ml Amber	80 ml Poly	751ml Bot	250 ml Bot	1 250 ml Bot
Preservative Used						H_2SO_4	H_2SO_4	—	H_2SO_4	H_2SO_4
Type of Analysis						TOC, NH_3	NO_2 NO_3	SO_4 / PO_4	TOX	TKN
Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	Lab Cooler No. / CLIENT COMMENTS					
S26-RB07	9.24.95	1430	AQ	DAY		X	X			
S25-SW004	9.25.95	1000	↓	DAY		X	X	X	X	X
S25-RB08	↓	1400	↓	DAY	HOLD - DO NOT ANALYZE	X	X			

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
David G. Yial	9.25.95 1547	Bill Cee 9-25-95 15:47			
Relinquished By:	Date/Time	Received By:	Date/Time / Shipper:	Airbill No.:	
Relinquished By:	Date/Time	Received By:	Lab Comments:		Temp:

G.P. W.O. ______

COC # 8A

GP Environmental Services, Inc.

202 Perry Parkway
Gaithersburg, Maryland 20877
(301) 926-6802

Contract #/Billing Reference ________

________ of ______ Pgs.

Project: INDIANHEAD STUMP NECK

Client:

Send Results To: LEE ANN SINAGOGA

Address:

Phone: (412) 921-8887

	Appendix IX Volatiles	Appendix IX SVOA	TAL Metals, Sn, CN	8330, NG, PETN, NC, NQ	TOC, NH3, NO2 + NO3					Lab Cooler No.
Turnaround Time										
# of Containers	1	1	1	1	1					
Container Type	4OZ	4OZ	4OZ	8OZ	8OZ					
Preservative Used	—	—	—	—	—					

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	Appendix IX Volatiles	Appendix IX SVOA	TAL Metals, Sn, CN	8330, NG, PETN, NC, NQ	TOC, NH3, NO2 + NO3					Client Comments
S25-SB02-001	10-3-95	1055	SOIL	DAY			X	X	X					
S25-SB02-002	↓	1100	↓	DAY	X	X	X	X	X					
S25-SB03-001	↓	1305	↓	DAY			X	X	X					
S25-SB03-002	↓	1310	↓	DAY	X	X	X	X	X					

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
[illegible]	10/3/95 [illegible]	[illegible] 10-4-95 10:01			
Relinquished By:	Date/Time	Received By:	Date/Time / Shipper:	Airbill No.:	
Relinquished By:	Date/Time	Received By:	Lab Comments:		Temp:

G.P. W.O. ________

COC #8B

GP ENVIRONMENTAL SERVICES, INC.

202 Perry Parkway
Gaithersburg, Maryland 20877
(301) 926-6802

Contract #/Billing Reference: ____________

______ of ______ Pgs.

Project: INDIAN HEAD-STUMP NECK

Client:

Send Results To: LEE ANN SINAGOGA

Address:

Phone: (412) 921-8887

Turnaround Time										
# of Containers										
Container Type	40 ml	1-LT AMBER	1-LT AMBER	1-LT AMBER	1-LT POLY	1-LT POLY	250 ml A-Poly	[illegible]		
Preservative Used	HCl	—	—	—	HNO_3	NAOH	H_2SO_4	H_2SO_4		
Type of Analysis	APPENDIX IX VOA	APPENDIX IX SVOA	EXPLOSIVES, PETN, NG	NC, NQ	TAL METALS, SN	CYANIDE	TOC, NH_3	NO_2 NO_3		Lab Cooler No.

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	APPENDIX IX VOA	APPENDIX IX SVOA	EXPLOSIVES, PETN, NG	NC, NQ	TAL METALS, SN	CYANIDE	TOC, NH_3	NO_2 NO_3			CLIENT COMMENTS
S25-TB08	10-3-95	1000	AQ	DAY	XXX										
S25-RB09	↓	1430	↓	DAY	XXX	X	X	X	X	X	X	X			

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
David Yost	10-4-95 1001	[illegible] 10-4-95 10:01			
Relinquished By:	Date/Time	Received By:	Date/Time / Shipper:	Airbill No.:	
Relinquished By:	Date/Time	Received By:	Lab Comments:		Temp:

G.P. W.O. ____________

COC 1A

GP Environmental Services, Inc.

202 Perry Parkway
Gaithersburg, Maryland 20877
(301) 926-6802

Contract #/Billing Reference: ____

____ of ____ Pgs.

Project: INDIAN HEAD - STUMP NECK

Client:

Send Results To: LEE ANN SINAGOGA

Address:

Phone: (412) 921-8887

	Type of Analysis	APPENDIX IX VOA	APPENDIX IX SVOA	NC/NG	EXPLOSIVES, PETN NG	PCBs	TPH-418.1	METALS - TOTAL, SN	METALS, SN FILTERED	CYANIDE	Lab Cooler No.	
	Turnaround Time											
	# of Containers											
	Container Type	40ml VOA	1LT AMBER	1LT AMBER	1LT AMBER	1LT AMBER	1LT AMBER	1LT POLY	1LT POLY	1LT POLY		

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	APPENDIX IX VOA	APPENDIX IX SVOA	NC/NG	EXPLOSIVES, PETN NG	PCBs	TPH-418.1	METALS - TOTAL, SN	METALS, SN FILTERED	CYANIDE	Lab Cooler No.	CLIENT COMMENTS
Preservative Used					HCl	—	—	—	—	H2SO4	HNO3	HNO3	NaOH		
26TB09	10-4-95	0800	AQ	DAY	XX										
25MW02	↓	1000	↓	LM	XXX	X	X	X			X	X	X		
25MW01	↓	1100	↓	LM	XXX	X	X	X			X	X	X		
25MW03	↓	1330	↓	LM	XXX	X	X	X			X	X	X		
26MW01	↓	1410	↓	LM	XXX XXX	XX	XX	XX	XX	XX	XX	XX	XX		MS/MSD
26MW03	↓	1550	↓	LM	XXX	X	X	X	X	X	X	X	X		
26MW02	↓	1620	↓	LM	XXX	X	X	X	X	X	X	X	X		
5MW01	↓	1650	↓	LM	XXX	X	X	X			X	X	X		
FD09	↓	0000	↓	LM	XXX	X	X	X			X	X	X		
FD10	↓	0000	↓	LM					X	X					
26RB10	↓	1930	↓	DAY	XXX	X	X	X	X	X	X	X	X		

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
David A. Yost	10-5-95 1029	[signature] 10-5-95 10:29			
Relinquished By:	Date/Time	Received By:	Date/Time / Shipper:	Airbill No.:	
Relinquished By:	Date/Time	Received By:	Lab Comments:		Temp:

G.P. W.O. ____

COC 13

GP E VIRONMENTAL SERVICES, INC.

202 Perry Parkway
Gaithersburg, Maryland 20877
(301) 926-6802

Contract #/Billing Reference ______

______ of ______ Pgs.

Project: INDIANHEAD STUMPNECK

Client

Send Results To: LEE ANN SINAGOGA

Address:

Phone: (412) 921-8887

Turnaround Time										
# of Containers										
Container Type	250ml amber	250ml plastic	250ml poly	250ml poly	80ml poly					
Preservative Used	H_2SO_4	H_2SO_4	H_2SO_4	—	H_2SO_4					
Type of Analysis	TOC, NH_3	TOX	TKN	SO_4/PO_4	NO_2/NO_3					Lab Cooler No.

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	TOC, NH_3	TOX	TKN	SO_4/PO_4	NO_2/NO_3					CLIENT COMMENTS
Z5MW02	10-4-95	1000	AQ	LM	X	X	X	X	X					
Z5MW01	↓	1100	↓	LM	X	X	X	X	X					
Z5MW03		1330		LM	X	X	X	X	X					
Z6MW01		1410		LM	XX	XX	XX	XX	XX					MS/MSD
Z6MW03		1550		LM	X	X	X	X	X					
Z6MW02		1620		LM	X	X	X	X	X					
5MW01		1650		LM	X	X	X	X	X					
FD09		0000		LM	X	X	X	X	X					
ZERB10	↓	1930	↓	DAY	X	X	X	X	X					

Relinquished By: [signature]	Date/Time 10-5-95 1029	Received By: [signature] 10-5-95 10:29	Relinquished By:	Received for Laboratory By:	Date/Time
Relinquished By:	Date/Time	Received By:	Date/Time / Shipper:	Airbill No.:	
Relinquished By:	Date/Time	Received By:	Lab Comments:		Temp:

G.P. W.O. ______

Halliburton NUS CORPORATION

NUS LABORATORY

CHAIN OF CUSTODY RECORD

PROJECT NO.: 5280

SITE NAME: Indian Head - Stump Neck Annex

SAMPLERS (SIGNATURE): Roland P. Marshall

STATION NO.	DATE	TIME	COMP	GRAB	STATION LOCATION	NO. OF CONTAINERS	TEST KIT						REMARKS
AREA 8	9/22/95	1240		✓	S25-SD001	1	1						
AREA 8	9/21/95	1400		✓	S25-SD002	1	1						
AREA 8	9/22/95	1430		✓	S25-SD003	1	1						
AREA 8	9/22/95	1004		✓	S25-MW02	1	1						
AREA 8	9/21/95	1315		✓	S25-SB01-001	1	1						
AREA 8	9/16/95	0925		✓	S25-MW01	1	1						

RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY (SIGNATURE):	RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY (SIGNATURE):
Roland P. Marshall	9/21/95 1430				
RELINQUISHED BY (SIGNATURE):	**DATE / TIME:**	**RECEIVED BY (SIGNATURE):**	**RELINQUISHED BY (SIGNATURE):**	**DATE / TIME:**	**RECEIVED BY (SIGNATURE):**
RELINQUISHED BY (SIGNATURE):	**DATE / TIME:**	**RECEIVED FOR LABORATORY BY (SIGNATURE):**	**DATE / TIME:**	**REMARKS:**	
				[illegible]	

NUS 440 REVISED 0?

CHAIN O. .USTODY RECORD

PROJECT NO.:	SITE NAME:
5250	INDIAN HEAD - STUMP NECK

SAMPLERS (SIGNATURE): [signature]

STATION NO.	DATE	TIME	COMP	GRAB	STATION LOCATION	NO. OF CONTAINERS	TNT	RPX					REMARKS
AREA8	10/3	1200	\	✓	S25-SB02	1	1	1					4oz Clear Jar
AREA8	10/3	1500	\	✓	S25-SB03	1	1	1					4oz Clear Jar

RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY(SIGNATURE):	RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY(SIGNATURE):
[signature]	10/14/03 1700				
RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY (SIGNATURE):	RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY(SIGNATURE):
RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED FOR LABORATORY BY (SIGNATURE):	DATE / TIME:	REMARKS:	
				SENT VIA FEDEX TO [illegible]	

Order No. 70440 (0693)

APPENDIX F

F.1 - BORING LOGS
F.2 - MONITORING WELL CONSTRUCTION SHEETS

F.1

BORING LOGS

BORING LOG

Brown & Root Environmental

PROJECT: INDIAN HEAD
PROJECT NO.: 5280
ELEVATION:
WATER LEVEL DATA
(Date, Time & Conditions)

DATE: 9/20/95
FIELD GEOLOGIST: MARSHALL/YOST

BORING NO.: TLB ASSOC. INC
DRILLER: SOS-MW01

SAMPLE NO. & TYPE	DEPTH (FT.) OR RUN NO.	BLOWS 6" OR RQD (%)	SAMPLE RECOVERY / SAMPLE LENGTH	LITHOLOGY CHANGE (Depth/Ft.)	SOIL DENSITY/CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	ROCK BR. OR USCS	REMARKS	HNU (ppm)
*S-1	0.0	4 / 7	1.6/2.0		M DENSE	BROWN	SILTY SAND w/GRAVEL	SM	RED STAINING	94
1310	2.0	11 / 13			—		OBSTRUCTION @ 1' —		2 SPOONS REQ'D	
S-2		4 / 6	1.5/2.0	FILL	M DENSE	BROWN	SILTY SAND w/GRAVEL	SM	RED STAINING	45
1355	4.0	7 / 9								
S-3	*	5 / 8	1.6/2.0	Silty Sand	M DENSE	BROWN	SILTY SAND w/CLAY	SM	MOIST	22
1517	6.0	7 / 9					-NO GRAVEL			
S-4		3 / 2	1.8/2.0	Clay	STIFF	TAN	SILTY CLAY w/TR. SAND	CL	DRY-MOTTLED	28
1555	8.0	6 / 9								
S-5		4 / 4	1.6/2.0		STIFF	TAN	SILTY CLAY	CL	DRY-MOTTLED	30
1630	10.0	7 / 9								
S-6		7 / 10	—		—	—	SPLIT SPOON LOST IN		HOLE — NO RECOVERY	
—	12.0	15 / 18								
S-7		10 / 22	2.0/2.0		DENSE	GRAY	SILTY SAND w/GRAVEL	SM	SATURATED	0
1733	14.0	28 / 27							-DRILLER HIT	
									WATER ~10'	
							BOTTOM @ 18'			
							WATER @ 10'			

REMARKS: ATV RIG — [illegible] (m) - 3.25" HSA - (ID)
* - CHEMICAL ANALYSIS

* See Legend on Back

BORING SOS-MW01
PAGE 1 OF 1

Brown & Root Environmental

BORING LOG

PROJECT: INDIAN HEAD
PROJECT NO.: 5280
DATE: 9/19/95
ELEVATION:
FIELD GEOLOGIST: MARSHALL/YOST
BORING NO.: 525-MW01
DRILLER: TLB Assoc. Inc
WATER LEVEL DATA:
(Date, Time & Conditions)

SAMPLE NO. & TYPE	DEPTH (Ft.) OR RUN NO.	BLOWS 6" OR RQD (%)	SAMPLE RECOVERY / SAMPLE LENGTH	LITHOLOGY CHANGE (Depth/Ft.)	MATERIAL DESCRIPTION*: SOIL DENSITY/CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	ROCK BR. OR USCS	REMARKS	Hnu (ppm)
*	0.0								2 SPOONS NEEDED	
S-1 0925	2.0	1 1 1	1.4/2.0	Silty Sand	V LOOSE	TAN	SILTY SAND w/ TR CLAY	SM	MOIST	25
	3.0								Driller hit water @ 2'	
S-2		1 1	1.6/2.0		V LOOSE	TAN	SILTY SAND w/ TR CLAY	SM	WET - PERCHED	0
0955	5.0	1 1								
S-3		2 3	1.2/2.0	CLAY LENS	STIFF	BRN	SILTY (LOW) CLAY	CL	MOIST	0
1004	7.0	4 13								
S-4	*	3 6	1.8/2.0	Silty Sand	M DENSE	GRAY	SILTY SAND	SM	MOIST	13
1010	9.0	7 16								
S-5		7 9	2.0/2.0		M DENSE	GRAY	SILTY SAND	SM	WET - SATURATED	0
1032	11.0	12 15								
S-6		7 9	1.8/2.0		M DENSE	GRAY	SILTY SAND	SM	SATURATED	0
1042	13.0	12 18								
							BOTTOM @ 15'			
							WATER @ 8'			

REMARKS: ATV RIG - 3.25" HOLLOW STEM AUGER (ID)
* - CHEM ANALYSIS

BORING 525-MW01

PAGE 1 OF 1

* See Legend on Back

Brown & Root Environmental

BORING LOG

PROJECT: INDIAN HEAD
PROJECT NO.: 5280
DATE: 9/22/95
ELEVATION:
BORING NO.: S25-MW02
DRILLER: TLB Assoc. Inc
FIELD GEOLOGIST: MARSHALL/YOST
WATER LEVEL DATA
(Date, Time & Conditions)

SAMPLE NO. & TYPE	DEPTH (Ft.) OR RUN NO.	BLOWS 6" OR RQD (%)	SAMPLE RECOVERY / SAMPLE LENGTH	LITHOLOGY CHANGE (Depth/Ft.)	SOIL DENSITY/ CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	ROCK BR. or USCS	REMARKS	HNU (ppm)
1020 *	0.0	3 6	1.0/2.0		~~TAN~~	TAN	SILTY SAND	SM	DRY	0
S-1	2.0	6 6			M DENSE				2 SPOONS REQ'D	
S-2		9 11	1.4/2.0		M DENSE	RUST	SILTY SAND	SM	DRY	10→ 9
1035	4.0	16 16		Silty Sand						
S-3		14 19	1.6/2.0		M DENSE	RD/BR	SILTY SAND w/TR. CLAY	SM	DRY	20
1050	6.0	11 13								
S-4	*	12 15	1.5/2.0		DENSE	RD/BR	SILTY SAND w/TRACE GRAVEL + CLAY	SM	DRY	18
1115	8.0	23 19								
S-5		5 6		WATER	M DENSE	RD/		SM	MOIST/SATURATED	10
1125	10.0	12 13							WATER @ 9.5'	

WATER @ 9'
BOTTOM @ 17.5
SCREEN 7.5'-17.5'
SAND 5.5'-17.5'
BENTONITE 3.5-5.5'

REMARKS: ATV RIG 3.25" HSA (ID)
* - CHEMICAL ANALYSIS

* See Legend on Back

BORING S25-MW02

PAGE 1 OF 1

BORING LOG

Brown & Root Environmental

PROJECT: INDIAN HEAD
PROJECT NO.: 5280
DATE: 9/25/95
BORING NO.: ILB ASSOC. INC
DRILLER: S25-MW03
ELEVATION:
FIELD GEOLOGIST: MARSHALL/[redacted]
WATER LEVEL DATA
(Date, Time & Conditions)

SAMPLE NO. & TYPE	DEPTH (Ft.) OR RUN NO.	BLOWS 6" OR RQD (%)	SAMPLE RECOVERY / SAMPLE LENGTH	LITHOLOGY CHANGE (Depth/Ft.)	SOIL DENSITY/CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS	HNU (ppm)
S-1	0.0	3 11	1.6/2.0		M DENSE	TAN	SILTY SAND	SM	-RAINING	
0955 *	2.0	13 15					-(2 SPOONS REQ'D)		-TOO DAMP	
	3.0	5 6							FOR HNU -	
S-2	*	7 12	1.8/2.0		M DENSE	BROWN	SILTY SAND	SM	NOT FUNCTIONING	
1008	5.0						-(2 SPOONS REQ'D)		PROPERLY	
									-OBSERVED	
						BROWN	SILTY SAND		CUTTINGS	
	8.0									
S-3		1 3	1.6/2.0		M DENSE	BROWN	SILTY SAND	SM	DRY	
	10.0	5 8								
						BROWN	SILTY SAND	SM	-CUTTINGS	
	12.0									
S-4		8 12	1.5/2.0		M DENSE	BROWN	SILTY SAND	SM	DAMP	
	14.0	9 9								
	15.0									
S-5		7 6	1.8/2.0		M DENSE	BROWN	SILTY SAND w/TR CLAY	SM	DAMP	
	17.0	5 5								
	18.0									
S-6		3 6	1.4/2.0		M DENSE	BROWN	SILTY SAND w/TR CLAY	SM	DAMP	
	20.0	7 10								
S-7		2 6	1.6/2.0		M DENSE	BROWN	SILTY SAND w/CLAY	SM	DAMP	
	22.0	7 8								
	23.0									
S-8		3 5	1.8/2.0		M DENSE	BROWN	SILTY SAND w/CLAY	SM	MOIST	
	25.0	7 4								

REMARKS: ATV RIG - 3.25" HSA (ID)
* CHEMICAL ANALYSIS
- POURING DOWN RAIN

BORING S25-MW03

PAGE 1 OF 2

* See Legend on Back

BORING LOG

Brown & Root Environmental

PROJECT: INDIAN HEAD
PROJECT NO.: 5280
ELEVATION:
WATER LEVEL DATA
(Date, Time & Conditions)

DATE: 9/25/95
BORING NO.: TLB ASSOC. INC
DRILLER: 525-MW03
FIELD GEOLOGIST: MARSHALL/[redacted]

SAMPLE NO & TYPE	DEPTH (FT) OR RUN NO.	BLOWS 6" OR RQD (%)	SAMPLE RECOVERY / SAMPLE LENGTH	LITHOLOGY CHANGE (Depth/Ft)	SOIL DENSITY/CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS
	25.0	NDR 8							
S-9	27.0	6 5	1.6/2.0		M DENSE	BROWN	SILTY SAND W/CLAY	SM	MOIST
	28.0	7 4	~~1.5/2.0~~						~~AT~~
S-10		5 7	2.0/2.0		M DENSE	BROWN	SILTY SAND W/CLAY	SM	MOIST
	30.0								
S-11		4 5	1.8/2.0	Silty Sand	M DENSE	BROWN	SILTY SAND W/CLAY	SM	MOIST
	32.0	7 8							
S-12		3 5	1.6/2.0		M DENSE	BROWN	SILTY SAND W/CLAY	SM	MOIST
	34.0	5 5							
					M DENSE	BROWN	SILTY SAND W/CLAY	SM	CUTTINGS
	36.0								
S-13		3 5	1.8/2.0		M DENSE	BROWN	SILTY SAND W/CLAY	SM	MOIST W/IRON
	38.0	6 7		WATER					STAINS
					M DENSE	BROWN	SILTY SAND W/CLAY	SM	CUTTINGS
	40.0								
S-14		5 6	1.6/2.0		M DENSE	BROWN	SILTY SAND	SM	SATURATED
	42.0	4 7							
							WATER @ 38'		
							BOTTOM @ 45'		

REMARKS:

BORING 525-MW03

PAGE 2 OF 2

* See Legend on Back

BORING LOG

Brown & Root Environmental

PROJECT: INDIAN HEAD
PROJECT NO.: 5280 DATE: 9/21/95
ELEVATION: ___ FIELD GEOLOGIST: MARSHALL/YOST
BORING NO.: S25-SB01 w/Airlot?
DRILLER: TLB Assoc. Inc
WATER LEVEL DATA (Date, Time & Conditions): ___

SAMPLE NO & TYPE	DEPTH (FT) OR RUN NO.	BLOWS 6" OR RQD (%)	SAMPLE RECOVERY / SAMPLE LENGTH	LITHOLOGY CHANGE (Depth/Ft)	SOIL DENSITY/CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS	HNU (ppm)
* 1405	0.0	2 / 2	1.0/2.0		Loose	TAN	FINE-MEDIUM SAND	SW	DAMP	5
S-1	2.0	3 / 5							2 SPOONS REQ'D	
S-2		4 / 7		Sand	M DENSE	TAN	FINE-MEDIUM SAND	SW	DRY	10
1411	4.0	11 / 14								
* S-3		16 / 14			M DENSE	TAN	FINE-MEDIUM SAND	SW	DRY	8
1426	6.0	13 / 12					W/CLAY			
S-4		5 / 11	1.6/2.0		M DENSE	TAN	FINE-MEDIUM SAND	SW	DRY	7
1435	8.0	12 / 13					W/CLAY			
S-5		6 / 10	1.8/2.0		M DENSE	TAN	FINE-MEDIUM SAND	SW	DRY	0
	10.0	14 / 14					W/CLAY			
~~S-6~~					—		NO SAMPLE TAKEN		—	
	12.0									
~~S-8~~					—		NO SAMPLE TAKEN		—	
	14.0									
~~S-8~~ S-6		20 / 23	1.2/2.0		DENSE	TAN	SILTY SAND W/GRAVEL	SM	MOIST	0
	16.0	23 / 20								
							BOTTOM @ 16'			
							WATER BELOW 16'			

REMARKS: ATV RIG - 3.25" HSA (ID)
* - CHEM ANALYSIS

* See Legend on Back

BORING S25-SL
PAGE 1 OF 1

BORING LOG

Brown & Root Environmental

PROJECT: INDIAN HEAD
PROJECT NO.: 5280
ELEVATION:
WATER LEVEL DATA (Date, Time & Conditions):
DATE: 9/19/95
FIELD GEOLOGIST: MARSHALL/YOST
BORING NO.: TLB ASSOC. INC
DRILLER: S26-MW01-[redacted]

SAMPLE NO. & TYPE	DEPTH (Ft.) OR RUN NO.	BLOWS 6" OR RQD (%)	SAMPLE RECOVERY / SAMPLE LENGTH	LITHOLOGY CHANGE (Depth, Ft.)	SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	ROCK BR. OR USCS	REMARKS	HNU (PPM)
S-1	0.0	4 / 7							2 SPOONS REQ'D	
* 1735	2.0	17 / 22	1.6/2.0	Sand	DENSE	TAN	SILTY VERY FINE SAND	SM		13
S-2	1742	8 / 14							NO ODOR!!!	140
8	4.0	19 / 18	1.9/2.0	Clay	DENSE	TAN	SILTY CLAY w/ FINE SAND	CL	APPEARS CLEAN	
S-3	*	6 / 8								
1810	6.0	8 / 8	1.4/2.0	Silty Sand	M DENSE	TAN	SILTY SAND w/CLAY	SM	DAMP	56
S-4	1810	2 / 3	2.0/2.0		M DENSE	TAN	SILTY SAND w/GRAVEL	SM	SATURATED/MOTTLED	15
	8.0	5 / 10								

BOTTOM @ 19'
WATER @ 7'

REMARKS: 3.25" HSA-ID - TRUCK RIG
* - CHEM ANALYSIS

BORING S26-MW01

PAGE 1 OF 1

* See Legend on Back

BORING LOG

Brown & Root Environmental

PROJECT: INDIAN HEAD
PROJECT NO.: 5280
DATE: 9/23/95
BORING NO.: TLB ASSOC. INC
DRILLER: S26-MW02
ELEVATION:
FIELD GEOLOGIST: MARSHALL/YOST
WATER LEVEL DATA
(Date, Time & Conditions)

SAMPLE NO. & TYPE	DEPTH (FT.) OR RUN NO.	BLOWS 6" OR RQD (%)	SAMPLE RECOVERY / SAMPLE LENGTH	LITHOLOGY CHANGE (Depth/Ft.)	SOIL DENSITY/CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	ROCK BK. OR USCS	REMARKS	HNU (PPM)
S-1	0.0	2 4	1.6/2.0		M STIFF	TAN	SILTY CLAY w/SAND	CL	DRY	0
1030 *	2.0	5 7							2 SPOONS REQ'D	
S-2		4 4	1.7/2.0		STIFF	TAN	SILTY CLAY w/TR SAND	CL	DRY	2
1040	4.0	13 10		Silty						
S-3		7 8	1.8/2.0	Clay	STIFF	TAN	SILTY CLAY w/TR SAND	CL	MOIST	1
1050	6.0	11 10								
S-4		4 5	2.0/2.0		M STIFF	TAN	SILTY CLAY w/TR SAND	CL	MOIST	1
1101	8.0	5 9								
S-5		3 6	2.0/2.0		M STIFF	TAN	SILTY CLAY w/TR SAND	CL	MOIST	1
1109	10.0	6 8								
S-6	*	4 6	2.0/2.0		M STIFF	TAN	SILTY CLAY w/TR SAND	CL	MOIST	6
1115	12.0	7 10								
S-7		2 2	2.0/2.0	WATER	M STIFF	TAN	SILTY CLAY w/TR SAND	CL	MOIST/SATURATED	0
1123	14.0	3 2							DRILLER HIT	
									WATER @ 13'	
							BOTTOM @ 22'			
							WATER @ 13'			

REMARKS: TRUCK RIG - 3.25" HSA - (ID)
* CHEM ANALYSIS

BORING S26-MW02

PAGE 1 OF 1

* See Legend on Back

BORING LOG

Brown & Root Environmental

PROJECT: INDIAN HEAD

BORING NO.: TLB Assoc. Inc

PROJECT NO.: 5280

DATE: 9/24/95

DRILLER: 526 MW03

ELEVATION:

FIELD GEOLOGIST: MARSHALL/ YOST

WATER LEVEL DATA:

(Date, Time & Conditions)

SAMPLE NO. & TYPE	DEPTH (Ft.) OR RUN NO.	BLOWS 6" OR RQD (%)	SAMPLE RECOVERY / SAMPLE LENGTH	LITHOLOGY CHANGE (Depth/Ft.)	MATERIAL DESCRIPTION: SOIL DENSITY/ CONSISTENCY OR ROCK HARDNESS	MATERIAL DESCRIPTION: COLOR	MATERIAL DESCRIPTION: MATERIAL CLASSIFICATION	ROCK BR. OR USCS	REMARKS	HNu (ppm)
0827 *	0.0	6 / 12	1.0/2.0	SOIL	mDENSE	BROWN	ORGANIC SOIL /	—	—	0
S-1	2.0	14 / 20		Silty Sand			SILTY SAND w/CLAY	SM	2 SPOON REC'D	
S-2		7 / 8	1.2/2.0		mDENSE	BROWN	SILTY SAND w/CLAY	SM	—	10
0839	4.0	4 / 16		Silty						
S-3		10 / 15	1.6/2.0	Clay	STIFF	TAN	SILTY CLAY w/TR SAND	CL	MOTTLED	6
0845	6.0	22 / 31								
S-4		4 / 9	1.8/2.0		mSTIFF	TAN	SILTY CLAY w/SAND	CL	MOTTLED w/	0
0858	8.0	4 / 4							BLACKSTAIN	
S-5		4 / 3	2.4/2.0	Silty	mDENSE	TAN	SILTY SAND w/CLAY	SM		0
0905	10.0	2 / 4		Sand					WATER @ 9'	
							WATER @ 9'			
							BOTTOM @ 17.5			
							SCREEN 7.5-17.5			

REMARKS: TRUCK RIG - 3.25" HSA - (ID)

* - chem Hazl

BORING 526-MW03

PAGE 1 OF 1

* See Legend on Back

Brown & Root Environmental

BORING LOG

PROJECT: INDIAN HEAD
BORING NO.: 526-SB01
PROJECT NO.: 5280
DATE: 9-18-95
DRILLER: TLB Assoc. Inc
ELEVATION:
FIELD GEOLOGIST: MARSHALL/YOST
WATER LEVEL DATA:
(Date, Time & Conditions)

SAMPLE NO & TYPE	DEPTH (Ft.) OR RUN NO.	BLOWS 6" OR RQD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth/Ft.)	SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	ROCK BR. OR USCS	REMARKS	HNU (ppm)
S-1 1530	0.0	2 / 7							S-1 0-2' -3 SAMPLES TAKEN	
*	2.0	12 / 10	1.0/2.0	Intermittent Sand & Clay	M DENSE	TAN	SILTY SAND w/TR CLAY	SM	DRY-DAMP	0
S-2 1535		7 / 9					+ TR. GRAVEL			
	4.0	11 / 13	1.8/2.0		M DENSE	TAN	CLAYEY SILT w/TR SAND	CL	MOIST/MOTTLED	0
S-3 1542		6 / 6								
	6.0	10 / 14	1.8/2.0		M DENSE	TAN/RUST	SILTY CLAY w/TR SAND	CL	MOIST/MOTTLED	.5
S-4 1553		3 / 6	1.8/2.0			TAN/RUST	SILTY SAND / SANDY CLAY	SM	MOIST/MOTTLED	2
	8.0	9 / 12			M DENSE					2
S-5 1559		6 / 7	1.8/2.0		M DENSE	TAN/RUST	SILTY SAND / SANDY CLAY	SM	MOIST/MOTTLED	2
	10.0	9 / 8								
S-6 1635		1 / 4	1.5/2.0		M DENSE	TAN/RUST	SILTY SAND w/TR CLAY	SM	MOIST/MOTTLED	3
	12.0	7 / 10								
S-7 1642	*	5 / 15	1.6/2.0		M DENSE	TAN/RUST	SILTY SAND w/TR CLAY	SM	WET AT 13'	1
	14.0	16 / 21		Silty Sand			— SILTY SAND			
							BOTTOM @ 14'			
							WATER @ 13'			

REMARKS: MOBILE B-57 DRILL RIG. 3 1/4 INCH I.D. H.S.A.
* SAMPLED FOR CHEM ANAL

BORING 526-SB01

PAGE 1 OF 1

* See Legend on Back

BORING LOG

Brown & Root Environmental

PROJECT: INDIAN HEAD
PROJECT NO.: 5280
ELEVATION:
WATER LEVEL DATA
(Date, Time & Conditions)

DATE: 9/2/95
FIELD GEOLOGIST: MARSHALL/YOST

BORING NO.: TLB ASSOC. INC
DRILLER: 526-SB02

SAMPLE NO. & TYPE	DEPTH (FT.) OR RUN NO.	BLOWS 6" OR RQD (%)	SAMPLE RECOVERY / SAMPLE LENGTH	LITHOLOGY CHANGE (Depth/Ft.)	SOIL DENSITY/CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	ROCK BR. OR USCS	REMARKS	HNU (ppm)
1628 *	0.0	7 / 7	1.2/2.0	Silty Clay	STIFF	TAN	SILTY CLAY w/FILL	CL	NO ODOR	130
S-1	2.0	7 / 7							35 POUNDS REQ'D	
S-2		1 / 3	1.6/2.0		STIFF	TAN	SILTY CLAY	CL	NO ODOR	25
1644	4.0	7 / 17								
S-3		4 / 7	1.2/2.0	Silty Sand	M DENSE	TAN	SILTY SAND w/CLAY	SM	MOIST	3
1705	6.0	6 / 8								
S-4		2 / 3	1.4/2.0	Sandy Clay	M STIFF	TAN	SANDY CLAY	CL	MOIST	0
1715	8.0	5 / 5								
S-5		1 / 3	1.4/2.0		M STIFF	TN/GR	SANDY CLAY	CL	MOIST	0
1725	10.0	2 / 3								
S-6	*	1 / 2		Silty Sand w/clay	M DENSE	TN/GR	SILTY SAND w/CLAY	SM	MOIST	0
1735	12.0	2 / 4							DRILLER	
~~S-7~~				Silty Sand			BOTTOM @ 12'		HIT WATER	
	~~14.0~~						WATER @ 12'		@ 12'	
~~S-8~~										
	~~16.0~~									

MATERIAL DESCRIPTION*

REMARKS: ATV RIG - 3.25" HSA (ID)
* CHEM ANALYSIS

BORING 526-SB02

PAGE 1 OF 1

* See Legend on Back

BORING LOG

Brown & Root Environmental

PROJECT: INDIAN HEAD
PROJECT NO.: 5280
DATE: 9/23/95
ELEVATION:
BORING NO.: TLB ASSOC. INC
DRILLER: 526-SB03
FIELD GEOLOGIST: MARSHALL/YOST
WATER LEVEL DATA
(Date, Time & Conditions)

SAMPLE NO. & TYPE	DEPTH (Ft.) OR RUN NO.	BLOWS 6" OR RQD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth/Ft.)	SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS	HNU ppm
—	0.0				—	TAN	FINE SAND	—	—	—
—	2.0									
S-1	2	8 / 16	1.0/2.0		STIFF	TAN	SILTY CLAY w/FINE SAND	CM	MOTTLED	7
1710	4.0	21 / 29								
S-2		5 / 13	1.2/2.0		M DENSE	TAN	SILTY SAND w/CLAY	SM	MOTTLED	5
1720	6.0	24 / 33								
S-3		15 / 16	1.5/2.0		M DENSE	TAN	SILTY SAND w/TR CLAY	SM	MOTTLED	6
1725	8.0	17 / 11								
S-4		3 / 4	2.0/2.0		M DENSE	TAN	SILTY SAND w/TR CLAY	SM	MOIST	0
1730	10.0	3 / 6								
S-5		4 / 3	2.0/2.0		M DENSE	TAN	SILTY SAND w/TR CLAY	SM	WET	
1748	12.0	3 / 4								
									WATER @ 11'	
							BOTTOM @ 12' 10'			
							WATER @ 11'			

REMARKS: TRUCK RIG - 3.25" - ID - HOLLOW STEM AUGER
* CHEMICAL ANALYSIS

BORING 526-SB03

PAGE 1 OF 1

* See Legend on Back

Brown & Root Environmental

BORING LOG

PROJECT: INDIAN HEAD BORING NO. TLB Assoc. Inc
PROJECT NO.: 5280 DATE: 9/23/95 DRILLER: S26-SB04
ELEVATION: FIELD GEOLOGIST: MARSHALL/YOST
WATER LEVEL DATA:
(Date, Time & Conditions)

SAMPLE NO. & TYPE	DEPTH (Ft.) OR RUN NO.	BLOWS 6" OR RQD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth/Ft.)	SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	ROCK BR. OR USCS	REMARKS	HNU (ppm)
—	0.0			Silty Sand		BROWN	SILTY SAND w/GRAVEL	SM		0
—	2.0									
S-1		7 8	1.2/2.0		M DENSE	BROWN	SILTY SAND ~~(LM)~~	SM		0
1428	4.0	7 8								
S-2		7 8	1.8/2.0		M DENSE	BROWN	SILTY SAND w/TR CLAY	SM		0
1432	6.0	9 9								
S-3		6 7	2.0/2.0		M DENSE	BROWN	SILTY SAND w/CLAY	SM	MOIST	0
1438	8.0	8 8								
S-4	*	6 8	1.8/2.0		M DENSE	BROWN	SILTY SAND w/CLAY	SM	MOIST	0
1445	10.0	7 9								
S-5		3 3	1.8/2.0		M DENSE	BROWN	SILTY SAND w/CLAY	SM	MOIST	0
	12.0	6 6							HIT WATER @ 10'	
S-6		2 3	2.0/2.0		M DENSE	BROWN	SILTY SAND w/CLAY	SM	- THIS SPOON	0
	14.0	4 4							TO CONFIRM	
									WATER TABLE	

BOTTOM @ 12'
WATER @ 10'

REMARKS TRUCK RIG 3.25" HSA (ID)
* Chem Analysis

BORING S26-SB04

PAGE 1 OF 1

* See Legend on Back

F.2

MONITORING WELL CONSTRUCTION SHEETS

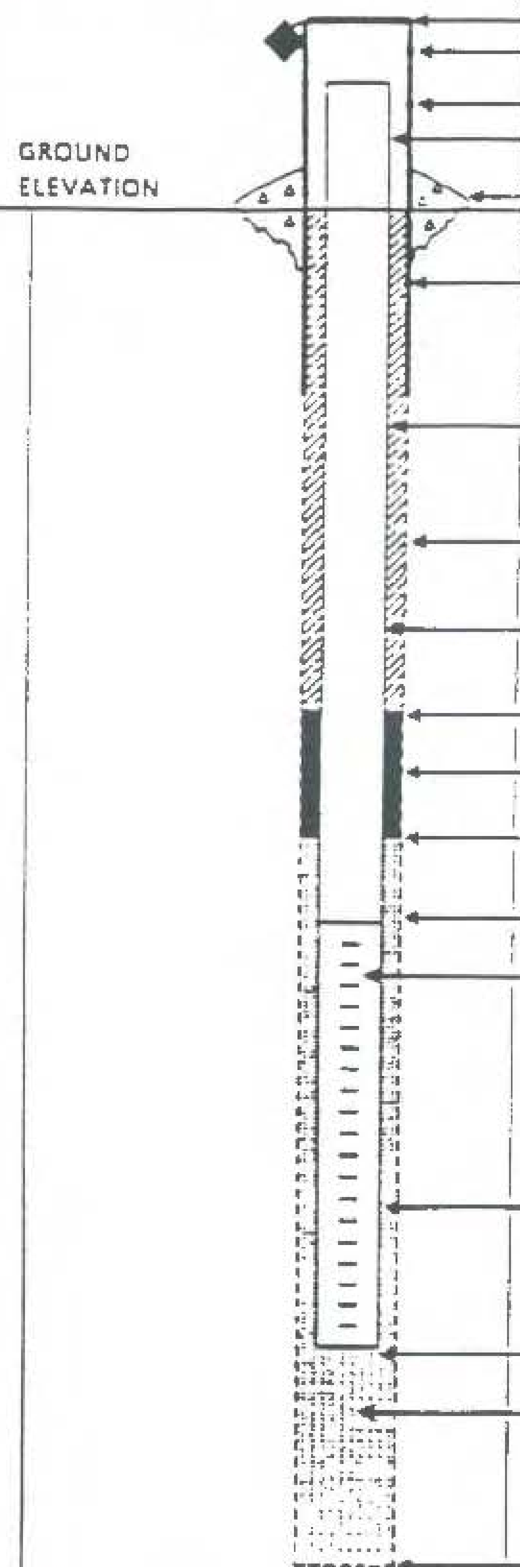
BORING NO. 505-MW01

Brown & Root Environmental

MONITORING WELL SHEET

PROJECT: INDIAN HEAD
LOCATION: RANGE 6
PROJECT NO.: 5280
BORING: 505-MW01
ELEVATION:
DATE: 9/20/95
FIELD GEOLOGIST: MARSHALL/YOST

DRILLER: TLB Assoc. INC
DRILLING METHOD: HSA
DEVELOPMENT METHOD: BAILER



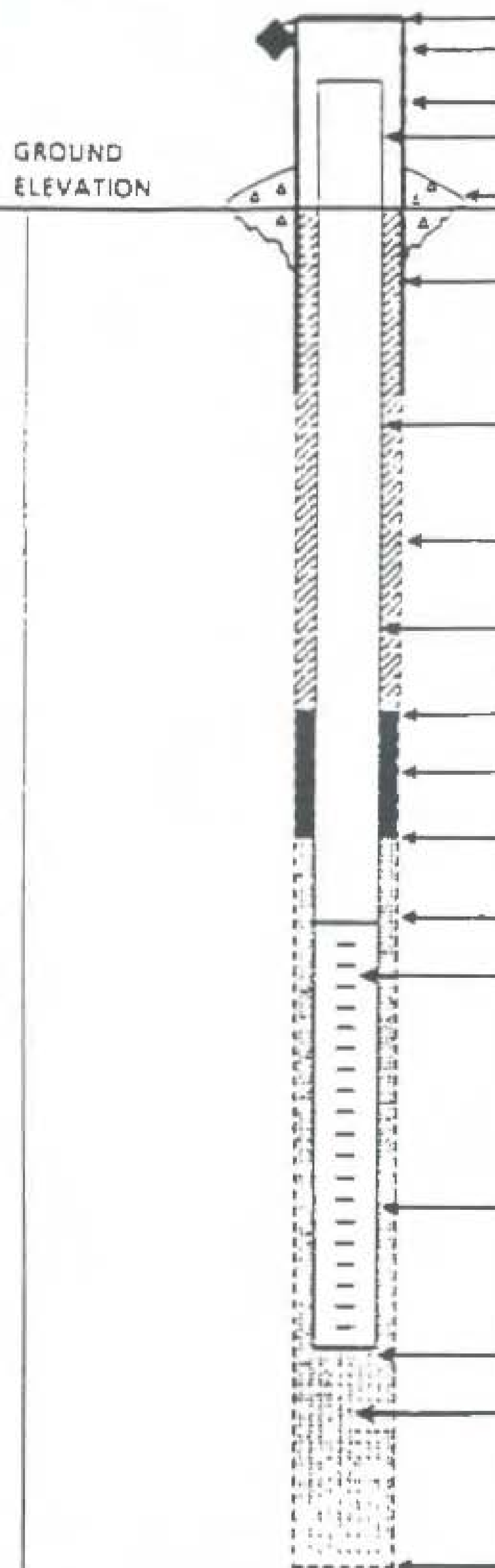
ELEVATION OF TOP OF SURFACE CASING:
ELEVATION OF TOP OF RISER PIPE:
STICK - UP TOP OF SURFACE CASING:
STICK - UP RISER PIPE:
TYPE OF SURFACE SEAL: CEMENT GROUT
I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: STEEL
RISER PIPE I.D.: 4"
TYPE OF RISER PIPE: SCHEDULE 40 PVC
BOREHOLE DIAMETER: 4W @ 11"
TYPE OF BACKFILL: CEMENT GROUT
ELEVATION / DEPTH TOP OF SEAL: 4'
TYPE OF SEAL: BENTONITE
DEPTH TOP OF SAND PACK: 6'
ELEVATION / DEPTH TOP OF SCREEN: 8'
TYPE OF SCREEN: SCHEDULE 40 PVC
SLOT SIZE x LENGTH: 10 S x 10'
I.D. OF SCREEN: 4"
TYPE OF SAND PACK: #20-#30 US SIEVE
ELEVATION / DEPTH BOTTOM OF SCREEN: 18'
ELEVATION / DEPTH BOTTOM OF SAND PACK:
TYPE OF BACKFILL BELOW OBSERVATION WELL: CAVED
ELEVATION / DEPTH OF HOLE: 18'

Brown & Root Environmental

BORING NO. ~~[illegible]~~ LM S25-MW01

MONITORING WELL SHEET

PROJECT: INDIAN HEAD	LOCATION: ~~SA~~ 25-MW01 (Area)	DRILLER: TLB Assoc. Inc.
PROJECT NO.: 5280	BORING: SS-MW01	DRILLING METHOD: HSA
ELEVATION:	DATE: 9/19/95	DEVELOPMENT METHOD: BAIL & PURGE
FIELD GEOLOGIST: MARSHALL/POST		



ELEVATION OF TOP OF SURFACE CASING: ______

ELEVATION OF TOP OF RISER PIPE: ______

STICK - UP TOP OF SURFACE CASING: ______

STICK - UP RISER PIPE: ______

TYPE OF SURFACE SEAL: CEMENT GROUT

I.D. OF SURFACE CASING: 6"

TYPE OF SURFACE CASING: STEEL

RISER PIPE I.D.: 4"

TYPE OF RISER PIPE: SCHEDULE 40 PVC

BOREHOLE DIAMETER: LM ~~6~~ 4 11"

TYPE OF BACKFILL: CEMENT / BENTONITE GROUT

ELEVATION / DEPTH TOP OF SEAL: 2'

TYPE OF SEAL: BENTONITE

DEPTH TOP OF SAND PACK: ~~3~~ 4'

ELEVATION / DEPTH TOP OF SCREEN: 5'

TYPE OF SCREEN: PVC

SLOT SIZE x LENGTH: 10sl X10'

I.D. OF SCREEN: 4"

TYPE OF SAND PACK: #20-#30 US SIEVE

ELEVATION / DEPTH BOTTOM OF SCREEN: 15'

ELEVATION / DEPTH BOTTOM OF SAND PACK: 15'

TYPE OF BACKFILL BELOW OBSERVATION WELL: ——

ELEVATION / DEPTH OF HOLE: 15'

BORING NO. 525-MW02

Brown & Root Environmental

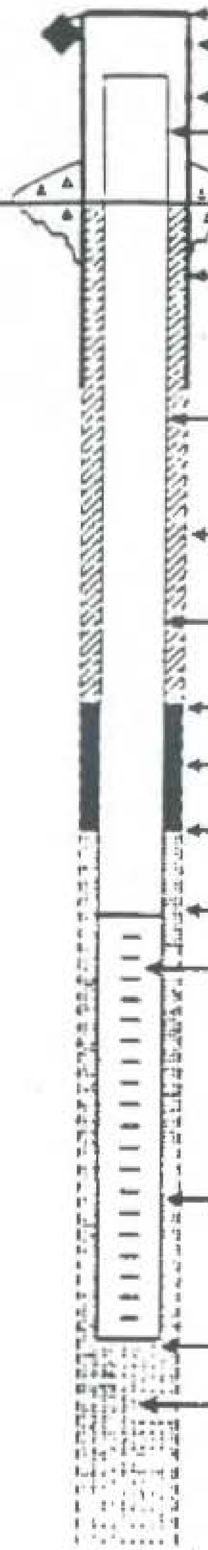
MONITORING WELL SHEET

PROJECT: INDIAN HEAD
PROJECT NO.: 5280
ELEVATION:
FIELD GEOLOGIST: MARSHALL/POST

LOCATION: AREA 8
BORING: 526-MW02
DATE: 9/22/95

DRILLER: JLB Assoc. Inc.
DRILLING METHOD: HSA
DEVELOPMENT METHOD: BAILER

GROUND ELEVATION



ELEVATION OF TOP OF SURFACE CASING:
ELEVATION OF TOP OF RISER PIPE:

STICK - UP TOP OF SURFACE CASING:
STICK - UP RISER PIPE:

TYPE OF SURFACE SEAL: CEMENT GROUT

I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: STEEL

RISER PIPE I.D.: 4"
TYPE OF RISER PIPE: SCHEDULE 40 PVC

BOREHOLE DIAMETER: 11"

TYPE OF BACKFILL: CEMENT GROUT

ELEVATION / DEPTH TOP OF SEAL: 3.5'
TYPE OF SEAL: BENTONITE

DEPTH TOP OF SAND PACK: 5.5'

ELEVATION / DEPTH TOP OF SCREEN: 7.5'
TYPE OF SCREEN: SCHEDULE 40 PVC
SLOT SIZE x LENGTH: 10s X10'
I.D. OF SCREEN: 4"

TYPE OF SAND PACK: #20-#30 US SIEVE

ELEVATION / DEPTH BOTTOM OF SCREEN: 17.5'
ELEVATION / DEPTH BOTTOM OF SAND PACK: 19.5'
TYPE OF BACKFILL BELOW OBSERVATION WELL: SAND

ELEVATION / DEPTH OF HOLE: 19.5'

BORING NO. S25- MW03

Brown & Root Environmental

MONITORING WELL SHEET

PROJECT: INDIAN HEAD	LOCATION: AREA 8	DRILLER: TLB Assoc. INC
PROJECT NO.: 5280	BORING: S25-MW03	DRILLING METHOD: HSA
ELEVATION:	DATE: 9/25/95	DEVELOPMENT METHOD: BAILING
FIELD GEOLOGIST: MARSHALL/YOST		

GROUND ELEVATION

ELEVATION OF TOP OF SURFACE CASING: ______

ELEVATION OF TOP OF RISER PIPE: ______

STICK - UP TOP OF SURFACE CASING: ______

STICK - UP RISER PIPE: ______

TYPE OF SURFACE SEAL: CEMENT GROUT

I.D. OF SURFACE CASING: 6"

TYPE OF SURFACE CASING: STEEL

RISER PIPE I.D.: 4"

TYPE OF RISER PIPE: SCHEDULE 40 PVC

BOREHOLE DIAMETER: 11"

TYPE OF BACKFILL: CEMENT GROUT

ELEVATION / DEPTH TOP OF SEAL: 26'

TYPE OF SEAL: BENTONITE

DEPTH TOP OF SAND PACK: CM 30'

ELEVATION / DEPTH TOP OF SCREEN: 35'

TYPE OF SCREEN: ______

SLOT SIZE x LENGTH: 10s X 10'

I.D. OF SCREEN: 4"

TYPE OF SAND PACK: #20-#30 US SIEVE

ELEVATION / DEPTH BOTTOM OF SCREEN: 45'

ELEVATION / DEPTH BOTTOM OF SAND PACK: 45'

TYPE OF BACKFILL BELOW OBSERVATION WELL: ______

ELEVATION / DEPTH OF HOLE: 45'

BORING NO. S26-MW01

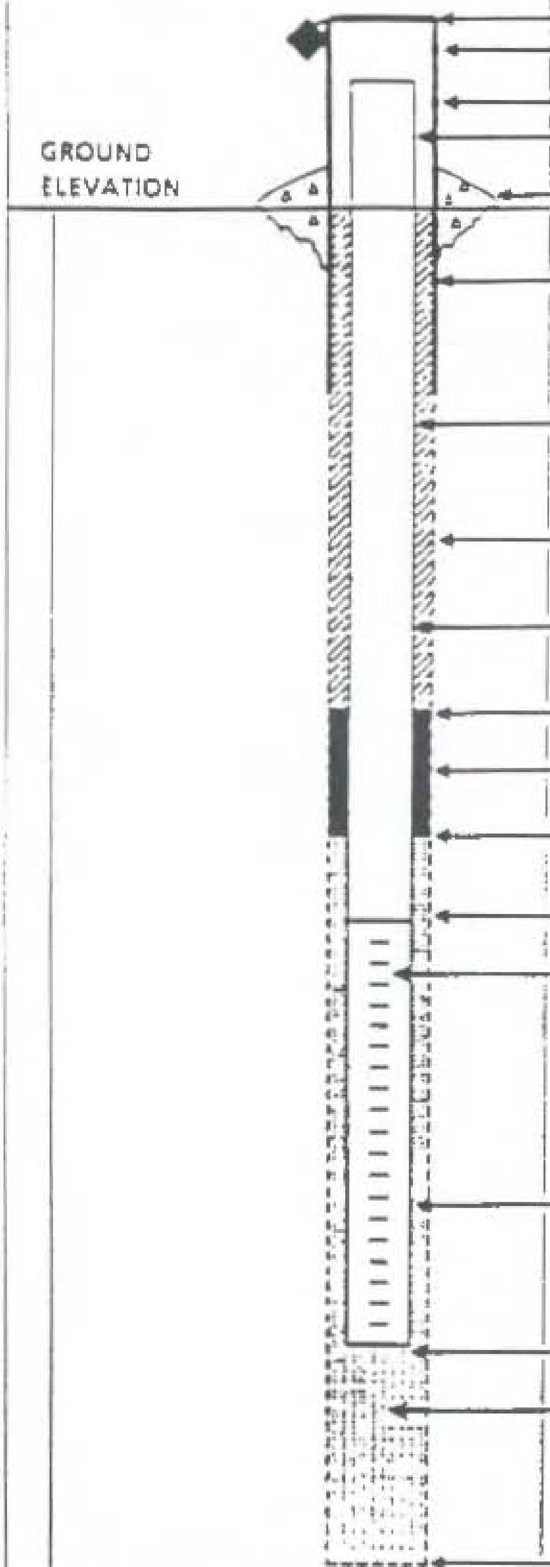
Brown & Root Environmental

MONITORING WELL SHEET

PROJECT: INDIAN HEAD
PROJECT NO.: 5280
ELEVATION:
FIELD GEOLOGIST: MARSHALL/YOST

LOCATION: IEO
BORING: S26-MW01
DATE: 9/20/95

DRILLER: TLB Assoc. INC.
DRILLING METHOD: HSA
DEVELOPMENT METHOD: BAILING



ELEVATION OF TOP OF SURFACE CASING: ______

ELEVATION OF TOP OF RISER PIPE: ______

STICK - UP TOP OF SURFACE CASING: ______

STICK - UP RISER PIPE: ______

TYPE OF SURFACE SEAL: CEMENT GROUT

I.D. OF SURFACE CASING: 6"

TYPE OF SURFACE CASING: STEEL

RISER PIPE I.D.: 4"

TYPE OF RISER PIPE: SCHEDULE 40 PVC

BOREHOLE DIAMETER: 11"

TYPE OF BACKFILL: CEMENT GROUT

ELEVATION / DEPTH TOP OF SEAL: 1'

TYPE OF SEAL: BENTONITE

DEPTH TOP OF SAND PACK: 3'

ELEVATION / DEPTH TOP OF SCREEN: 4'

TYPE OF SCREEN: SCHEDULE 40 PVC

SLOT SIZE x LENGTH: 10S X 10'

I.D. OF SCREEN: 4"

TYPE OF SAND PACK: #20-#30 US SIEVE

ELEVATION / DEPTH BOTTOM OF SCREEN: 14'

ELEVATION / DEPTH BOTTOM OF SAND PACK: 15'

TYPE OF BACKFILL BELOW OBSERVATION WELL: #20-#30 US SIEVE SAND

ELEVATION / DEPTH OF HOLE: 19'

BORING NO. S26-MW02

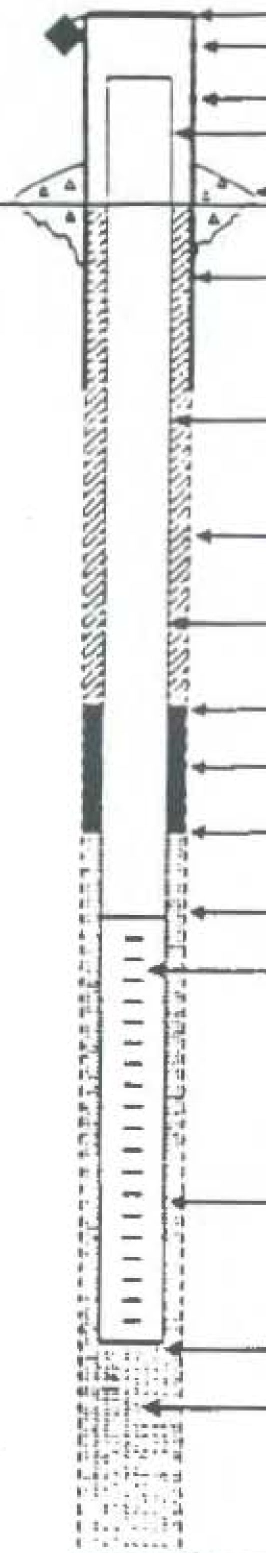
Brown & Root Environmental

MONITORING WELL SHEET

PROJECT: INDIAN HEAD
LOCATION: TEP
PROJECT NO.: 5280
BORING: S26-MW02
ELEVATION:
DATE: 9/23/95
FIELD GEOLOGIST: MARSHALL/POST

DRILLER: TLB Assoc. INC
DRILLING METHOD: HSA
DEVELOPMENT METHOD: BAILER

GROUND ELEVATION



ELEVATION OF TOP OF SURFACE CASING:
ELEVATION OF TOP OF RISER PIPE:
STICK - UP TOP OF SURFACE CASING:
STICK - UP RISER PIPE:
TYPE OF SURFACE SEAL: CEMENT
I.D. OF SURFACE CASING: STEEL - 6"
TYPE OF SURFACE CASING:
RISER PIPE I.D.: 4"
TYPE OF RISER PIPE: PVC - SCHEDULE 40
BOREHOLE DIAMETER: 11"
TYPE OF BACKFILL: CEMENT GROUT
ELEVATION / DEPTH TOP OF SEAL: 7'
TYPE OF SEAL: BENTONITE
DEPTH TOP OF SAND PACK: 9'
ELEVATION / DEPTH TOP OF SCREEN: 11'
TYPE OF SCREEN: PVC
SLOT SIZE x LENGTH: 10S x 10'
I.D. OF SCREEN: 4"
TYPE OF SAND PACK: #20-#30 US SIEVE
ELEVATION / DEPTH BOTTOM OF SCREEN: 21'
ELEVATION / DEPTH BOTTOM OF SAND PACK:
TYPE OF BACKFILL BELOW OBSERVATION WELL: SAND
ELEVATION / DEPTH OF HOLE: 22'

BORING NO. S26-MW03

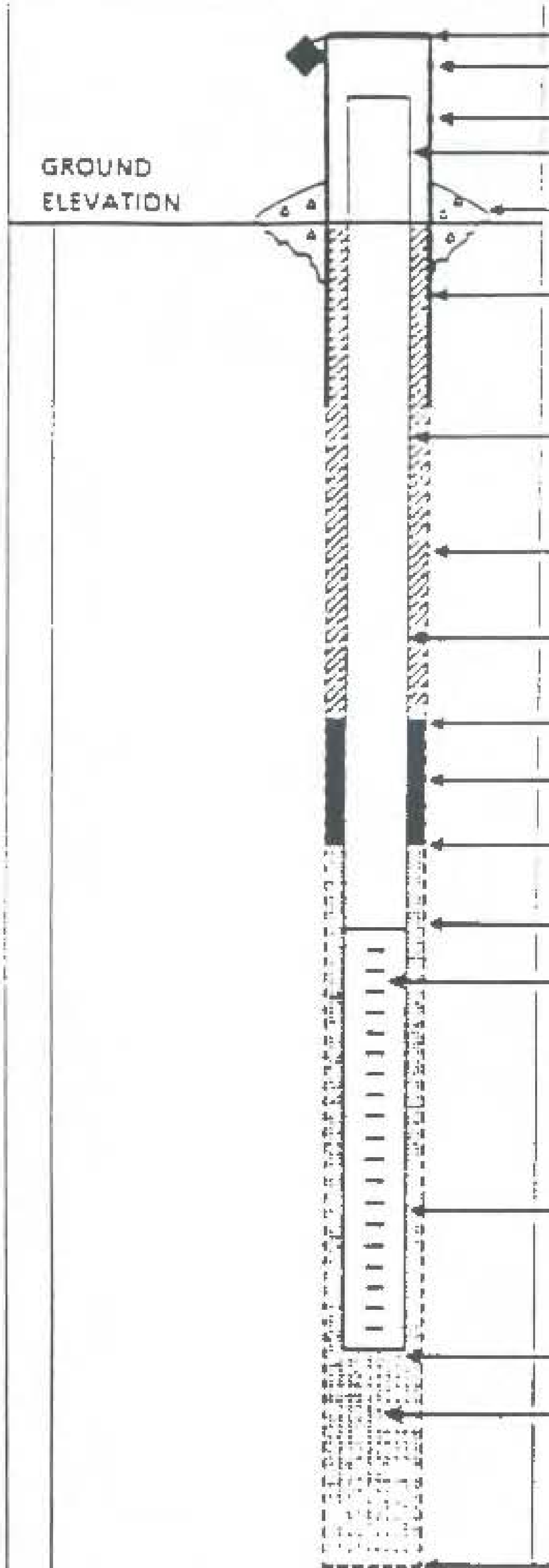
Brown & Root Environmental

MONITORING WELL SHEET

PROJECT: INDIAN HEAD
PROJECT NO.: 5280
ELEVATION:
FIELD GEOLOGIST: MARSHALL ~~[illegible]~~

LOCATION: IED
BORING: S26-MW03
DATE: 7/24/95

DRILLER: TLB Assoc. Inc.
DRILLING METHOD: HSA
DEVELOPMENT METHOD: Bail + Surge



ELEVATION OF TOP OF SURFACE CASING:
ELEVATION OF TOP OF RISER PIPE:
STICK - UP TOP OF SURFACE CASING:
STICK - UP RISER PIPE:
TYPE OF SURFACE SEAL: CEMENT
I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: STEEL
RISER PIPE I.D.: 4"
TYPE OF RISER PIPE: SCHEDULE 40 PVC
BOREHOLE DIAMETER: LM ~~[illegible]~~ 11"
TYPE OF BACKFILL: CEMENT GROUT
ELEVATION / DEPTH TOP OF SEAL: 3.5'
TYPE OF SEAL: BENTONITE
DEPTH TOP OF SAND PACK: 5.5'
ELEVATION / DEPTH TOP OF SCREEN: 7.5'
TYPE OF SCREEN: SCHEDULE 40 PVC
SLOT SIZE x LENGTH: 10s X10'
I.D. OF SCREEN: 4"
TYPE OF SAND PACK: #20-#30 US SIEVE
ELEVATION / DEPTH BOTTOM OF SCREEN: 17.5'
ELEVATION / DEPTH BOTTOM OF SAND PACK: 18.5'
TYPE OF BACKFILL BELOW OBSERVATION WELL: SAND
ELEVATION / DEPTH OF HOLE: 18.5'

APPENDIX G

HYDROGEOLOGICAL CALCULATIONS

G.1 - GROUNDWATER LEVEL MEASUREMENTS
G.2 - SLUG TEST CALCULATIONS
G.3 - GROUNDWATER FLOW VELOCITY

G.1

GROUNDWATER LEVEL MEASUREMENTS

GROUNDWATER LEVEL MEASUREMENT SHEET

PROJECT NAME: INDIAN HEAD
PROJECT NUMBER: 5280
PERSONNEL: MARSHALL / YOST
DATE: 10/17/95
WEATHER CONDITIONS:

LOCATION:
MEASURING DEVICE: M-SCOPE
ADJUSTMENT FACTOR: TOC
REMARKS:

Well or Piezometer Number	Time	Water Level Indicator Reading (Feet)*	Comments
52S-MW01	1549	2.13	WATER INTO RISER PIPE
52S-MW02	1553	10.79	
52S-MW03	1600	34.91	
526-MW01	1312	8.93	
526-MW02	1316	14.54	
526-MW03	1319	12.44	
505-MW01	1302	8.51	

Measurements to nearest 0.01 foot

Signature(s): [signature]

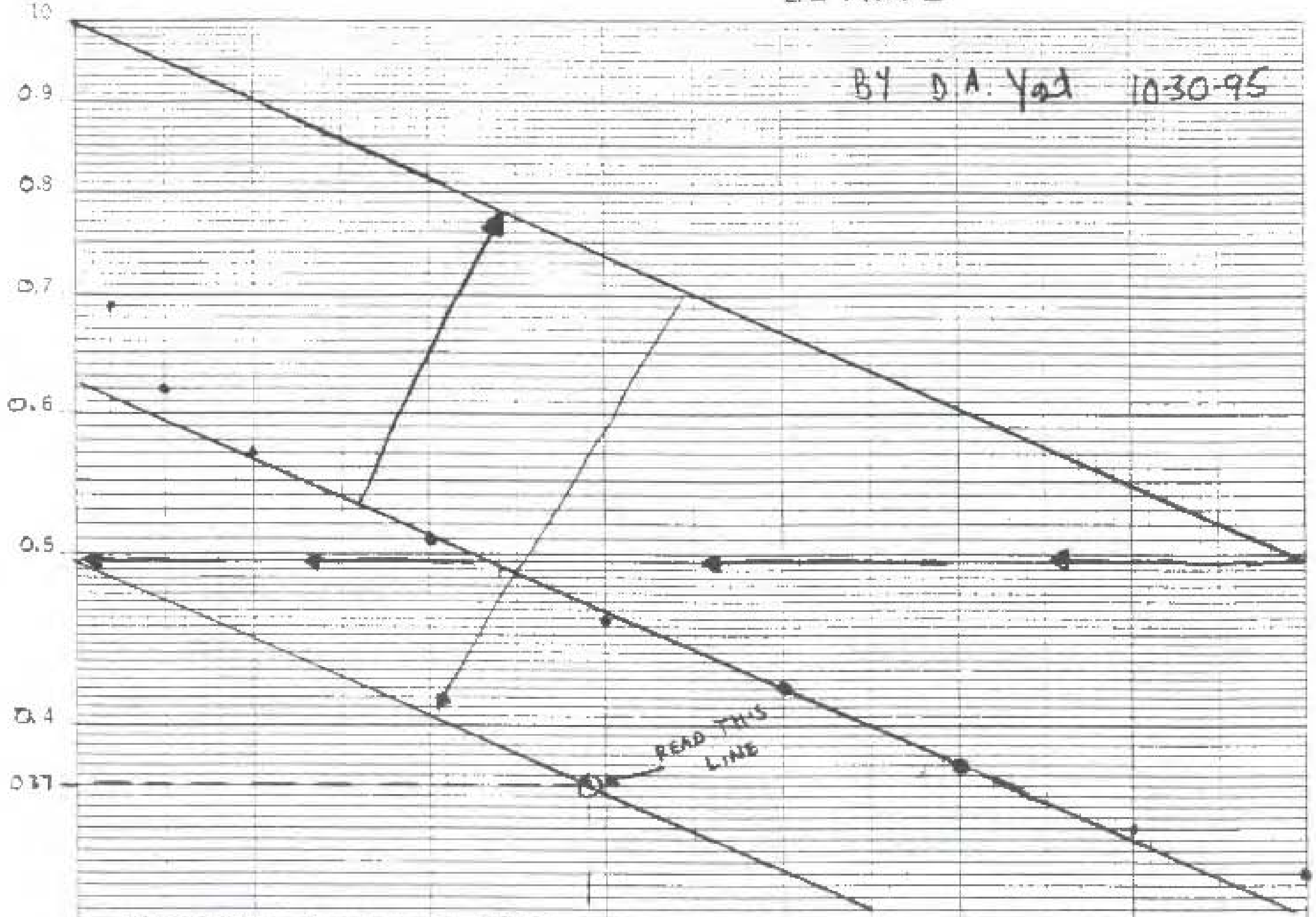
G.2

SLUG TEST CALCULATIONS

RISING HEAD SLUG TEST

26 MW02

BY D.A. Yost 10-30-95



METHOD: HVORSLEV, 1951

$$K = \frac{r^2 \ln(L/R)}{2 L T_0}$$

r = 0.167 Feet

R = 0.458 FEET

L = 12 FEET

T_0 = 99 minutes

K = HYDRAULIC CONDUCTIVITY

r = RADIUS OF WELL CASING

R = RADIUS OF WELL SCREEN + GRAVEL PACK

L = LENGTH OF WELL SCREEN

T_0 = TIME FOR WATER LEVEL TO RISE OR FALL TO 37% OF INITIAL CHANGE

$$K = \frac{(0.167)^2 \ln(12/0.458)}{2(12)(99)} = 3.83 \times 10^{-5} \text{ FT/min}$$

$$K = 4.51 \times 10^{-5} \frac{\text{FT}}{\text{min}} \times \frac{1440 \text{ min}}{\text{day}} = 5.5 \times 10^{-2} \text{ FT/day}$$

4.51×10^{-5} FT/min $\times$ 0.508 = 1.95×10^{-5} cm/sec

checked by LJS 11/10/95

t_0 = 99 minutes

0 10 (80) 20 (90) 30 (100) 40 (110) 50 60 70

h/h₀ (feet)

K+E SEMI-LOGARITHMIC 46 4650 KEUFFEL & ESSER CO.

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Brown & Root Environmental

PROJECT NAME: INDIAN HEAD   WELL/BORING NO.: S26-MW02
PROJECT NO.: 5280   GEOLOGIST: MARSHALL / YOST
WELL DIAMETER: 4"   SCREEN LENGTH/DEPTH: 14'-24'   TEST NO.: 3
STATIC WATER LEVEL (Depth/Elevation): 14.54   DATE: 10/17/95
TEST TYPE (Rising/Falling/Constant Head): RISING HEAD   CHECKED:
METHOD OF INDUCING WATER LEVEL CHANGE: 3" SLUG, 3½' LONG   PAGE 5 OF 7
REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): TOC

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	~~ELAPSED TIME~~ (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
0		2.000	1.00		
10		1.155	0.57		
20		1.019	0.51		
30		0.919	0.46		
40		0.845	0.42		
50		0.774	0.38		
60		0.712	0.35		
80		0.631	0.31		
100		0.560	0.28		
120		0.550	0.27		
140		0.534	0.26		
200		0.506	0.25		
270		0.499	0.25		

WELL SCHEMATIC

REMARKS:

CALCS, SKETCH MAPS, ETC.:

SE1000C
Environmental Logger
10/18 15:12

Unit# 00000 Test 1

Setups:	INPUT 1
Type	Level (F)
Mode	TOC
I.D.	00007
Reference	0.000
Linearity	0.030
Scale factor	0.030
Offset	-0.150
Delay mSEC	50.000

Step 0 10/17 13:05:12

Elapsed Time	INPUT 1
0.0000	2.081
0.0033	2.074
0.0066	2.074
0.0100	2.068
0.0133	2.068
0.0166	2.061
0.0200	2.055
0.0233	2.055
0.0266	2.052
0.0300	2.052
0.0333	2.039
0.0366	2.042
0.0400	2.039
0.0433	2.039
0.0466	2.029
0.0500	2.026
0.0533	2.023
0.0566	2.023
0.0600	2.023
0.0633	2.016
0.0666	2.010
0.0700	2.010
0.0733	2.010
0.0766	1.997
0.0800	2.000
0.0833	1.990
0.0866	1.990
0.0900	1.987
0.0933	1.987
0.0966	1.981
0.1000	1.981
0.1033	1.971
0.1066	1.971

26 MW 2

Rising Head Slug Test

0.1166	[illegible]
0.1200	1.088
0.1233	1.065
0.1266	1.051
0.1300	1.050
0.1333	1.045
0.1366	1.040
0.1400	1.030
0.1433	1.028
0.1466	1.032
0.1500	1.020
0.1533	1.026
0.1566	1.023
0.1600	1.020
0.1633	1.020
0.1666	1.015
0.1700	1.010
0.1733	1.010
0.1766	1.007
0.1800	1.000
0.1833	1.000
0.1866	1.897
0.1900	1.894
0.1933	1.891
0.1966	1.887
0.2000	1.884
0.2033	1.881
0.2066	1.881
0.2100	1.878
0.2133	1.875
0.2166	1.871
0.2200	1.868
0.2233	1.865
0.2266	1.862
0.2300	1.858
0.2333	1.858
0.2366	1.855
0.2400	1.852
0.2433	1.849
0.2466	1.845
0.2500	1.845
0.2533	1.842
0.2566	1.839
0.2600	1.836
0.2633	1.833
0.2666	1.832
0.2700	1.829
0.2733	1.826
0.2766	1.823
0.2800	1.823
0.2833	1.813
0.2866	1.820
0.2900	1.813
0.2933	1.810
0.2966	1.810
0.3000	1.807
0.3033	1.804
0.3066	1.807
0.3100	1.797
0.3133	1.800
0.3166	1.794
0.3200	1.794
0.3233	1.791
0.3266	1.787

26 mw2
R.H

[illegible]	1.777
0.3333	1.762
0.3500	1.753
0.4000	1.741
0.4166	1.733
0.4333	1.724
0.4500	1.712
0.4666	1.70[illegible]
0.4833	1.69[illegible]
0.5000	1.68[illegible]
0.5166	1.679
0.5333	1.669
0.5500	1.662
0.5666	1.655
0.5833	1.646
0.6000	1.639
0.6166	1.633
0.6333	1.626
0.6500	1.620
0.6666	1.613
0.6833	1.607
0.7000	1.600
0.7166	1.594
0.7333	1.588
0.7500	1.584
0.7666	1.579
0.7833	1.575
0.8000	1.568
0.8166	1.565
0.8333	1.559
0.8500	1.555
0.8666	1.550
0.8833	1.546
0.9000	1.541
0.9166	1.538
0.9333	1.533
0.9500	1.530
0.9666	1.523
0.9833	1.520
1.0000	1.517
1.2000	1.488
1.4000	1.450
1.6000	1.413
1.8000	1.394
2.0000	1.378
2.2000	1.362
2.4000	1.349
2.6000	1.336
2.8000	1.328
3.0000	1.317
3.2000	1.310
3.4000	1.300
3.6000	1.294
3.8000	1.287
4.0000	1.278
4.2000	1.275
4.4000	1.268
4.6000	1.262
4.8000	1.255
5.0000	1.250
5.2000	1.245
5.4000	1.237
5.6000	1.234
5.8000	1.228
[illegible]	[illegible]

26MW2
RH

Z6 MWZ
R. H

[illegible]	[illegible]
6.2000	1.013
6.4000	1.018
6.6000	1.0[illegible]
6.8000	1.0[illegible]
7.0000	1.107
7.2000	1.104
7.4000	1.101
7.6000	1.187
7.8000	1.15[illegible]
8.0000	1.151
8.2000	1.173
8.4000	1.17[illegible]
8.6000	1.171
8.8000	1.188
9.0000	1.198
9.2000	1.180
9.4000	1.165
9.6000	1.155
9.8000	1.120
10.0000	1.100
12.0000	1.071
14.0000	1.040
16.0000	1.010
18.0000	0.99[illegible]
20.0000	0.974
22.0000	0.955
24.0000	0.930
26.0000	0.910
28.0000	0.898
30.0000	0.890
32.0000	0.876
34.0000	0.861
36.0000	0.845
38.0000	0.833
40.0000	0.819
42.0000	0.808
44.0000	0.793
46.0000	0.77[illegible]
48.0000	0.757
50.0000	0.745
52.0000	0.731
54.0000	0.720
56.0000	0.710
58.0000	0.700
60.0000	0.692
62.0000	0.683
64.0000	0.673
66.0000	0.664
68.0000	0.657
70.0000	0.651
72.0000	0.644
74.0000	0.638
76.0000	0.631
78.0000	0.625
80.0000	0.618
82.0000	0.612
84.0000	0.605
86.0000	0.600
88.0000	0.593
90.0000	0.588
92.0000	0.580
94.0000	0.576
96.0000	[illegible]

130.000	0.511
140.000	0.511
150.000	0.504
160.000	0.515
170.000	0.511
180.000	0.511
190.000	0.502
200.000	0.505
210.000	0.505
220.000	0.512
230.000	0.493
240.000	0.499
250.000	0.499
260.000	0.495
270.000	0.499
280.000	0.500
290.000	0.505
300.000	0.505
310.000	0.499
320.000	0.495
330.000	0.495
340.000	0.493
350.000	0.493
360.000	0.493
370.000	0.493
380.000	0.493
390.000	0.495
400.000	0.495
410.000	0.499
420.000	0.495
430.000	0.493
440.000	0.495
450.000	0.495
460.000	0.499
470.000	0.495
480.000	0.499
490.000	0.502
500.000	0.500
510.000	0.502
520.000	0.505
530.000	0.508
540.000	0.508
550.000	0.511
560.000	0.511
570.000	0.511
580.000	0.518
590.000	0.501
600.000	0.528
610.000	0.525
620.000	0.531
630.000	0.534
640.000	0.541
650.000	0.541
660.000	0.537
670.000	0.534
680.000	0.531
690.000	0.531

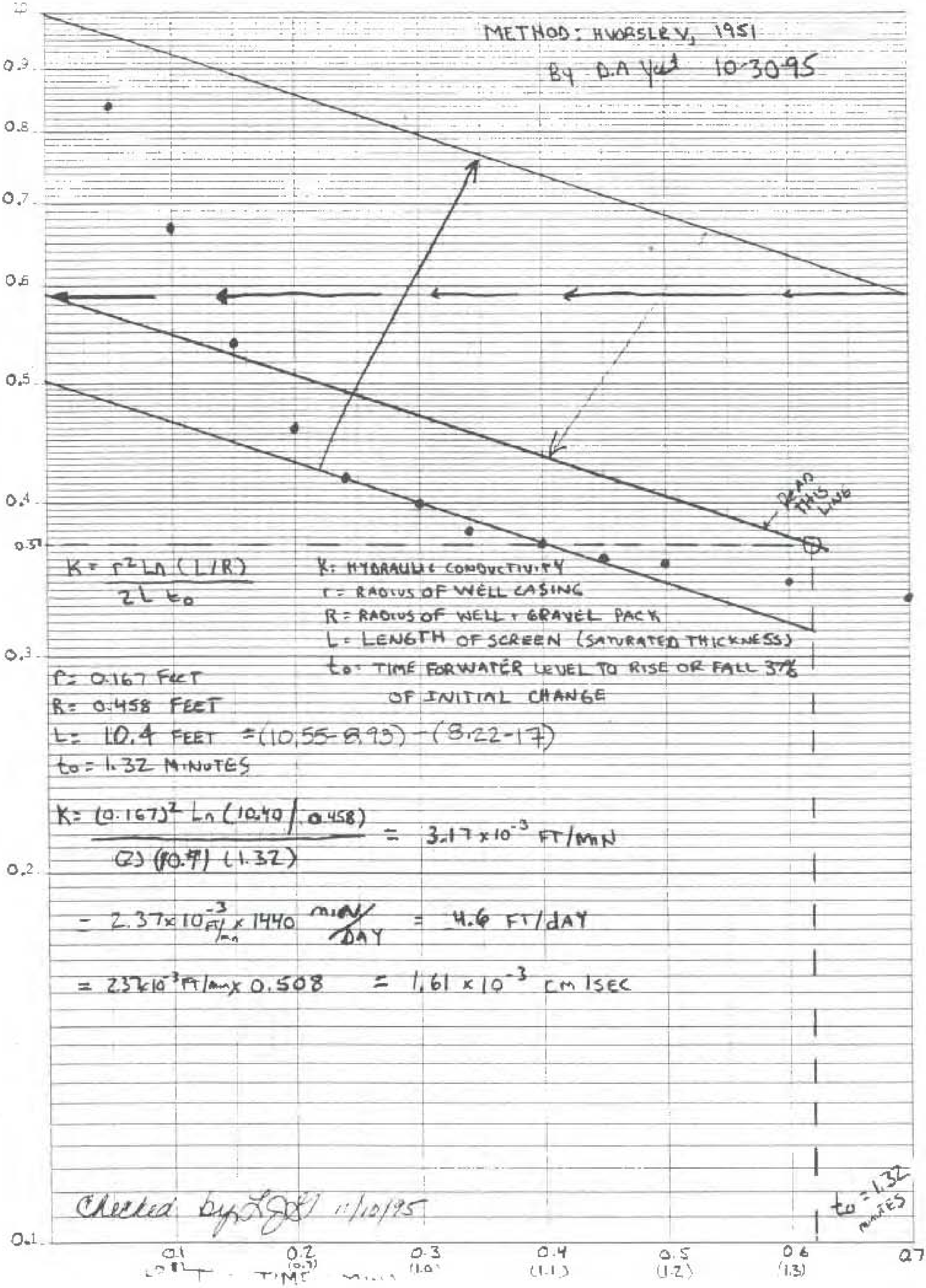
END

26 MWZ
R. H.

RISING HEAD SLUG TEST 26MW01

METHOD: HVORSLEV, 1951

By D.A Yut 10-30-95



$$K = \frac{r^2 \ln(L/R)}{2 L t_0}$$

K: HYDRAULIC CONDUCTIVITY

r = RADIUS OF WELL CASING

R = RADIUS OF WELL + GRAVEL PACK

L = LENGTH OF SCREEN (SATURATED THICKNESS)

t_0 = TIME FOR WATER LEVEL TO RISE OR FALL 37% OF INITIAL CHANGE

r = 0.167 FEET

R = 0.458 FEET

L = 10.4 FEET = (10.55-8.93) - (8.22-17)

t_0 = 1.32 MINUTES

$$K = \frac{(0.167)^2 \ln(10.40 / 0.458)}{(2)(10.4)(1.32)} = 3.17 \times 10^{-3} \text{ FT/MIN}$$

$$= 2.37 \times 10^{-3} \text{ FT/min} \times 1440 \text{ min/DAY} = 4.6 \text{ FT/DAY}$$

$$= 2.37 \times 10^{-3} \text{ FT/min} \times 0.508 = 1.61 \times 10^{-3} \text{ cm/SEC}$$

Checked by LJJ 11/10/95

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET — **Brown & Root Environmental**

PROJECT NAME: INDIAN HEAD WELL/BORING NO.: S26-MW01

PROJECT NO.: 5280 GEOLOGIST: MARSHALL / YUST

WELL DIAMETER: 4" SCREEN LENGTH/DEPTH: 7-17' TEST NO.: 0

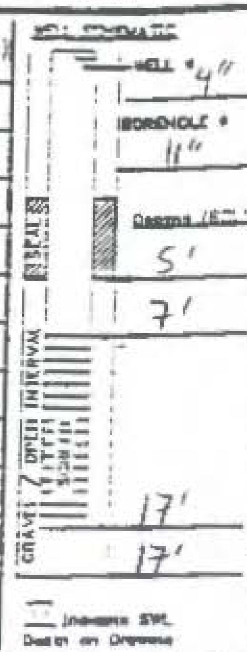
STATIC WATER LEVEL (Depth/Elevation): 8.93 DATE: 10/18/95

TEST TYPE (Rising/Falling/Constant Head): RISING HEAD CHECKED:

METHOD OF INDUCING WATER LEVEL CHANGE: 3" SLUG 3½' LONG PAGE 4 OF 7

REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): TOC

ELAPSED TIME (min or sec)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	~~ELAPSED TIME~~ H/Ho (min or sec)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
0	-	2.042	1.00		
0.1		1.375	0.67		
0.15		1.098	0.54		
0.2		0.934	0.46		
0.25		0.860	0.42		
0.30		0.816	0.40		
0.35		0.786	0.38		
0.40		0.764	0.37		
0.45		0.744	0.36		
0.50		0.731	0.358		
0.7		0.686	0.336		
0.8		0.667	0.327		
0.05		1.725	0.841		



REMARKS:

8.86

CALCS, SKETCH MAPS, ETC.:

-

SE1000C
Environmental Logger
10/13 09:11

Unit# 00000 Test 0

Setups:	INPUT 1
Type	Level (F)
Mode	TOC
I.D.	00007

Reference	0.000
Linearity	0.030
Scale factor	9.980
Offset	-0.130
Delay mSEC	50.000

Step 0 10/13 14:15:21

Elapsed Time	INPUT 1
0.0000	2.068
0.0033	-0.051
0.0066	2.379
0.0100	1.612
0.0133	2.046
0.0166	1.372
0.0200	2.042
0.0233	1.948
0.0266	1.598
0.0300	1.581
0.0333	1.843
0.0366	1.821
0.0400	1.805
0.0433	1.788
0.0466	1.750
0.0500	1.725
0.0533	1.698
0.0566	1.660
0.0600	1.646
0.0633	1.619
0.0666	1.596
0.0700	1.577
0.0733	1.551
0.0766	1.529
0.0800	1.506
0.0833	1.481
0.0866	1.465
0.0900	1.439
0.0933	1.413
0.0966	1.394
0.1000	1.375
0.1033	1.352
0.1066	1.333

S26-MW01
RISING HEAD TEST

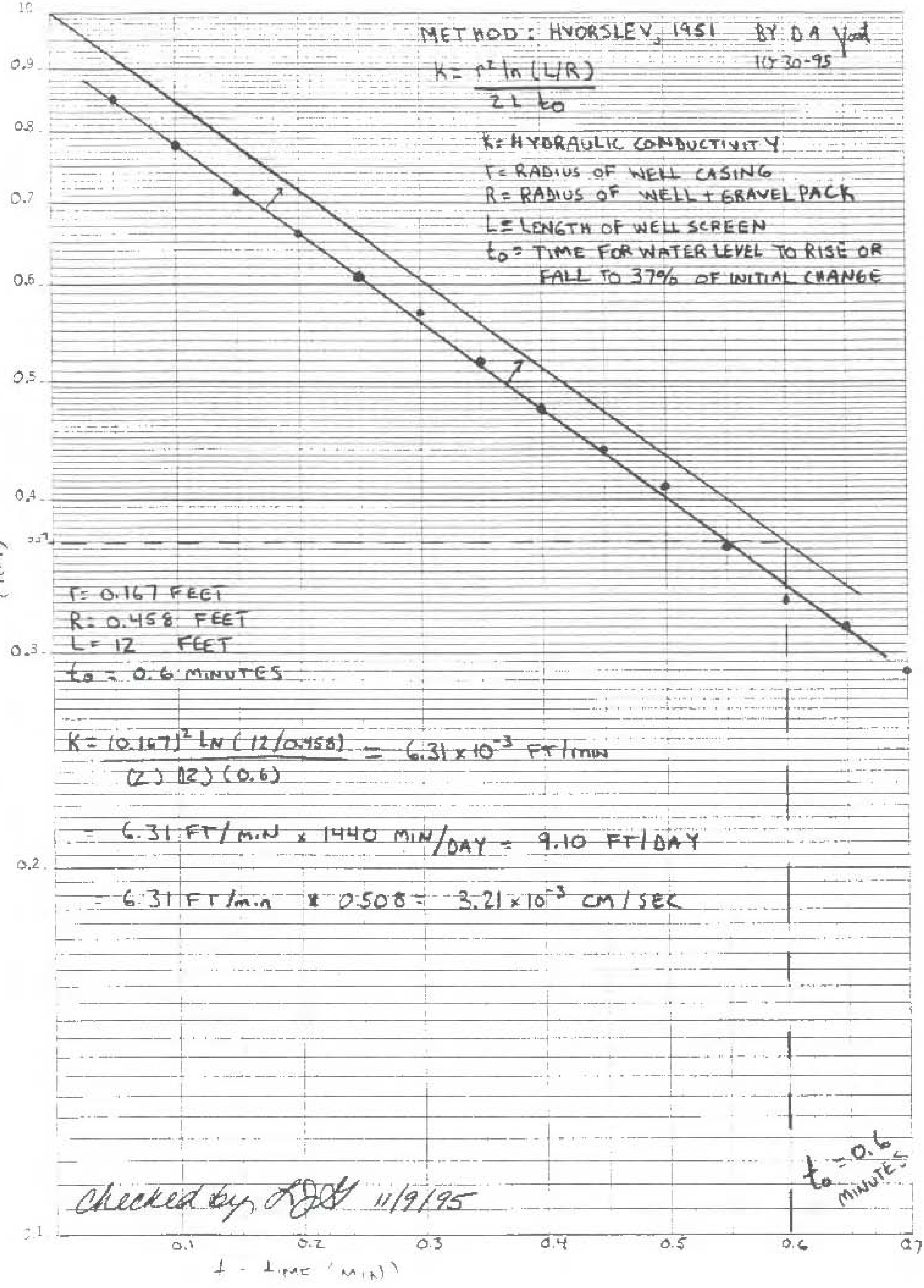
[illegible]	[illegible]
0.1200	1.257
0.1233	1.235
0.1266	1.214
0.1300	1.193
0.1333	1.173
0.1366	1.162
0.1400	1.146
0.1433	1.130
0.1466	1.114
0.1500	1.098
0.1533	1.082
0.1566	1.069
0.1600	1.056
0.1633	1.043
0.1666	1.031
0.1700	1.018
0.1733	1.005
0.1766	0.995
0.1800	0.988
0.1833	0.976
0.1866	0.966
0.1900	0.957
0.1933	0.947
0.1966	0.941
0.2000	0.934
0.2033	0.928
0.2066	0.921
0.2100	0.915
0.2133	0.908
0.2166	0.902
0.2200	0.898
0.2233	0.892
0.2266	0.888
0.2300	0.883
0.2333	0.879
0.2366	0.876
0.2400	0.870
0.2433	0.867
0.2466	0.865
0.2500	0.860
0.2533	0.857
0.2566	0.854
0.2600	0.850
0.2633	0.847
0.2666	0.844
0.2700	0.841
0.2733	0.838
0.2766	0.834
0.2800	0.831
0.2833	0.831
0.2866	0.828
0.2900	0.825
0.2933	0.821
0.2966	0.818
0.3000	0.818
0.3033	0.815
0.3066	0.812
0.3100	0.812
0.3133	0.809
0.3166	0.805
0.3200	0.805
0.3233	0.802
0.3266	0.799

[illegible]	[illegible]
0.3666	0.780
0.3833	0.770
0.4000	0.764
0.4166	0.757
0.4333	0.751
0.4500	0.746
0.4666	0.741
0.4833	0.735
0.5000	0.731
0.5166	0.725
0.5333	0.722
0.5500	0.718
0.5666	0.712
0.5833	0.709
0.6000	0.706
0.6166	0.702
0.6333	0.699
0.6500	0.696
0.6666	0.693
0.6833	0.690
0.7000	0.686
0.7166	0.683
0.7333	0.680
0.7500	0.677
0.7666	0.673
0.7833	0.670
0.8000	0.667
0.8166	0.664
0.8333	0.661
0.8500	0.657
0.8666	0.657
0.8833	0.654
0.9000	0.651
0.9166	0.648
0.9333	0.644
0.9500	0.644
0.9666	0.641
0.9833	0.638
1.0000	0.635
1.2000	0.608
1.4000	0.583
1.6000	0.564
1.8000	0.545
2.0000	0.528
2.2000	0.512
2.4000	0.498
2.6000	0.483
2.8000	0.470
3.0000	0.458
3.2000	0.446
3.4000	0.435
3.6000	0.425
3.8000	0.416
4.0000	0.403
4.2000	0.393
4.4000	0.383
4.6000	0.374
4.8000	0.367
5.0000	0.358
5.2000	0.348
5.4000	0.341
5.6000	0.332
5.8000	0.325

[illegible]	[illegible]
6.6000	0.303
6.8000	0.291
7.0000	0.283
7.2000	0.280
7.4000	0.271
7.6000	0.267
7.8000	0.261
8.0000	0.254
8.2000	0.251
8.4000	0.245
8.6000	0.242
8.8000	0.235
9.0000	0.232
9.2000	0.225
9.4000	0.223
9.6000	0.218
9.8000	0.212
10.0000	0.209
12.0000	0.171
14.0000	0.142
16.0000	0.118
18.0000	0.100

END

25MW03



METHOD: HVORSLEV, 1951 BY D.A. [illegible] 10-30-95

$$K = \frac{r^2 \ln(L/R)}{2 L t_o}$$

K = HYDRAULIC CONDUCTIVITY
r = RADIUS OF WELL CASING
R = RADIUS OF WELL + GRAVEL PACK
L = LENGTH OF WELL SCREEN
t_o = TIME FOR WATER LEVEL TO RISE OR FALL TO 37% OF INITIAL CHANGE

r = 0.167 FEET
R = 0.458 FEET
L = 12 FEET
t_o = 0.6 MINUTES

$$K = \frac{(0.167)^2 \ln(12/0.458)}{(2)(12)(0.6)} = 6.31 \times 10^{-3} \text{ FT/min}$$

= 6.31 FT/min x 1440 MIN/DAY = 9.10 FT/DAY

= 6.31 FT/min * 0.508 = 3.21×10^{-3} CM/SEC

Checked by LJG 11/9/95

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET | **Brown & Root Environmental**

PROJECT NAME: INDIAN HEAD WELL/BORING NO.: 525-MW05

PROJECT NO.: 5280 GEOLOGIST: MARSHALL / YOST

WELL DIAMETER: 4" SCREEN LENGTH/DEPTH: 38'-48' TEST NO.: 6

STATIC WATER LEVEL (Depth/Elevation): 34.91 DATE: 10/18/95

TEST TYPE (Rising/Falling/Constant Head): RISING HEAD CHECKED:

METHOD OF INDUCING WATER LEVEL CHANGE: 3" SLUG, 3½' LONG PAGE 3 OF 7

REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): TOC

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	~~ELAPSED TIME~~ H/H0 (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
0		1.991	1.00		
0.05		1.682	0.85		
0.1		1.548	0.78		
0.2		1.311	0.66		
0.3		1.128	0.57		
0.5		0.809	0.41		
0.8		0.499	0.25		
1		0.369	0.19		
2		0.107	0.054		
4		0.055	0.028		
6		0.048	0.024		
12		0.035	0.018		

WELL SCHEMATIC

WELL Ø: 4"

BOREHOLE Ø: 11"

Depths (BGS): 36' 38' 48' 48'

SEAL

GRAVEL / OPEN INTERVAL / SCREEN

Indicate SWL Depth on Drawing

REMARKS:

CALCS, SKETCH MAPS, ETC.:

SE1000C
Environmental Logger
10/15 13:55

Unit# 00000 Test 2

Setups:	INPUT 1
Type	Level (F)
Mode	TOC
I.D.	00007
Reference	0.000
Linearity	0.000
Scale factor	0.000
Offset	-0.000
Delay mSEC	50.000

Step 0 10/15 03:00:18

ZS MW 03

Rising Head SLUG Test

Elapsed Time	INPUT 1
0.0000	0.330
0.0033	-0.177
0.0066	0.150
0.0100	2.064
0.0133	1.305
0.0166	2.240
0.0200	1.180
T=0 0.0233	1.901
0.0266	1.842
0.0300	1.808
0.0333	1.782
0.0366	1.764
0.0400	1.737
0.0433	1.702
0.0466	1.711
0.0500	1.680
0.0533	1.685
0.0566	1.660
0.0600	1.682
0.0633	1.650
0.0666	1.640
0.0700	1.633
0.0733	1.620
0.0766	1.614
0.0800	1.604
0.0833	1.594
0.0866	1.585
0.0900	1.575
0.0933	1.565
0.0966	1.555
0.1000	1.540
0.1033	1.540
0.1066	1.532

[illegible]	[illegible]
0.1200	[illegible]
0.1233	[illegible]
0.1266	[illegible]
0.1300	[illegible]
0.1333	[illegible]
0.1366	1.481
0.1400	[illegible]
0.1433	[illegible]
0.1466	[illegible]
0.1500	[illegible]
0.1533	[illegible]
0.1566	[illegible]
0.1600	[illegible]
0.1633	1.398
0.1666	1.393
0.1700	1.378
0.1733	1.379
0.1766	1.367
0.1800	1.360
0.1833	1.350
0.1866	1.341
0.1900	1.330
0.1933	1.324
0.1966	1.320
0.2000	1.311
0.2033	1.308
0.2066	1.301
0.2100	1.300
0.2133	1.289
0.2166	1.279
0.2200	1.272
0.2233	1.268
0.2266	1.256
0.2300	1.251
0.2333	1.249
0.2366	1.243
0.2400	1.238
0.2433	1.230
0.2466	1.223
0.2500	1.211
0.2533	1.207
0.2566	1.201
0.2600	1.194
0.2633	1.191
0.2666	1.181
0.2700	1.174
0.2733	1.171
0.2766	1.165
0.2800	1.157
0.2833	1.155
0.2866	1.146
0.2900	1.140
0.2933	1.138
0.2966	1.120
0.3000	1.126
0.3033	1.110
0.3066	1.113
0.3100	1.108
0.3133	1.100
0.3166	1.098
0.3200	1.090
0.3233	1.083
0.3266	1.080

ZS MW03

R. H

[illegible]	[illegible]
0.3666	[illegible]
0.3833	0.912
0.4000	0.892
0.4166	0.887
0.4333	[illegible]
0.4500	0.873
0.4666	0.858
0.4833	0.800
0.5000	0.800
0.5166	0.787
0.5333	0.767
0.5500	[illegible]
0.5666	0.725
0.5833	0.705
0.6000	0.685
0.6166	0.660
0.6333	0.650
0.6500	0.633
0.6666	0.617
0.6833	0.601
0.7000	0.581
0.7166	0.568
0.7333	0.555
0.7500	0.530
0.7666	0.528
0.7833	0.510
0.8000	0.490
0.8166	0.485
0.8333	0.473
0.8500	0.463
0.8666	0.450
0.8833	0.441
0.9000	0.429
0.9166	0.418
0.9333	0.405
0.9500	0.398
0.9666	0.388
0.9833	0.370
1.0000	0.360
1.2000	0.250
1.4000	0.198
1.6000	0.158
1.8000	0.127
2.0000	0.107
2.2000	0.091
2.4000	0.081
2.6000	0.075
2.8000	0.068
3.0000	0.065
3.2000	0.062
3.4000	0.058
3.6000	0.058
3.8000	0.055
4.0000	0.055
4.2000	0.055
4.4000	0.052
4.6000	0.050
4.8000	0.052
5.0000	0.052
5.2000	0.048
5.4000	0.040
5.6000	0.040
5.8000	0.040

75MW03
R. H

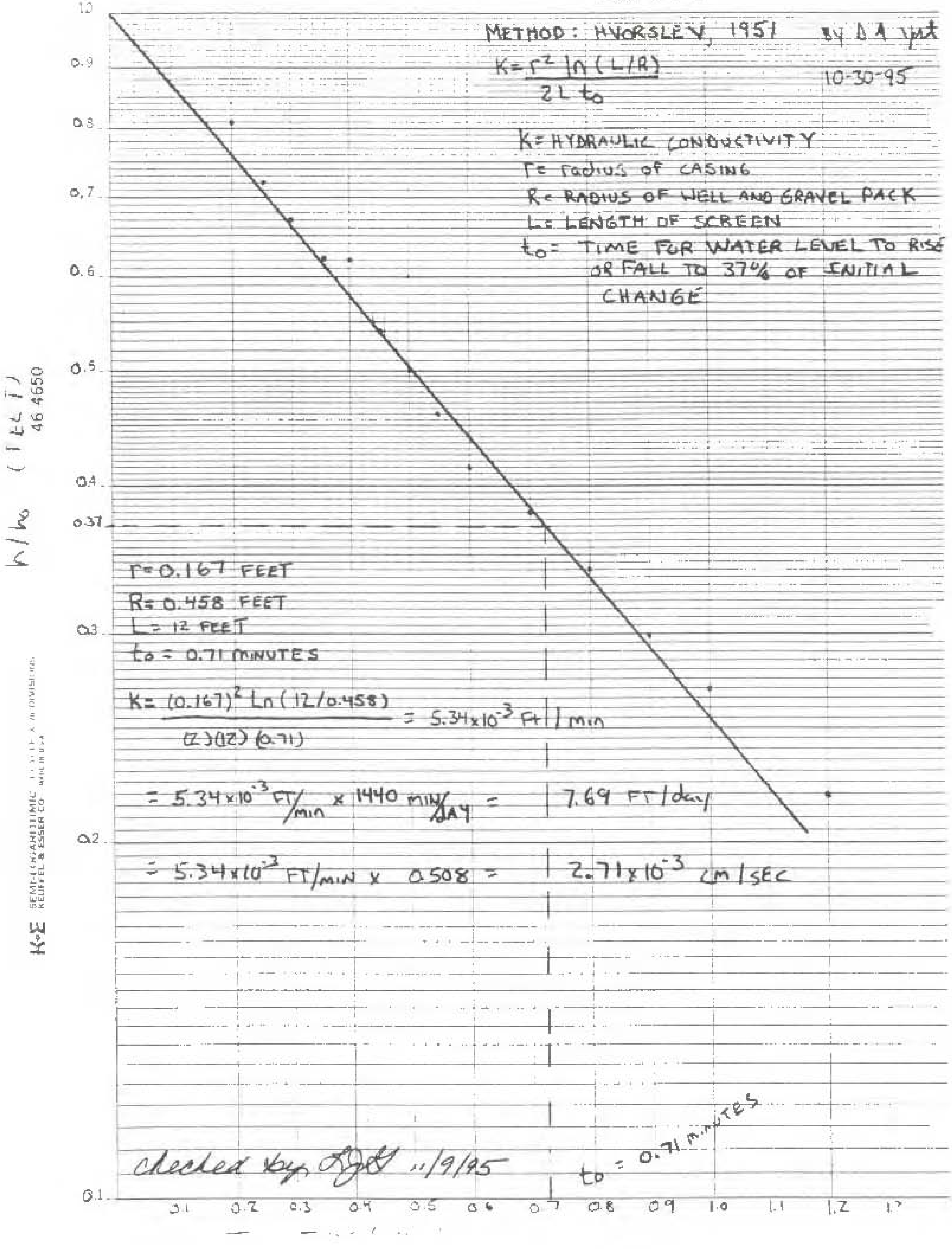
[illegible]	[illegible]
6.8000	[illegible]
6.6000	0.045
7.0000	0.045
7.2000	0.045
7.[illegible]000	0.045
7.4000	0.045
7.8000	0.040
8.0000	0.040
8.2000	0.040
8.[illegible]000	0.040
8.8000	0.040
8.3000	0.0[illegible]0
9.0000	0.030
9.2000	0.030
9.[illegible]000	0.030
9.6000	0.030
9.8000	0.030
10.0000	0.030
12.0000	0.025

END

ZS MW03
R.H

FALLING HEAD SLUG TEST

ZSMW03



HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Brown & Root Environmental

PROJECT NAME: INDIAN HEAD WELL/BORING NO.: S25-MW03

PROJECT NO.: 5280 GEOLOGIST: MARSHALL / YOST

WELL DIAMETER: 4" SCREEN LENGTH/DEPTH: 35'-45' TEST NO.: 5

STATIC WATER LEVEL (Depth/Elevation): 34.91 DATE: 10/18/95

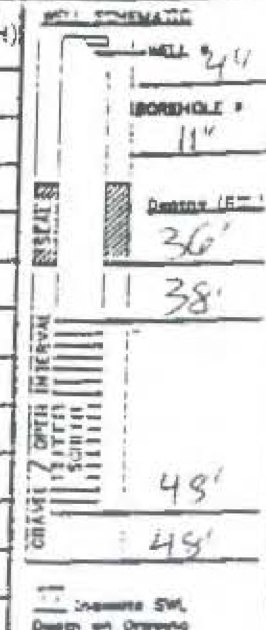
TEST TYPE (Rising/Falling/Constant Head): FALLING HEAD CHECKED:

METHOD OF INDUCING WATER LEVEL CHANGE: 3" SLUG, 3 1/2' LONG PAGE OF

REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): TOC

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
0		2.008	1.00		
0.5		0.999	0.498	02	0.61
1		0.546	0.27	03	0.67
2		0.304	0.15	04	0.67
3		0.268	0.13	06	0.43
4		0.258	0.13	0.7	0.38
5		0.255	0.13	0.8	0.336
6		0.252	0.125	0.9	
7		0.248	0.124		
8		0.245	0.122		
10		0.238	0.12		
12		0.238	0.12		

WELL SCHEMATIC



REMARKS:

CALCS SKETCH MAPS, ETC.:

SE1000C
Environmental Logger
10/16 13:48

Unit# 00000 Test 5

Setups:	INPUT 1
Type	Level (F)
Mode	TOC
I.D.	00007
Reference	0.000
Linearity	0.030
Scale factor	0.086
Offset	-0.130
Delay mSEC	50.000

Step 0 10/16 08:48:20

Elapsed Time	INPUT 1
0.0000	0.058
0.0033	0.088
0.0066	0.062
0.0100	-0.018
0.0133	-0.333
0.0166	-0.510
0.0200	-0.752
0.0233	-0.888
0.0266	-1.030
0.0300	-1.000
0.0333	-1.278
0.0366	-1.478
0.0400	-1.507
0.0433	-1.706
0.0466	-1.874
0.0500	-1.075
0.0533	-2.158
0.0566	-2.002
0.0600	-1.306
0.0633	-1.508
0.0666	-1.318
0.0700	-2.208
0.0733	-2.034
0.0766	-2.018
0.0800	-2.074
0.0833	-1.771
0.0866	-1.713
0.0900	-1.580
0.0933	-1.607
0.0966	-2.158
0.1000	-2.173
0.1033	-1.563

ZS MW03
Falling Head Slug Test

25MW03

FH.

	[illegible]	[illegible]
	0.1166	-1.734
	0.1200	-1.200
	0.1233	-1.380
	0.1266	-1.771
Io	0.1300	-1.008
	0.1333	-1.300
	0.1366	-1.023
	0.1400	-1.781
	0.1433	-1.551
	0.1466	-1.555
	0.1500	-1.617
	0.1533	-1.781
	0.1566	-1.781
	0.1600	-1.726
	0.1633	-1.817
	0.1666	-1.630
	0.1700	-1.452
	0.1733	-1.288
	0.1766	-1.603
	0.1800	-1.702
	0.1833	-1.788
	0.1866	-1.501
	0.1900	-1.462
	0.1933	-1.521
	0.1966	-1.610
	0.2000	-1.528
	0.2033	-1.501
	0.2066	-1.407
	0.2100	-1.501
	0.2133	-1.551
	0.2166	-1.541
	0.2200	-1.515
	0.2233	-1.406
	0.2266	-1.710
	0.2300	-1.301
	0.2333	-1.327
	0.2366	-1.203
	0.2400	-1.265
	0.2433	-1.563
	0.2466	-1.133
	0.2500	-1.303
	0.2533	-1.440
	0.2566	-1.403
	0.2600	-1.430
	0.2633	-1.420
	0.2666	-1.313
	0.2700	-1.301
	0.2733	-1.383
	0.2766	-1.358
	0.2800	-1.301
	0.2833	-1.377
	0.2866	-1.365
	0.2900	-1.380
	0.2933	-1.357
	0.2966	-1.350
	0.3000	-1.304
	0.3033	-1.334
	0.3066	-1.331
	0.3100	-1.304
	0.3133	-1.317
	0.3166	-1.311
	0.3200	-1.301
	0.3233	-1.309

[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
0.3333	[illegible]
[illegible]	[illegible]
0.4166	-1.130
0.4333	-1.127
0.4500	-1.087
0.4666	[illegible]
0.4833	-1.002
0.5000	-1.000
0.5166	-0.979
0.5333	-0.951
0.5500	-0.930
0.5666	[illegible]
0.5833	-0.887
0.6000	-0.868
0.6166	-0.848
0.6333	-0.838
0.6500	-0.810
0.6666	-0.785
0.6833	-0.776
0.7000	-0.781
0.7166	-0.768
0.7333	-0.750
0.7500	-0.717
0.7666	-0.700
0.7833	-0.687
0.8000	[illegible]
0.8166	-0.730
0.8333	-0.719
0.8500	-0.610
0.8666	[illegible]
0.8833	-0.510
0.9000	-0.500
0.9166	-0.530
0.9333	-0.551
0.9500	-0.573
0.9666	-0.529
0.9833	-0.555
1.0000	-0.538
1.2000	-0.438
1.4000	-0.353
1.6000	-0.346
1.8000	-0.322
2.0000	[illegible]
2.2000	-0.301
2.4000	-0.281
2.6000	-0.276
2.8000	-0.271
3.0000	-0.269
3.2000	-0.265
3.4000	-0.263
3.6000	-0.261
3.8000	-0.261
4.0000	-0.258
4.2000	-0.258
4.4000	-0.253
4.6000	-0.257
4.8000	-0.255
5.0000	-0.255
5.2000	-0.253
5.4000	-0.251
5.6000	-0.252

ZS MW03
F.H

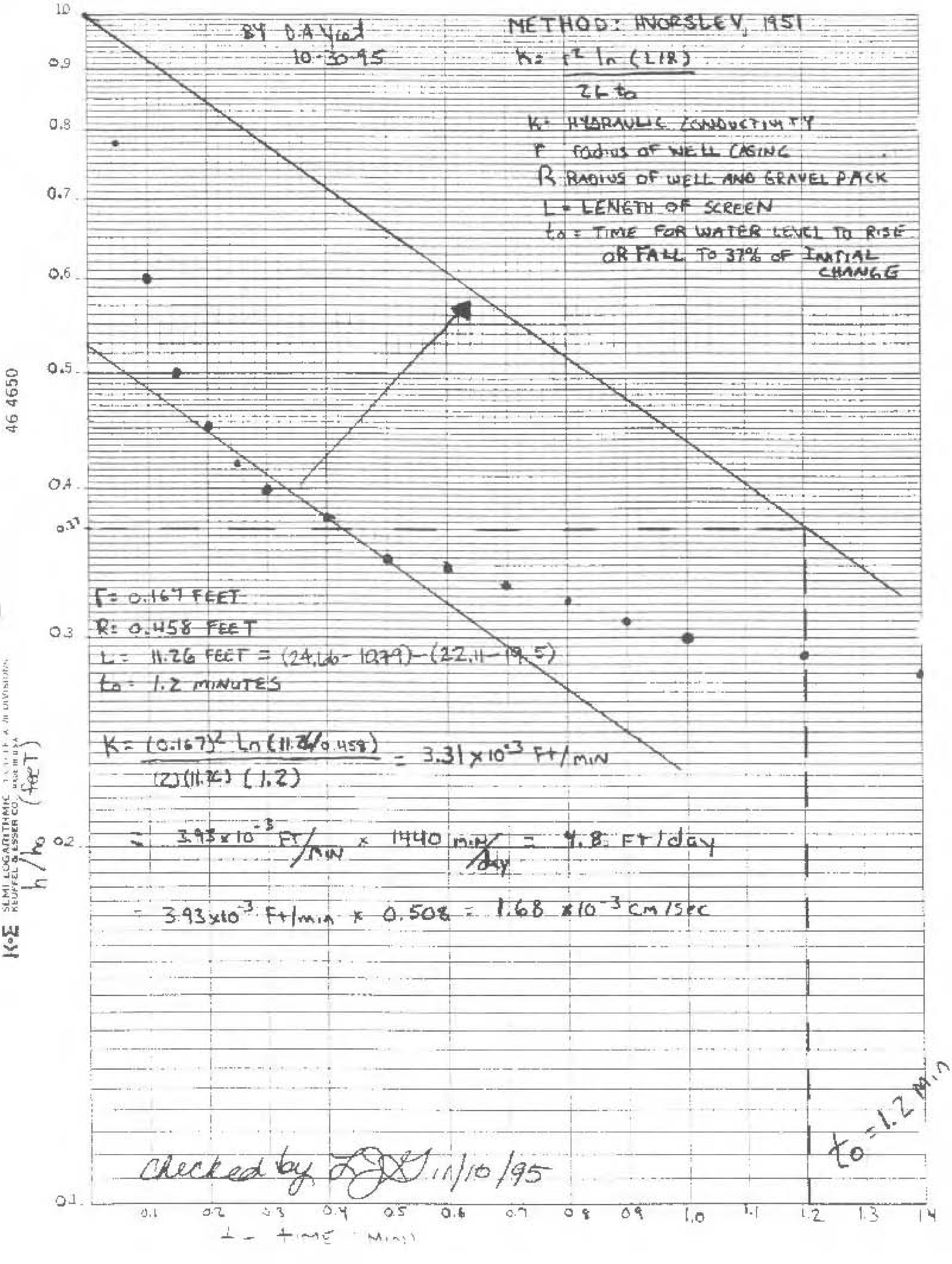
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
7.2000	[illegible]
7.4000	[illegible]
7.6000	-0.208
7.8000	-0.207
8.0000	[illegible]
8.2000	-0.205
8.4000	-0.248
8.6000	[illegible]
8.8000	-0.240
9.0000	-0.242
9.2000	-0.240
9.4000	-0.270
9.6000	-0.240
9.8000	-0.238
10.0000	-0.235
10.2000	-0.250

END

25 MW03

F.H.

25 MW02



BY D.A.Y. 10-30-95
METHOD: HVORSLEV, 1951
K= r² ln (L/R) / 2L t₀
K= HYDRAULIC CONDUCTIVITY
r radius of WELL CASING
R RADIUS OF WELL AND GRAVEL PACK
L= LENGTH OF SCREEN
t₀ = TIME FOR WATER LEVEL TO RISE OR FALL TO 37% OF INITIAL CHANGE
r= 0.167 FEET
R= 0.458 FEET
L= 11.26 FEET = (24.66 - 12.79) - (22.11 - 19.5)
t₀= 1.2 MINUTES
K= (0.167)² Ln (11.26/0.458) / (2)(11.26)(1.2) = 3.31 x 10⁻³ Ft/min
= 3.93 x 10⁻³ Ft/min x 1440 min/day = 4.8 Ft/day
= 3.93x10⁻³ Ft/min x 0.508 = 1.68 x 10⁻³ cm/sec
t₀ = 1.2 min.
Checked by 11/10/95
h/h₀ (feet)
t - time (min)
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.37
0.3
0.2
0.1
0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0 1.1 1.2 1.3 1.4
46 4650
K+E SEMI-LOGARITHMIC KEUFFEL & ESSER CO. MADE IN U.S.A.

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET — **Brown & Root Environmental**

PROJECT NAME: INDIAN HEAD WELL/BORING NO. S25MW02

PROJECT NO.: 5280 GEOLOGIST: MARSHALL / YOST

WELL DIAMETER: 4" SCREEN LENGTH/DEPTH: 9.5'-14.5 TEST NO.: 7

STATIC WATER LEVEL (Depth/Elevation): 10.79 DATE: 10/18/95

TEST TYPE (Rising/Falling/Constant Head): RISING HEAD CHECKED:

METHOD OF INDUCING WATER LEVEL CHANGE: 3" SLUG - 3½ LONG PAGE 2 OF 7

REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): TOC

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	~~ELAPSED TIME~~ (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
0		1.844	1.00		
0.05		1.451	0.78		
0.1		1.117	0.60		
0.2		0.831	0.45		
0.3		0.744	0.40		
0.5		0.660	0.35		
1		0.566	0.30		
2		0.472	0.25		
4		0.382	0.20		
8		0.307	0.16		
16		0.252	0.13		
22		0.248	0.13		

WELL SCHEMATIC

REMARKS (JM)

XD = 7.3'

CALCS, SKETCH MAPS, ETC.:

SE1000C
Environmental Logger
10/16 13:58

Unit# 00000 Test 7

Setups:	INPUT 1
Type	Level (F)
Mode	TOC
I.D.	00007
Reference	0.000
Linearity	0.430
Scale factor	0.080
Offset	-0.130
Delay mSEC	50.000

Step 0 10/16 00:55:48

Elapsed Time	INPUT 1
0.0000	1.041
0.0033	4.838
0.0066	2.546
0.0100	1.883
T=0 0.0133	1.844
0.0166	1.814
0.0200	1.783
0.0233	1.718
0.0266	1.677
0.0300	1.650
0.0333	1.620
0.0366	1.561
0.0400	1.535
0.0433	1.503
0.0466	1.480
0.0500	1.451
0.0533	1.430
0.0566	1.403
0.0600	1.374
0.0633	1.345
0.0666	1.310
0.0700	1.286
0.0733	1.277
0.0766	1.246
0.0800	1.225
0.0833	1.203
0.0866	1.187
0.0900	1.167
0.0933	1.148
0.0966	1.130
0.1000	1.112
0.1033	1.098

~~8~~
25 MW02

Rising Head
Slug Test

[illegible]	[illegible]
0.1166	1.035
0.1200	1.021
0.1233	1.013
0.1266	1.006
0.1300	0.997
0.1333	0.977
0.1366	0.961
0.1400	0.956
0.1433	0.945
0.1466	0.935
0.1500	0.925
0.1533	0.918
0.1566	0.909
0.1600	0.902
0.1633	0.898
0.1666	0.890
0.1700	0.890
0.1733	0.878
0.1766	0.867
0.1800	0.860
0.1833	0.857
0.1866	0.851
0.1900	0.844
0.1933	0.838
0.1966	0.838
0.2000	0.831
0.2033	0.825
0.2066	0.820
0.2100	0.815
0.2133	0.812
0.2166	0.810
0.2200	0.808
0.2233	0.802
0.2266	0.799
0.2300	0.798
0.2333	0.793
0.2366	0.790
0.2400	0.788
0.2433	0.783
0.2466	0.780
0.2500	0.779
0.2533	0.776
0.2566	0.773
0.2600	0.770
0.2633	0.770
0.2666	0.764
0.2700	0.764
0.2733	0.760
0.2766	0.760
0.2800	0.757
0.2833	0.754
0.2866	0.751
0.2900	0.751
0.2933	0.747
0.2966	0.744
0.3000	0.740
0.3033	0.741
0.3066	0.741
0.3100	0.738
0.3133	0.738
0.3166	0.734
0.3200	0.734
0.3233	0.731

25mw02

R. H.

0.3333	[illegible]
0.3500	0.715
0.3666	0.712
0.3833	0.706
0.4000	0.696
0.4166	0.693
0.4333	0.685
0.4500	0.678
0.4666	0.670
0.4833	0.667
0.5000	0.660
0.5166	0.657
0.5333	0.654
0.5500	0.647
0.5666	0.644
0.5833	0.641
0.6000	0.637
0.6166	0.631
0.6333	0.628
0.6500	0.624
0.6666	0.621
0.6833	0.618
0.7000	0.615
0.7166	0.613
0.7333	0.608
0.7500	0.606
0.7666	0.603
0.7833	0.600
0.8000	0.595
0.8166	0.595
0.8333	0.593
0.8500	0.590
0.8666	0.588
0.8833	0.583
0.9000	0.579
0.9166	0.579
0.9333	0.576
0.9500	0.579
0.9666	0.573
0.9833	0.580
1.0000	0.559
1.2000	0.537
1.4000	0.518
1.6000	0.505
1.8000	0.485
2.0000	0.475
2.2000	0.460
2.4000	0.447
2.6000	0.437
2.8000	0.427
3.0000	0.417
3.2000	0.411
3.4000	0.401
3.6000	0.398
3.8000	0.388
4.0000	0.380
4.2000	0.378
4.4000	0.372
4.6000	0.366
4.8000	0.360
5.0000	0.356
5.2000	0.352
5.4000	0.350
5.6000	0.348

25 MW 02

R.H.

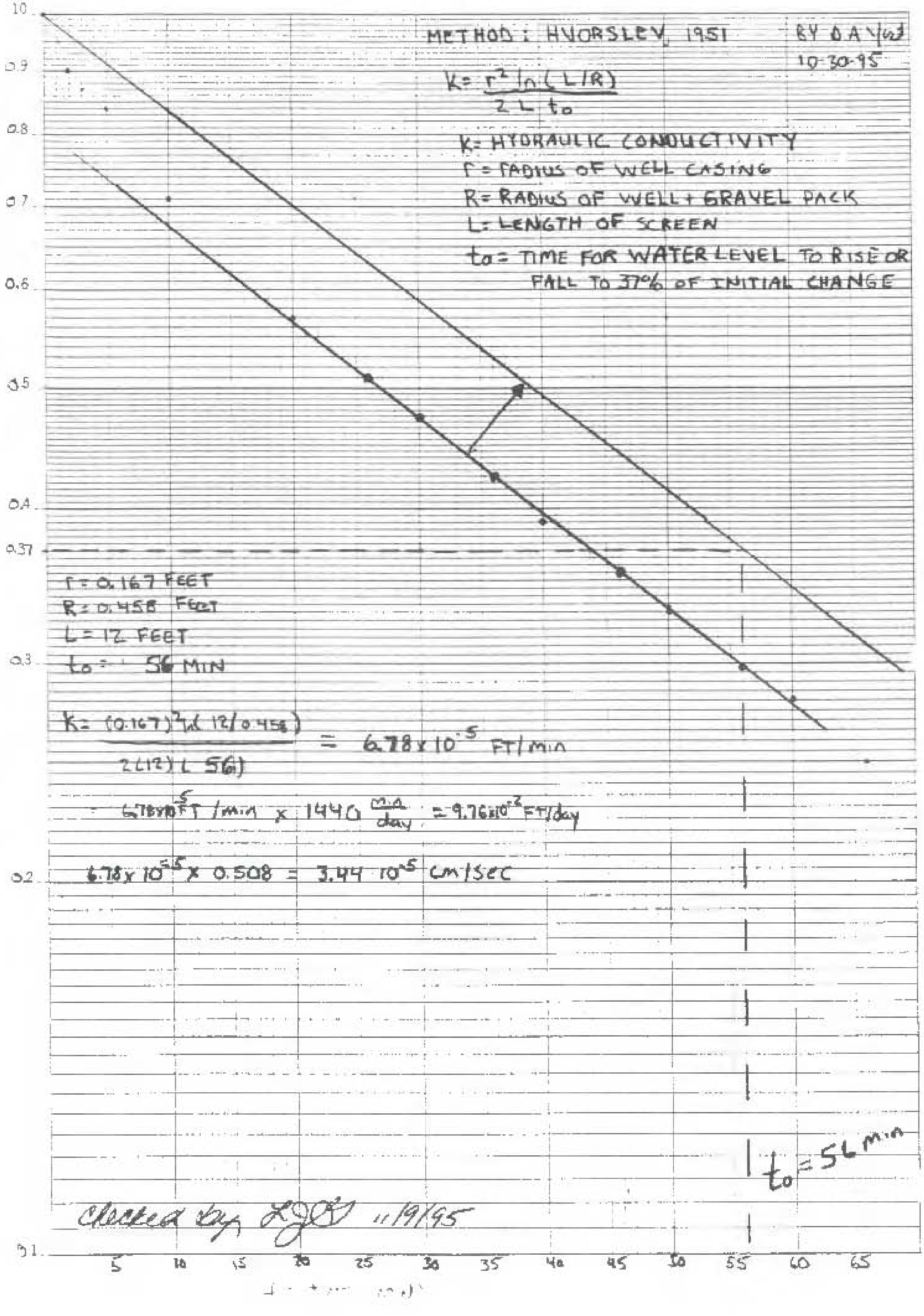
[illegible]	[illegible]
6.[illegible]	0.330
6.2000	0.327
6.6000	0.323
7.[illegible]	0.321
7.0000	0.317
7.[illegible]	0.314
7.6000	0.311
7.8000	0.307
8.0000	0.307
8.2000	0.303
8.4000	0.301
8.6000	0.301
8.8000	0.298
9.0000	0.294
9.2000	0.294
9.4000	0.291
9.6000	0.291
9.8000	0.288
10.0000	0.288
12.0000	0.279
14.0000	0.282
16.0000	0.282
18.0000	0.283
20.0000	0.285
22.0000	0.285

END

25 MW02

R. H

FALLING HEAD SLUG TEST 25 MW01



METHOD: HVORSLEV, 1951

BY DAY 10-30-95

$$K = \frac{r^2 \ln(L/R)}{2 L t_0}$$

K = HYDRAULIC CONDUCTIVITY

r = RADIUS OF WELL CASING

R = RADIUS OF WELL + GRAVEL PACK

L = LENGTH OF SCREEN

t_0 = TIME FOR WATER LEVEL TO RISE OR FALL TO 37% OF INITIAL CHANGE

r = 0.167 FEET

R = 0.458 FEET

L = 12 FEET

t_0 = 56 MIN

$$K = \frac{(0.167)^2 \ln(12/0.458)}{2(12)(56)} = 6.78 \times 10^{-5} \text{ FT/min}$$

6.78×10^{-5} FT/min $\times$ 1440 $\frac{\text{min}}{\text{day}}$ = 9.76×10^{-2} FT/day

$6.78 \times 10^{-5} \times 0.508 = 3.44 \times 10^{-5}$ cm/sec

t_0 = 56 min

Checked by LJO 11/19/95

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Brown & Root Environmental

PROJECT NAME: INDIAN HEAD WELL/BORING NO.: S25-MW4

PROJECT NO.: 5280 GEOLOGIST: MARSHALL / YOST

WELL DIAMETER: 4" SCREEN LENGTH/DEPTH: 7-17' TEST NO.: 8

STATIC WATER LEVEL (Depth/Elevation): 2.13 DATE: 10/18/95

TEST TYPE (Rising/Falling/Constant Head): FALLING HEAD CHECKED:

METHOD OF INDUCING WATER LEVEL CHANGE: 3" SLUG - 3½' LONG PAGE ... OF ...

REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): TOC

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	[illegible] Head [illegible]	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
0		2.013	1.00		
05		1934	0.96		
06		1.921	0.95		
1		1.888	0.93		
2		1.812	0.90		
3		1.752	0.87		
4		1.696	0.81		
5		1.646	0.84		
10		1.448	0.71		
20		1.165	0.57		
50		0.670	0.33		
100		0.279	0.13		

REMARKS:

XD = 11.28

CALCS, SKETCH MAPS, ETC.:

-

SE1000C
Environmental Logger
10/16 1?:01

Unit# 00000 Test 8

Setups:	INPUT 1
Type	Level (F)
Mode	TOC
I.D.	00007
Reference	0.000
Linearity	0.030
Scale factor	0.020
Offset	-0.100
Delay mSEC	50.000

Step 0 10/15 10:11:30

Elapsed Time	INPUT 1
0.0000	0.008
0.0033	-0.101
0.0066	-0.080
0.0100	-1.401
0.0133	-1.517
0.0166	-1.849
0.0200	-1.835
0.0233	-2.384
0.0266	-3.183
0.0300	-2.087
0.0333	-1.971
0.0366	-0.400
0.0400	-1.306
0.0433	-2.302
0.0466	-2.036
0.0500	-1.261
0.0533	-2.314
0.0566	-2.443
0.0600	-2.048
0.0633	-1.738
0.0666	-1.381
0.0700	-1.037
0.0733	-1.011
0.0766	-1.070
0.0800	-2.000
0.0833	-2.025
0.0866	-1.000
0.0900	-1.057
0.0933	-1.047
0.0966	-1.087
0.1000	-1.087
0.1033	-2.010
0.1066	-2.053
0.1100	-1.280

ZSMW01

Falling Head SLUG TEST

[illegible]	[illegible]
0.1233	-1.070
0.1266	[illegible]
0.1300	-1.010
0.1333	-1.000
0.1366	-1.077
0.1400	-1.057
0.1433	-1.051
0.1466	-1.024
0.1500	-1.051
0.1533	-1.077
0.1566	-1.003
0.1600	-1.071
0.1633	-1.080
0.1666	-1.050
0.1700	-1.057
0.1733	-1.067
0.1766	-1.074
0.1800	-1.120
0.1833	-1.208
0.1866	-1.130
0.1900	-1.033
0.1933	-1.051
0.1966	-1.047
0.2000	-1.150
0.2033	-1.128
0.2066	-1.138
0.2100	-1.010
0.2133	-1.010
0.2166	-1.017
0.2200	-1.100
0.2233	-1.058
0.2266	-1.333
0.2300	-1.771
0.2333	-1.077
0.2366	-1.377
0.2400	-1.417
0.2433	-1.056
0.2466	-1.785
0.2500	-1.700
0.2533	-1.700
0.2566	-1.730
0.2600	-1.708
0.2633	-1.008
0.2666	-1.060
0.2700	-1.080
0.2733	-1.021
0.2766	-1.010
0.2800	-1.080
0.2833	-1.067
0.2866	-1.080
0.2900	-1.017
0.2933	-1.010
0.2966	-1.010
0.3000	-1.080
0.3033	-1.030
0.3066	-1.310
0.3100	-1.510
0.3133	-1.158
0.3166	-1.105
0.3200	-1.148
0.3233	-1.083
0.3266	-1.987
0.3300	-1.010

25 MWO1

F. H.

[illegible]	[illegible]
[illegible]	[illegible]
0.[illegible]	-1.07[illegible]
0.3166	-1.047
0.[illegible]333	-1.037
0.4500	-1.037
0.[illegible]666	-1.03[illegible]
0.[illegible]833	-1.034
0.5000	-1.03[illegible]
0.5166	-1.031
0.5333	-1.031
0.5500	-1.027
0.5666	-1.027
0.5833	-1.024
0.6000	-1.021
0.6166	-1.021
0.6333	-1.021
0.6500	-1.017
0.6666	-1.017
0.6833	-1.014
0.7000	-1.014
0.7166	-1.014
0.7333	-1.011
0.7500	-1.011
0.7666	-1.008
0.7833	-1.008
0.8000	-1.00[illegible]
0.8166	-1.004
0.8333	-1.004
0.8500	-1.001
0.8666	-1.001
0.8833	-0.998
0.9000	-0.996
0.9166	-0.994
0.9333	-0.994
0.9500	-0.991
0.9666	-0.991
0.9833	-0.991
1.0000	-0.988
1.2000	-0.98[illegible]
1.4000	-0.981
1.6000	-0.978
1.8000	-0.975
2.0000	-0.813
2.2000	-0.798
2.4000	-0.785
2.6000	-0.770
2.8000	-0.760
3.0000	-0.753
3.2000	-0.730
3.4000	-0.720
3.6000	-0.710
3.8000	-0.703
4.0000	-0.698
4.2000	-0.684
4.4000	-0.678
4.6000	-0.660
4.8000	-0.658
5.0000	-0.648
5.2000	-0.638
5.4000	-0.630
5.6000	-0.620
5.8000	-0.610
6.0000	-0.600

25 MW01

F.H

[illegible]	[illegible]
6.8000	-1.907
7.0000	-1.781
7.2000	-1.851
7.4000	-1.8[illegible]
7.6000	-1.837
7.8000	-1.823
8.0000	-1.821
8.2000	-1.811
8.4000	-1.80[illegible]
8.6000	-1.[illegible]09
8.8000	-1.801
9.0000	-1.787
9.2000	-1.778
9.4000	-1.769
9.6000	-1.761
9.8000	-1.755
10.0000	-1.748
12.0000	-1.550
14.0000	-1.303
16.0000	-1.327
18.0000	-1.214
20.0000	-1.198
22.0000	-1.118
24.0000	-1.078
26.0000	-1.033
28.0000	-0.995
30.0000	-0.967
32.0000	-0.921
34.0000	-0.898
36.0000	-0.855
38.0000	-0.825
40.0000	-0.795
42.0000	-0.760
44.0000	-0.743
46.0000	-0.719
48.0000	-0.693
50.0000	-0.672
52.0000	-0.6[illegible]
54.0000	-0.62[illegible]
56.0000	-0.601
58.0000	-0.581
60.0000	-0.560
62.0000	-0.54[illegible]
64.0000	-0.522
66.0000	-0.500
68.0000	-0.488
70.0000	-0.478
72.0000	-0.460
74.0000	-0.443
76.0000	-0.427
78.0000	-0.41[illegible]
80.0000	-0.397
82.0000	-0.384
84.0000	-0.371
86.0000	-0.358
88.0000	-0.34[illegible]
90.0000	-0.338
92.0000	-0.325
94.0000	-0.313
96.0000	-0.302
98.0000	-0.290
100.000	-0.27[illegible]

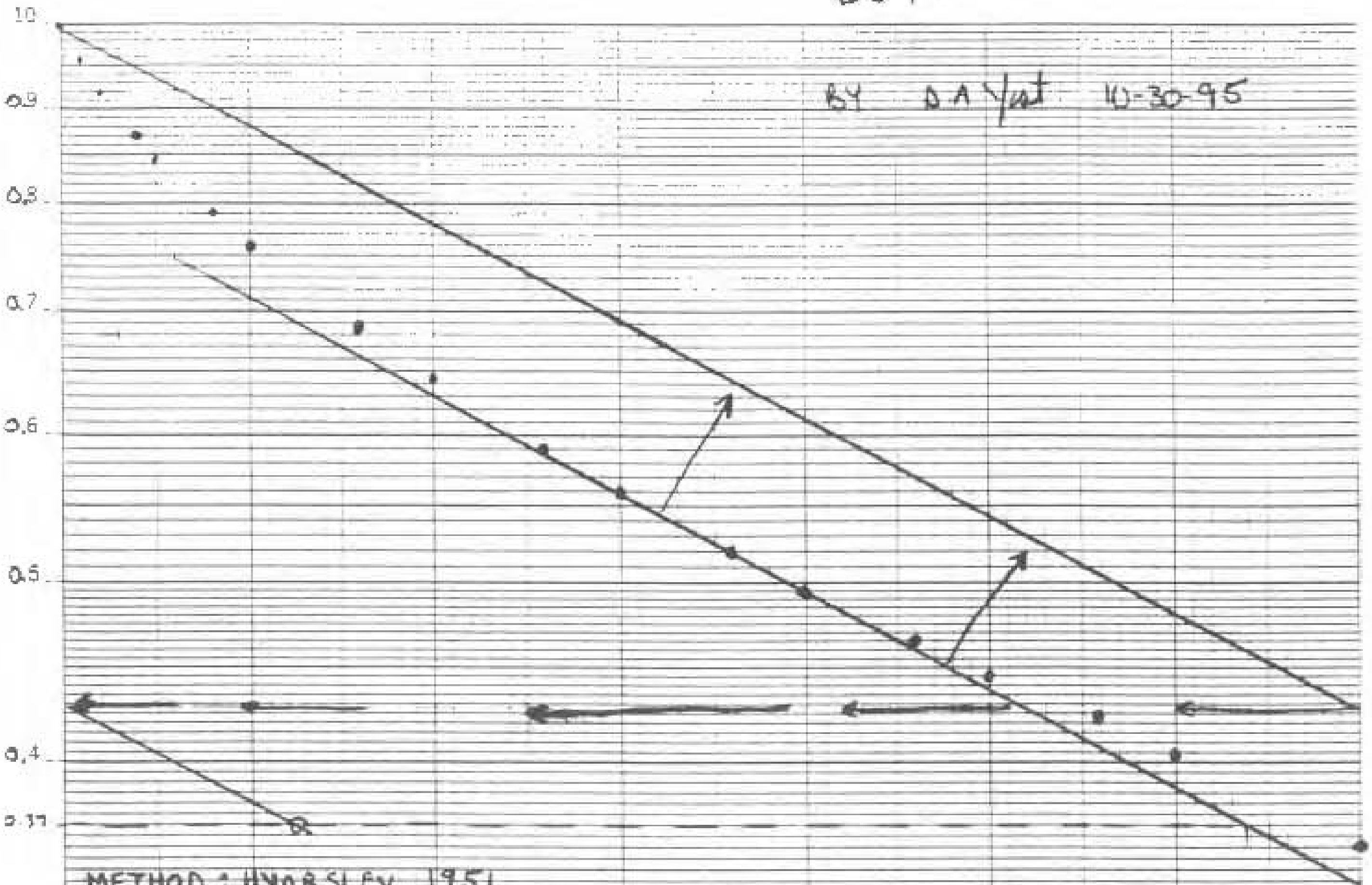
END

Z5MW01

F.H.

25 M

BY DAY/at 10-30-95



METHOD: HVORSLEV, 1951

$$K = \frac{r^2 \ln(L/R)}{2 L t_0}$$

$r = 0.167$ FEET
$R = 0.458$ FEET
$L = 12$ FEET
$t_0 = 82.5$ MINUTES

K = HYDRAULIC CONDUCTIVITY
r = radius OF WELL CASING
R = radius OF WELL + GRAVEL PACK
L = LENGTH OF WELL SCREEN
t_0 = TIME FOR WATER LEVEL TO RISE OR FALL TO 37% OF INITIAL CHANGE

0.3
0.2

$$K = \frac{(0.167)^2 \ln(12/0.458)}{2(12)(82.5)} = 4.60 \times 10^{-5} \text{ FT/min}$$

4.60×10^{-5} FT/min x 1440 min/DAY = 6.62×10^{-2} FT/day

4.60×10^{-5} Ft/min x 0.508 = 2.34×10^{-5} cm/sec

$t_0 = 82.5$ min

Checked by LJB 11/19/95

0.1

10 (70) 20 (80) 30 40 50 60

K&E SEMI-LOGARITHMIC 46 4650

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Brown & Root Environmental

PROJECT NAME: INDIAN HEAD — WELL/BORING NO.: S25-MW01

PROJECT NO.: 5280 — GEOLOGIST: MARSHALL / YOST

WELL DIAMETER: 4" — SCREEN LENGTH/DEPTH: (10') 7-17* — TEST NO.: 9 (A)

STATIC WATER LEVEL (Depth/Elevation): 2.13 — DATE: 10/18/95

TEST TYPE (Rising/Falling/Constant Head): RISING HEAD — CHECKED:

METHOD OF INDUCING WATER LEVEL CHANGE: 3" SLUG - 3½ LONG — PAGE 1 OF 7

REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): TOC*

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
0		2.004	1.000		
0.3		1.975	0.986		
0.5		1.955	0.976		
1		1.913	0.955		
2		1.841	0.919		
4		1.743	0.870		
5		1.697	0.847		
10		1.527	0.762		
20		1.292	0.645		
40		0.994	0.496		
60		0.810	0.404		
86		0.650	0.324		

WELL SCHEMATIC

WELL # 4"

BOREHOLE # 11"

DEPTHS (FT.)

5'

7'

17'

17'

Indicate SWL Depth on Drawing

REMARKS:

XO = 11.28

CALCS, SKETCH MAPS, ETC.:

SE1000C
Environmental Logger
10/15 14:05

Unit# [illegible] Test 0

Setups:	INPUT 1
Type	Level (F)
Mode	TOC
I.D.	00007
Reference	0.000
Linearity	0.450
Scale factor	0.080
Offset	-0.150
Delay mSEC	50.000

Step 0 10/15 11:55:03

Elapsed Time	INPUT 1
0.0000	2.880
0.0033	2.014
0.0066	1.879
0.0100	1.953
0.0133	-0.117
0.0166	2.500
0.0200	2.002
0.0233	1.155
0.0266	1.580
0.0300	2.640
0.0333	2.004
0.0366	1.843
0.0400	1.005
0.0433	2.040
0.0466	1.030
0.0500	1.802
0.0533	2.070
0.0566	2.070
0.0600	1.085
0.0633	1.055
0.0666	2.047
0.0700	2.011
0.0733	1.001
0.0766	2.014
0.0800	2.017
0.0833	2.001
0.0866	2.001
0.0900	2.011
0.0933	2.004
0.0966	2.001
0.1000	2.004
0.1033	2.004
0.1066	2.001
0.1100	2.001

To

25 MW01

Rising Head SLUG TEST

[illegible]	[illegible]
0.1233	1.001
0.1266	1.008
0.1300	1.008
0.1333	1.008
0.1366	1.008
0.1400	1.008
0.1433	1.008
0.1466	1.004
0.1500	1.005
0.1533	1.005
0.1566	1.005
0.1600	1.005
0.1633	1.005
0.1666	1.005
0.1700	1.001
0.1733	1.001
0.1766	1.001
0.1800	1.001
0.1833	1.001
0.1866	1.001
0.1900	1.001
0.1933	1.055
0.1966	1.088
0.2000	1.085
0.2033	1.085
0.2066	1.087
0.2100	1.087
0.2133	1.085
0.2166	1.085
0.2200	1.085
0.2233	1.085
0.2266	1.085
0.2300	1.085
0.2333	1.085
0.2366	1.085
0.2400	1.085
0.2433	1.080
0.2466	1.085
0.2500	1.080
0.2533	1.080
0.2566	1.080
0.2600	1.080
0.2633	1.080
0.2666	1.080
0.2700	1.080
0.2733	1.080
0.2766	1.078
0.2800	1.078
0.2833	1.078
0.2866	1.078
0.2900	1.078
0.2933	1.078
0.2966	1.078
0.3000	1.075
0.3033	1.075
0.3066	1.075
0.3100	1.075
0.3133	1.075
0.3166	1.075
0.3200	1.075
0.3233	1.075
0.3266	1.075
0.3300	1.075

25 mwcl

R. H.

[illegible]	[illegible]
0.3833	1.067
0.4000	1.065
0.4166	1.062
0.4333	1.063
0.4500	1.060
0.4666	1.060
0.4833	1.055
0.5000	1.055
0.5166	1.055
0.5333	1.052
0.5500	1.049
0.5666	1.049
0.5833	1.046
0.6000	1.046
0.6166	1.049
0.6333	1.042
0.6500	1.042
0.6666	1.039
0.6833	1.039
0.7000	1.036
0.7166	1.036
0.7333	1.031
0.7500	1.029
0.7666	1.033
0.7833	1.030
0.8000	1.030
0.8166	1.026
0.8333	1.026
0.8500	1.023
0.8666	1.023
0.8833	1.023
0.9000	1.021
0.9166	1.020
0.9333	1.020
0.9500	1.016
0.9666	1.016
0.9833	1.019
1.0000	1.013
1.2000	1.003
1.4000	[illegible]
1.6000	1.997
1.8000	1.987
2.0000	1.841
2.2000	1.831
2.4000	1.822
2.6000	1.800
2.8000	1.790
3.0000	1.782
3.2000	1.772
3.4000	1.763
3.6000	1.750
3.8000	1.751
4.0000	1.743
4.2000	1.733
4.4000	1.701
4.6000	1.711
4.8000	1.707
5.0000	1.697
5.2000	1.681
5.4000	1.651
5.6000	1.676
5.8000	1.655
6.0000	1.652

25MW01

R.H

6.6000	1.[illegible]
6.8000	1.882
7.0000	1.722
7.2000	1.818
7.4000	1.8[illegible]
7.6000	1.803
7.8000	1.802
8.0000	1.820
8.2000	1.[illegible]
8.4000	1.572
8.6000	1.578
8.8000	1.522
9.0000	1.557
9.2000	1.580
9.4000	1.5[illegible]
9.6000	1.511
9.8000	1.534
10.0000	1.527
12.0000	1.470
14.0000	1.420
16.0000	1.371
18.0000	1.331
20.0000	1.290
22.0000	1.258
24.0000	1.221
26.0000	1.187
28.0000	1.15[illegible]
30.0000	1.125
32.0000	1.107
34.0000	1.080
36.0000	1.0[illegible]
38.0000	1.020
40.0000	0.994
42.0000	0.971
44.0000	0.951
46.0000	0.932
48.0000	0.913
50.0000	0.898
52.0000	0.876
54.0000	0.860
56.0000	0.8[illegible]
58.0000	0.827
60.0000	0.810
62.0000	0.794
64.0000	0.781
66.0000	0.765
68.0000	0.753
70.0000	0.742
72.0000	0.733
74.0000	0.715
76.0000	0.702
78.0000	0.692
80.0000	0.683
82.0000	0.680
84.0000	0.659
86.0000	0.650

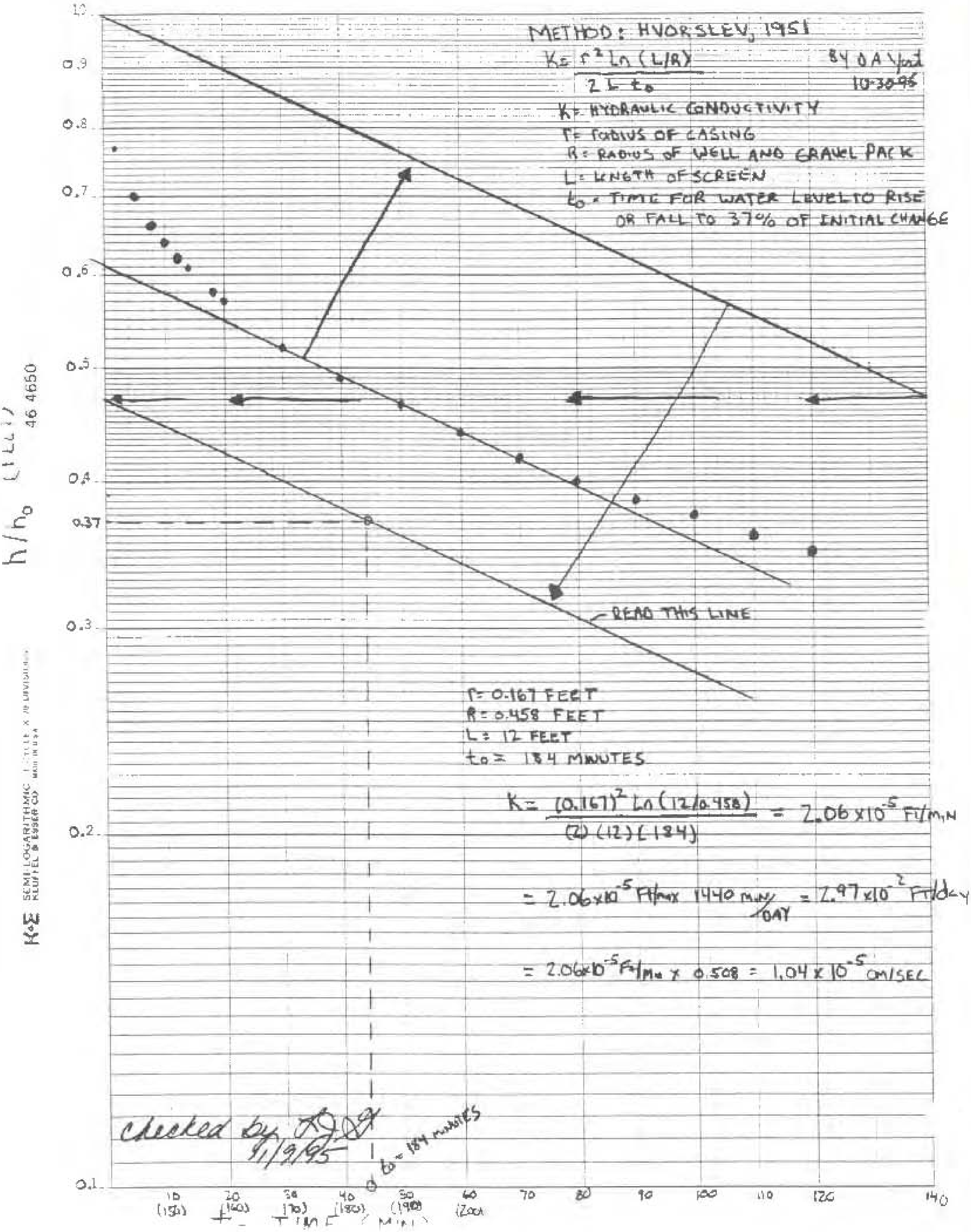
END

25 mwd

R. H.

FALLING HEAD SLUG TEST

5MW01



HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Brown & Root Environmental

PROJECT NAME: INDIAN HEAD WELL/BORING NO.: SCS-MW-1

PROJECT NO.: 5280 GEOLOGIST: MARSHALL / YOST

WELL DIAMETER: 4" SCREEN LENGTH/DEPTH: 10'-20' TEST NO.: 1

STATIC WATER LEVEL (Depth/Elevation): 8.51 DATE: 10/17/91

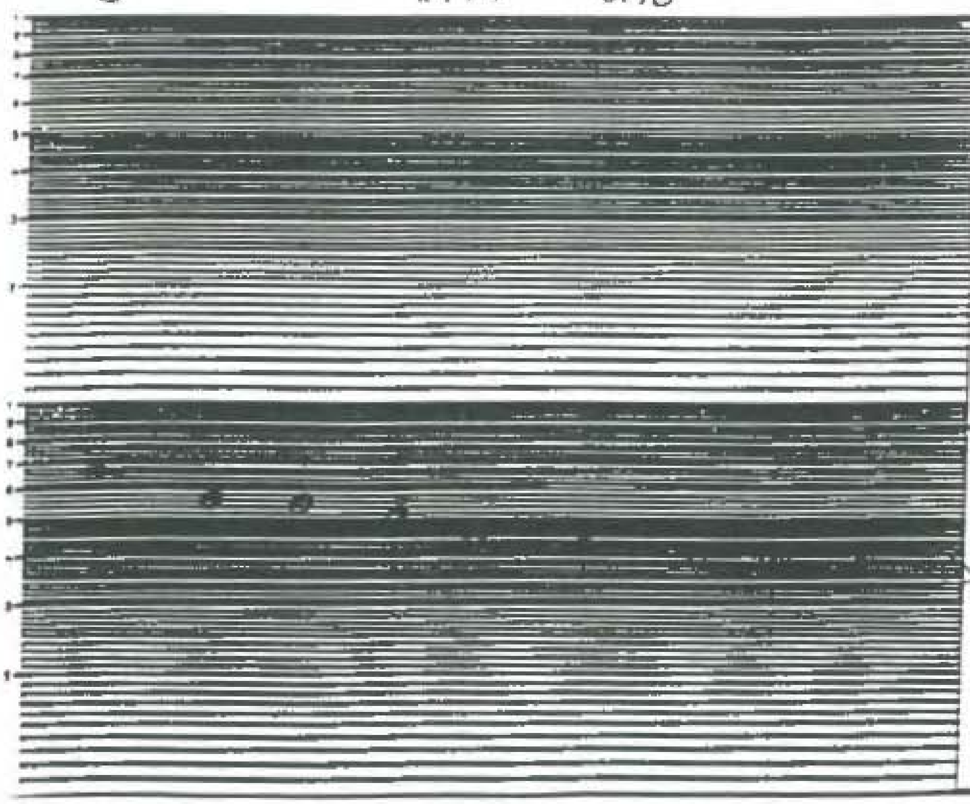
TEST TYPE (Rising/Falling/Constant Head): FALLING HEAD CHECKED:

METHOD OF INDUCING WATER LEVEL CHANGE: 3" SLUG, 3 1/2" LUG PAGE ___ OF ___

REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): TOC

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	H/H_0 ~~ELAPSED TIME~~ (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
0.0	-	2.094	1.00		
10		1.339	0.64		
20		1.191	0.57		
30		1.099	0.52		
40		1.030	0.49		
50		0.974	0.465		
60		0.925	0.44		
70		0.885	0.42		
80		0.848	0.40		
90		0.813	0.388		
100		0.787	0.375		
110		0.757	0.36		
5		1.474	0.70		

WELL SCHEMATIC



REMARKS:

X0 = 10.50

CALCS, SKETCH MAPS, ETC.:

Environmental Logger

Setups: INPUT 1

Type Level (F)

Elapsed Time INPUT 1

Elapsed Time	INPUT 1
0.0000	[illegible]
0.0033	[illegible]
0.0066	[illegible]
0.0100	[illegible]
0.0133	[illegible]
0.0166	[illegible]
0.0200	[illegible]
0.0233	[illegible]
0.0266	[illegible]
0.0300	[illegible]
0.0333	[illegible]
0.0366	[illegible]
0.0400	[illegible]
0.0433	[illegible]
0.0466	[illegible]
0.0500	[illegible]
0.0533	[illegible]
0.0566	[illegible]
0.0600	[illegible]
0.0633	[illegible]
0.0666	[illegible]
0.0700	[illegible]
0.0733	[illegible]
0.0766	[illegible]
0.0800	[illegible]
0.0833	[illegible]
0.0866	[illegible]
0.0900	[illegible]
0.0933	[illegible]
0.0966	[illegible]
0.1000	[illegible]
0.1033	[illegible]
0.1066	[illegible]
[illegible]	[illegible]

5MW01

Falling HEAD Test

5 mwol

F. H.

	[illegible]	[illegible]
	[illegible]	[illegible]
	[illegible]	[illegible]
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	[illegible]	[illegible]

5MW01
F H.

[illegible]	-1.[illegible]
[illegible]	-1.[illegible]
[illegible]	-1.[illegible]
[illegible]	-1.[illegible]
[illegible]	-1.[illegible]
[illegible]	-1.[illegible]
[illegible]	-1.[illegible]
[illegible]	-1.[illegible]
0.5000	-1.[illegible]
0.5166	-1.[illegible]
0.5333	-1.828
0.5500	-1.820
0.5666	-1.81[illegible]
0.5833	-1.812
0.6000	-1.810
0.6166	-1.81[illegible]
0.6333	-1.800
0.6500	-1.800
0.6666	-1.7[illegible]
0.6833	-1.7[illegible]
0.7000	-1.787
0.7166	-1.78[illegible]
0.7333	-1.780
0.7500	-1.7[illegible]
0.7666	-1.7[illegible]
0.7833	-1.7[illegible]
0.8000	-1.767
0.8166	-1.767
0.8333	-1.76[illegible]
0.8500	-1.761
0.8666	-1.76[illegible]
0.8833	-1.7[illegible]
0.9000	-1.751
0.9166	-1.7[illegible]
0.9333	-1.7[illegible]
0.9500	-1.7[illegible]
0.9666	-1.741
0.9833	-1.72[illegible]
1.0000	-1.72[illegible]
1.2000	-1.685
1.4000	-1.670
1.6000	-1.6[illegible]
1.8000	-1.622
2.0000	-1.616
2.2000	-1.602
2.4000	-1.588
2.6000	-1.575
2.8000	-1.562
3.0000	-1.556
3.2000	-1.550
3.4000	-1.540
3.6000	-1.535
3.8000	-1.523
4.0000	-1.517
4.2000	-1.50[illegible]
4.4000	-1.49[illegible]
4.6000	-1.480
4.8000	-1.481
5.0000	-1.47[illegible]
5.2000	-1.467
5.4000	-1.461
5.6000	-1.461
5.8000	-1.4[illegible]
[illegible]	-1.[illegible]

5 MW01

F.H

[illegible]	[illegible]
[illegible]	[illegible]
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12.0000	[illegible]
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22.0000	[illegible]
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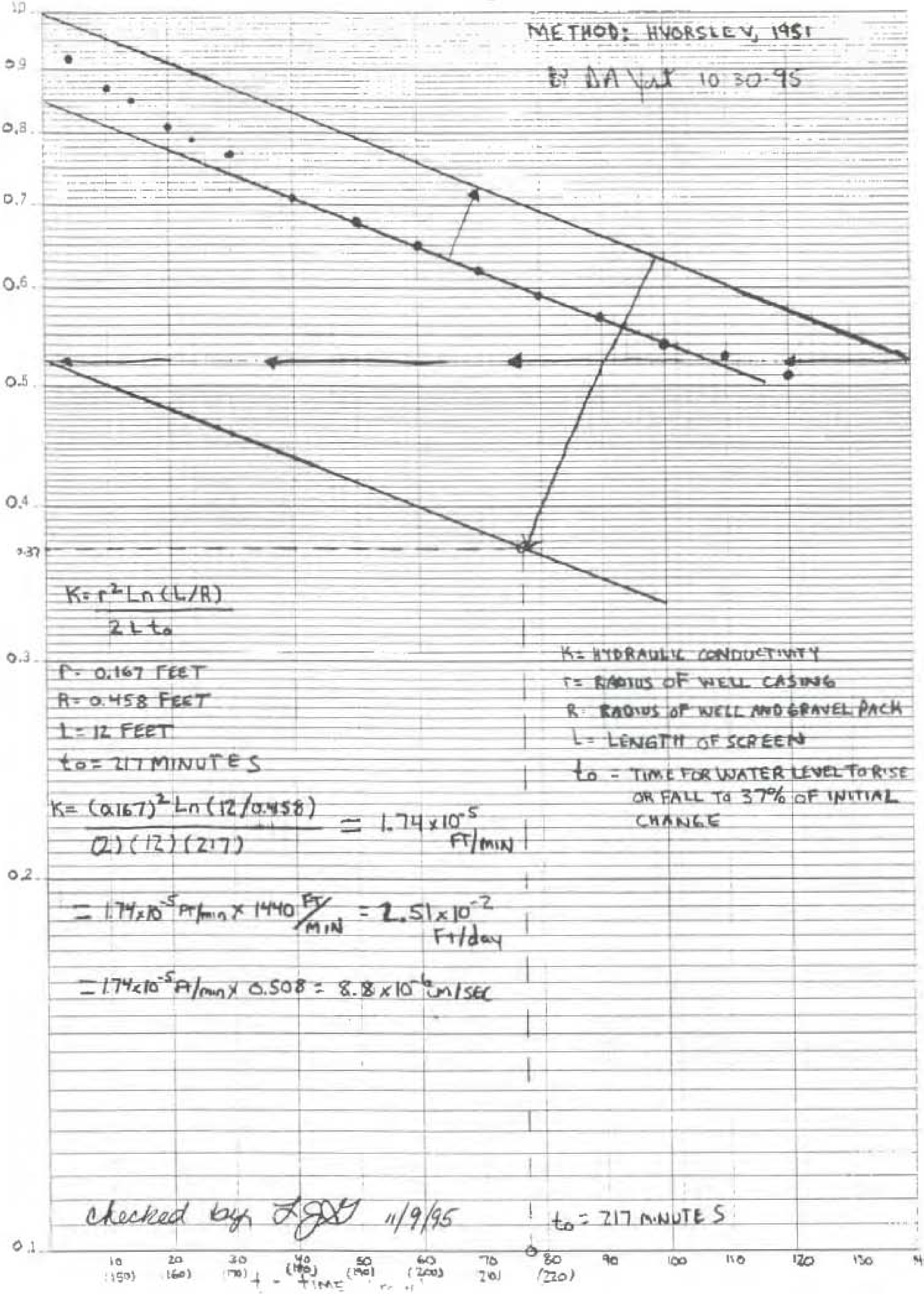
30.0000	[illegible]
32.0000	[illegible]
34.0000	[illegible]
36.0000	[illegible]
38.0000	[illegible]
40.0000	[illegible]
42.0000	[illegible]
44.0000	[illegible]
46.0000	[illegible]
48.0000	[illegible]
50.0000	[illegible]
52.0000	[illegible]
54.0000	[illegible]
56.0000	[illegible]
58.0000	[illegible]
60.0000	[illegible]
62.0000	[illegible]
64.0000	[illegible]
66.0000	[illegible]
68.0000	[illegible]
70.0000	[illegible]
72.0000	[illegible]
74.0000	[illegible]
76.0000	[illegible]
78.0000	[illegible]
80.0000	[illegible]
82.0000	[illegible]
84.0000	[illegible]
86.0000	[illegible]
88.0000	[illegible]
90.0000	[illegible]
92.0000	[illegible]
94.0000	[illegible]
96.0000	[illegible]
98.0000	[illegible]
100.000	[illegible]
[illegible]	[illegible]

EMW01



$K = \dfrac{r^2 \operatorname{Ln}(L/R)}{2 L t_o}$

r = 0.167 FEET

R = 0.458 FEET

L = 12 FEET

t_o = 217 MINUTES

$K = \dfrac{(0.167)^2 \operatorname{Ln}(12/0.458)}{(2)(12)(217)} = 1.74 \times 10^{-5}$ FT/MIN

$= 1.74 \times 10^{-5}$ FT/min $\times$ 1440 FT/MIN $= 2.51 \times 10^{-2}$ Ft/day

$= 1.74 \times 10^{-5}$ Ft/min $\times$ 0.508 $= 8.8 \times 10^{-6}$ cm/SEC

K = HYDRAULIC CONDUCTIVITY

r = RADIUS OF WELL CASING

R = RADIUS OF WELL AND GRAVEL PACK

L = LENGTH OF SCREEN

t_o = TIME FOR WATER LEVEL TO RISE OR FALL TO 37% OF INITIAL CHANGE

checked by LJS 11/9/95

t_o = 217 MINUTES

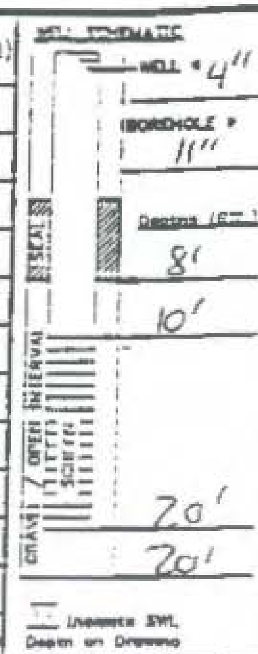
1ST TEST

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET | **Brown & Root Environmental**

PROJECT NAME: INDIAN HEAD
WELL/BORING NO.: S05-MW01
PROJECT NO.: 5280
GEOLOGIST: MARSHALL / YOST
WELL DIAMETER: 4"
SCREEN LENGTH/DEPTH: 10'-20'
TEST NO.: 2
STATIC WATER LEVEL (Depth/Elevation): 8.51
DATE: 10/17/95
TEST TYPE (Rising/Falling/Constant Head): RISING HEAD
CHECKED:
METHOD OF INDUCING WATER LEVEL CHANGE: 3" SLUG, 32" LONG
PAGE 7 OF 7
REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): TOC

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
0		2.103	1.00		
10		1.830	0.87		
20		1.715	0.81		
30		1.514	0.77		
40		1.505	0.71		
50		1.447	0.68		
60		1.378	0.65		
70		1.313	0.62		
80		1.258	0.59		
90		1.205	0.57		
100		1.150	0.54		
110		1.114	0.53		
120		1.074	0.51		

WELL SCHEMATIC



REMARKS:
XD = 10.50

CALCS, SKETCH MAPS, ETC.:

-

HERMIT 1000C
Environmental Logger
10/17 16:50

Unit# 00000 Test 2

Setups: 5MW01 1
------------ --------
Type Level (F)
Mode TOC
I.D. 00007

Reference 0.000
Linearity 0.030
Scale factor 9.967
Offset -0.100
Delay mSEC 50.000

Step 0 10/17 16:20:15

Elapsed Time	5MW01 1
0.0000	0.610
0.0033	1.421
0.0066	1.872
0.0100	2.005
0.0133	2.107
0.0166	2.142
0.0200	2.124
0.0233	2.108
0.0266	2.110
0.0300	2.120
0.0333	2.108
0.0366	2.112
0.0400	2.100
0.0433	2.110
0.0466	2.102
0.0500	2.115
0.0533	2.110
0.0566	2.103
0.0600	2.110
0.0633	2.100
0.0666	2.100
0.0700	2.100
0.0733	2.097
0.0766	2.097
0.0800	2.101
0.0833	2.095
0.0866	2.097
0.0900	2.093
0.0933	2.097
0.0966	2.090
0.1000	2.105
0.1033	2.090
0.1066	2.087
0.1100	2.087
0.1133	[illegible]

5MW01
Risinghead
Slug Test

Smucy
RH

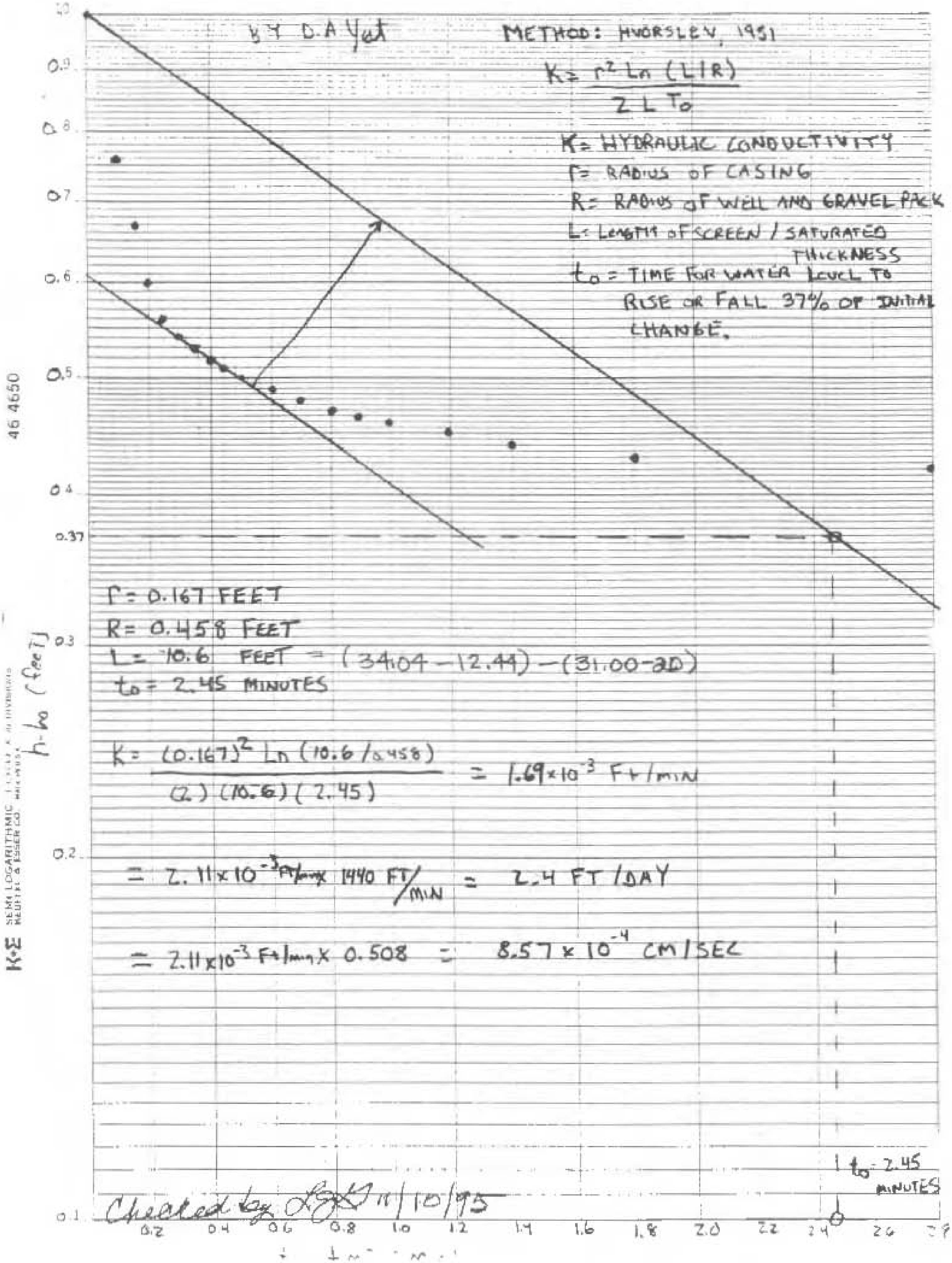
5mwcl

RH

0.3833	1.101
0.4000	1.101
0.4166	1.101
0.4333	1.102
0.4500	1.102
0.4666	1.102
0.4833	[illegible]
0.5000	[illegible]
0.5166	1.101
0.5333	1.101
0.5500	1.101
0.5666	1.102
0.5833	1.102
0.6000	1.103
0.6166	1.103
0.6333	1.103
0.6500	1.103
0.6666	1.102
0.6833	1.101
0.7000	1.101
0.7166	1.101
0.7333	1.101
0.7500	1.103
0.7666	1.102
0.7833	1.100
0.8000	1.103
0.8166	1.103
0.8333	1.103
0.8500	1.100
0.8666	1.102
0.8833	1.101
0.9000	1.101
0.9166	1.101
0.9333	1.101
0.9500	1.101
0.9666	1.115
0.9833	1.115
1.0000	1.115
1.2000	1.108
1.4000	1.103
1.6000	1.092
1.8000	1.080
2.0000	1.082
2.2000	1.076
2.4000	1.073
2.6000	1.066
2.8000	1.060
3.0000	1.058
3.2000	1.053
3.4000	1.047
3.6000	1.043
3.8000	1.040
4.0000	1.035
4.2000	1.030
4.4000	1.027
4.6000	1.024
4.8000	1.020
5.0000	1.017
5.2000	1.010
5.4000	1.007
5.6000	1.003
5.8000	1.001
6.0000	1.000
6.2000	[illegible]

[illegible]	1.083
[illegible]	1.081
[illegible]	1.078
[illegible]	1.175
[illegible]	1.072
[illegible]	1.087
[illegible]	1.083
[illegible]	1.083
[illegible]	1.082
[illegible]	1.083
[illegible]	1.083
[illegible]	1.082
[illegible]	1.078
[illegible]	1.078
[illegible]	1.072
[illegible]	1.080
10.0000	1.080
12.0000	1.810
14.0000	1.781
16.0000	1.781
18.0000	1.739
20.0000	1.715
22.0000	1.682
24.0000	1.672
26.0000	1.655
28.0000	1.631
30.0000	1.617
32.0000	1.607
34.0000	1.577
36.0000	1.560
38.0000	1.542
40.0000	1.526
42.0000	1.500
44.0000	1.487
46.0000	1.476
48.0000	1.462
50.0000	1.457
52.0000	1.451
54.0000	1.418
56.0000	1.403
58.0000	1.382
60.0000	1.370
62.0000	1.365
64.0000	1.352
66.0000	1.330
68.0000	1.326
70.0000	1.313
72.0000	1.303
74.0000	1.300
76.0000	1.277
78.0000	1.267
80.0000	1.255
82.0000	1.243
84.0000	1.425
86.0000	1.225
88.0000	1.218
90.0000	1.206
92.0000	1.192
94.0000	1.188
96.0000	1.176
98.0000	1.185
100.000	1.180
110.000	1.114
[illegible]	[illegible]

5 mmol R.H



BY D.A Yet
METHOD: HVORSLEV, 1951
K= r² Ln (L/R) / 2 L To
K= HYDRAULIC CONDUCTIVITY
r= RADIUS OF CASING
R= RADIUS OF WELL AND GRAVEL PACK
L= LENGTH OF SCREEN / SATURATED THICKNESS
to = TIME FOR WATER LEVEL TO RISE OR FALL 37% OF INITIAL CHANGE.
r= 0.167 FEET
R= 0.458 FEET
L= 10.6 FEET = (34.04 − 12.44) − (31.00 − 20)
to= 2.45 MINUTES
K= (0.167)² Ln (10.6 / 0.458) / (2) (10.6) (2.45) = 1.69×10⁻³ Ft/min
= 2.11×10⁻³ Ft/min x 1440 FT/MIN = 2.4 FT/DAY
= 2.11×10⁻³ Ft/min x 0.508 = 8.57 × 10⁻⁴ CM/SEC
to= 2.45 MINUTES
Checked by [illegible] 11/10/95
0.37
h-ho (feet)
K+E SEMI-LOGARITHMIC KEUFFEL & ESSER CO.
46 4650

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Brown & Root Environmental

PROJECT NAME: INDIAN HEAD WELL/BORING NO.: S26-MW03

PROJECT NO.: 5280 GEOLOGIST: MARSHALL / YOST

WELL DIAMETER: 4" SCREEN LENGTH/DEPTH: 10'-20' TEST NO.: MW 5

STATIC WATER LEVEL (Depth/Elevation): 12.44 DATE: 10/15/95

TEST TYPE (Rising/Falling/Constant Head): RISING HEAD CHECKED:

METHOD OF INDUCING WATER LEVEL CHANGE: 3" SLUG, 3 1/2' LONG PAGE 6 OF 7

REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): TOC

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	~~ELAPSED TIME (min. or sec.)~~ H/Ho	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet) H/Ho
0		2.162	1.00	1 min	0.46
2		0.927	0.42	1.2	0.45
5		0.856	0.39	1.4	0.44
10		0.795	0.36	1.6	0.44
20		0.772	0.35	1.8	0.43
30		0.766	0.35	2.0	0.42
40		0.762	0.35	2.8	0.42
50		0.759	0.35		
60		0.756	0.35		
0.2		1.298	0.60		
0.4		1.114	0.52		
0.6		1.056	0.49		
0.8		1.070	0.47		

WELL SCHEMATIC

WELL ⌀ 4"

BOREHOLE ⌀ 11"

DEPTHS (BGL):

SEAL 8'

10'

OPEN INTERVAL / SCREEN 20'

GRAVEL 20'

Indicates SWL Depth on Drawing

REMARKS:

XD = 7.09

CALCS, SKETCH MAPS, ETC.:

-

SE1000C
Environmental Logger
10/18 08:22

Unit# 00000 Test 4

Setups:	INPUT 1
Type	Level (F)
Mode	TOC
I.D.	00007

Reference	0.000
Linearity	0.030
Scale factor	0.080
Offset	-0.130
Delay mSEC	50.000

Step 0 10/18 07:02:57

Z6 MW3
Rising head slug test

Elapsed Time	INPUT 1
0.0000	0.804
0.0033	0.888
0.0066	1.084
0.0100	1.330
0.0133	1.888
0.0166	2.002
T.O → 0.0200	2.130
0.0233	2.093
0.0266	2.041
0.0300	2.088
0.0333	2.028
0.0366	1.998
0.0400	1.978
0.0433	1.954
0.0466	1.943
0.0500	1.910
0.0533	1.898
0.0566	1.883
0.0600	1.858
0.0633	1.841
0.0666	1.818
0.0700	1.803
0.0733	1.780
0.0766	1.761
0.0800	1.745
0.0833	1.738
0.0866	1.710
0.0900	1.703
0.0933	1.674
0.0966	1.658
→ 0.1000	1.647
0.1033	1.623
[illegible]	[illegible]

[illegible]	[illegible]
0.1200	1.882
0.1233	[illegible]
0.1266	[illegible]
0.1300	[illegible]
0.1333	[illegible]
0.1366	[illegible]
0.1400	[illegible]
0.1433	[illegible]
0.1466	[illegible]
0.1500	[illegible]
0.1533	[illegible]
0.1566	[illegible]
0.1600	[illegible]
0.1633	1.788
0.1666	1.781
0.1700	[illegible]
0.1733	[illegible]
0.1766	[illegible]
0.1800	[illegible]
0.1833	[illegible]
0.1866	[illegible]
0.1900	[illegible]
0.1933	[illegible]
0.1966	[illegible]
0.2000	[illegible]
0.2033	1.281
0.2066	1.285
0.2100	1.278
0.2133	1.272
0.2166	1.267
0.2200	1.260
0.2233	1.256
0.2266	1.250
0.2300	1.248
0.2333	1.240
0.2366	1.236
0.2400	1.233
0.2433	1.227
0.2466	1.222
0.2500	1.220
0.2533	1.211
0.2566	1.216
0.2600	1.207
0.2633	1.204
0.2666	1.201
0.2700	1.198
0.2733	1.194
0.2766	1.191
0.2800	1.188
0.2833	1.185
0.2866	1.182
0.2900	1.182
0.2933	1.179
0.2966	1.175
0.3000	1.172
0.3033	[illegible]
0.3066	[illegible]
0.3100	1.165
0.3133	[illegible]
0.3166	[illegible]
0.3200	[illegible]
0.3233	[illegible]
0.3266	[illegible]

26 mw3
R.H.

[illegible]	[illegible]
0.3666	1.13?
0.3833	1.12?
0.4000	1.11?
0.4166	1.11?
0.4333	1.10?
0.4500	1.105
0.4666	1.103
0.4833	1.092
0.5000	1.079
0.5166	1.075
0.5333	1.072
0.5500	1.068
0.5666	1.062
0.5833	1.060
0.6000	1.052
0.6166	1.050
0.6333	1.048
0.6500	1.045
0.6666	1.043
0.6833	1.040
0.7000	1.038
0.7166	1.033
0.7333	1.030
0.7500	1.027
0.7666	1.024
0.7833	1.023
0.8000	1.020
0.8166	1.017
0.8333	1.017
0.8500	1.014
0.8666	1.011
0.8833	1.011
0.9000	1.007
0.9166	1.005
0.9333	1.004
0.9500	1.001
0.9666	1.001
0.9833	0.998
1.0000	0.995
1.2000	0.975
1.4000	0.960
1.6000	0.948
1.8000	0.937
2.0000	0.927
2.2000	0.921
2.4000	0.914
2.6000	0.907
2.8000	0.901
3.0000	0.897
3.2000	0.891
3.4000	0.885
3.6000	0.880
3.8000	0.876
4.0000	0.872
4.2000	0.869
4.4000	0.866
4.6000	0.862
4.8000	0.858
5.0000	0.855
5.2000	0.850
5.4000	0.848
5.6000	0.843
5.8000	[illegible]

26 MW3

R. H

[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
7.2000	0.817
7.8000	0.81[illegible]
[illegible]	0.8[illegible]
[illegible]	[illegible]
[illegible]	0.807
[illegible]	0.807
[illegible]	0.80[illegible]
[illegible]	0.80[illegible]
[illegible]	0.801
[illegible]	0.801
[illegible]	0.801
[illegible]	0.798
10.0000	0.795
12.0000	0.789
14.0000	0.783
16.0000	0.779
18.0000	0.775
20.0000	0.771
22.0000	0.772
24.0000	0.769
26.0000	0.760
28.0000	0.760
30.0000	0.766
32.0000	0.768
34.0000	0.768
36.0000	0.762
38.0000	0.762
40.0000	0.760
42.0000	0.760
44.0000	0.763
46.0000	0.760
48.0000	0.760
50.0000	0.762
52.0000	0.760
54.0000	0.760
56.0000	0.760
58.0000	0.758
60.0000	0.758
62.0000	0.758
64.0000	0.758
66.0000	0.753
68.0000	0.753

END

Z6 MW3
R. H

G.3

GROUNDWATER FLOW VELOCITY

CALCULATION WORKSHEET Order No. 19118 (01-91)

PAGE ___ OF ___

CLIENT	JOB NUMBER
SUBJECT SEEPAGE VELOCITY CALCS FOR Indian Head - Stump Neck ANNEX	
BASED ON	DRAWING NUMBER

BY	CHECKED BY	APPROVED BY	DATE
D YOST			12-8-94

$V = \frac{Ki}{n}$ WHERE V = AVERAGE LINEAR FLOW VELOCITY
K = HYDRAULIC CONDUCTIVITY
i = GROUNDWATER FLOW GRADIENT
n = EFFECTIVE POROSITY = ASSUME = 0.30

IED SITE

$K = 2.99 \times 10^{-4}$ cm/sec $\times \frac{1 \text{ FT/min}}{0.508 \text{ cm/sec}} = 5.89 \times 10^{-4}$ FT/min $\times \frac{60 \text{ min}}{\text{hr}} \times \frac{24 \text{ hr}}{\text{DAY}}$

$= 0.85$ FT/day $\times \frac{365 \text{ day}}{\text{YR}} = 309$ FT / YR

$V = \frac{(309 \text{ FT/YR}) \times (0.034 \text{ ft/ft})}{(0.30)} = 35$ FEET / YEAR

AREA 8

$K = 5.20 \times 10^{-4} \frac{\text{cm}}{\text{sec}} \times \frac{1 \text{ FT/min}}{0.508 \text{ cm/sec}} = 1.02 \times 10^{-3}$ FT/min $\times \frac{60 \text{ min}}{\text{hr}} \times \frac{24 \text{ HR}}{\text{DAY}} = 1.47$ ft/d.

$1.47 \text{ FT/day} \times \frac{365 \text{ day}}{\text{YR}} = 538$ ft/YR

$V = \frac{(538)(0.043)}{(0.30)} = 77.1$ ft/YR

APPENDIX H

STANDARD OPERATING PROCEDURES (SOPs)

H.1 SA-6.1
H.2 SA-6.2

H.1 SA-6.1

STANDARD OPERATING PROCEDURES

Number	SA-6.1
Page	1 of 14
Effective Date	05/04/90
Revision	2
Applicability	EMG
Prepared	Earth Sciences
Approved	D. Senovich

Subject: SAMPLE IDENTIFICATION AND CHAIN-OF-CUSTODY

TABLE OF CONTENTS

1.0 PURPOSE

This purpose of this procedure is to provide information on chain-of-custody procedures to be used under the NUS Program.

2.0 SCOPE

This procedure describes the steps necessary for transferring samples through the use of Chain-of-Custody Records. A Chain-of-Custody Record is required, without exception, for the tracking and recording of all samples collected for on-site or off-site analysis (chemical or geotechnical) during program activities. Use of the Chain-of-Custody Record Form creates an accurate written record that can be used to trace the possession and handling of the sample from the moment of its collection through analysis and its introduction as evidence. This procedure identifies the necessary custody records and describes their completion.

This procedure does not take precedence over region-specific or site-specific requirements for chain-of-custody.

3.0 GLOSSARY

Chain-of-Custody Record Form - A Chain-of-Custody Record Form is a printed two-part form that accompanies a sample or group of samples as custody of the sample(s) is transferred from one custodian to another custodian. A Chain-of-Custody Record Form is a controlled document, provided by the regional office of EPA.

The chain-of-custody form is a two-page carbon-copy type form. The original form accompanies the samples during shipment, and the pink carbon-copy is retained in the project file.

Controlled Document - A consecutively-numbered form released by EPA or Program Management Office (PMO) for use on a particular work assignment. All unused forms must be returned or accounted for at the conclusion of the assignment.

Custodian - The person responsible for the custody of samples at a particular time, until custody is transferred to another person (and so documented), who then becomes custodian. A sample is under your custody if:

- It is in your actual possession.
- It is in your view, after being in your physical possession.
- It was in your physical possession and then you locked it up to prevent tampering.
- It is in a designated and identified secure area.

Sample - A sample is physical evidence collected from a facility or the environment, which is representative of conditions at the point and time that it was collected.

4.0 RESPONSIBILITIES

Field Operations Leader - Responsible for determining that chain-of-custody procedures are implemented up to and including release to the shipper.

Field Samplers - Responsible for initiating the Chain-of-Custody Record and maintaining custody of samples until they are relinquished to another custodian, to the shipper, or to the common carrier.

Remedial Investigation Leader - Responsible for determining that chain-of-custody procedures have been met by the sample shipper and analytical laboratory.

5.0 PROCEDURES

5.1 OVERVIEW

The term "chain-of-custody" refers to procedures which ensure that evidence presented in a court of law is what it is represented to be. The chain-of-custody procedures track the evidence from the time and place it is first obtained to the courtroom and, secondly, provide security for the evidence as it is moved and/or passes from the custody of one individual to another.

Chain-of-custody procedures, recordkeeping, and documentation are an important part of the management control of samples. Regulatory agencies must be able to provide the chain of possession and custody of any samples that are offered for evidence, or that form the basis of analytical test results introduced as evidence. Written procedures must be available and followed whenever evidence samples are collected, transferred, stored, analyzed, or destroyed.

5.2 SAMPLE IDENTIFICATION

The method of identification of a sample depends on the type of measurement or analysis performed. When in-situ measurements are made, the data are recorded directly in bound logbooks or other field data records, with identifying information.

5.2.1 Sample Label

Samples, other than in-situ measurements, are removed and transported from the sample location to a laboratory or other location for analysis. Before removal, however, a sample is often divided into portions, depending upon the analyses to be performed. Each portion is preserved in accordance with the Sampling Plan. Each sample container is identified by a sample label (see Attachment B). Sample labels are provided by the PMO. The information recorded on the sample label includes:

- **Project:** EPA Work Assignment Number (can be obtained from the Sampling Plan).
- **Station Location:** The unique sample number identifying this sample (can be obtained from the Sampling Plan).
- **Date:** A six-digit number indicating the day, month, and year of sample collection; e.g., 12/21/85.
- **Time:** A four-digit number indicating the 24-hour time of collection (for example: 0954 is 9:54 a.m., and 1629 is 4:29 p.m.).
- **Medium:** Water, soil, sediment, sludge, waste, etc.

- Concentration: The expected concentration (i.e., low, medium, high).
- Sample Type: Grab or composite.
- Preservation: Type of preservation added and pH levels.
- Analysis: VOA, BNAs, PCBs, pesticides, metals, cyanide, other.
- Sampled By: Printed name of the sampler.
- Case Number: Case number assigned by the Sample Management Office.
- Traffic Report Number: Number obtained from the traffic report labels.
- Remarks: Any pertinent additional information.

Using just the work assignment number of the sample label maintains the anonymity of sites. This may be necessary, even to the extent of preventing the laboratory performing analysis from knowing the identity of the site (e.g., if the laboratory is part of an organization that has performed previous work on the site).

5.2.2 Sample Identification Tag

A Sample Identification Tag (Attachment F) must also be used for samples collected for CLP (Contract Laboratory Program) analysis. The Sample Identification Tag is a white, waterproof paper label, approximately 3-by-6 inches, with a reinforced eyelet, and string or wire for attachment to the neck of the sample bottle. The Sample Tag is a controlled document, and is provided by the regional EPA office. Following sample analysis, the Sample Tag is retained by the laboratory as evidence of sample receipt and analysis.

The following information is recorded on the tag:

- Project Code: Work Assignment Number.
- Station Number: The middle portion of the Station Location Number, (between the hyphens).
- Month/Day/Year: Same as Date on Sample Label.
- Time: Same as Time on Sample Label.
- Designate - Comp/Grab: Composite or grab sample.
- Station Location: Same as Station Location on Sample Label.
- Samplers: Same as Sampled By on Sample Label.
- Preservative: Yes or No.
- Analyses: Check appropriate box(es).

- **Remarks:** Same as Remarks on Sample Label (make sure the Case Number and Traffic Report numbers are recorded).

- **Lab Sample Number:** For laboratory use only.

The tag is then tied around the neck of the sample bottle.

If the sample is to be split, it is aliquoted into similar sample containers. Identical information is completed on the label attached to each split.

Blank, duplicate, or field spike samples shall not be identified as such on the label, as they may compromise the quality control function. Sample blanks, duplicates, spikes, and splits are defined in Procedure SA-6.6.

5.3 CHAIN-OF-CUSTODY PROCEDURES

After collection, separation, identification, and preservation, the sample is maintained under chain-of-custody procedures until it is in the custody of the analytical laboratory and has been stored or disposed of.

5.3.1 Field Custody Procedures

- Samples are collected as described in the site-specific Sampling Plan. Care must be taken to record precisely the sample location and to ensure that the sample number on the label matches the sample log sheet and Chain-of-Custody Record exactly.

- The person undertaking the actual sampling in the field is responsible for the care and custody of the samples collected until they are properly transferred or dispatched.

- When photographs are taken of the sampling as part of the documentation procedure, the name of the photographer, date, time, site location, and site description are entered sequentially in the site logbook as photos are taken. Once developed, the photographic prints shall be serially numbered, corresponding to the logbook descriptions.

- Sample labels shall be completed for each sample, using waterproof ink unless prohibited by weather conditions, e.g., a logbook notation would explain that a pencil was used to fill out the sample label because a ballpoint pen would not function in freezing weather.

5.3.2 Transfer of Custody and Shipment

Samples are accompanied by a Chain-of-Custody Record Form. Chain-of-Custody Record Forms used in EPA Regions I-IV are shown in Attachments A through D. The appropriate form shall be obtained from the EPA Regional Office. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the Record. This Record documents sample custody transfer from the sampler, often through another person, to the analyst in the laboratory. The Chain-of-Custody Record is filled out as follows:

- Enter header information (project number, samplers, and project name – project name can be obtained from the Sampling Plan).

- Sign, date, and enter the time under "Relinquished by" entry.

- Enter station number (the station number is the middle portion of the station location number, between the hyphens).
- Check composite or grab sample.
- Enter station location number (the same number as the station location on the tag and label).
- Enter the total number of containers per station number and the type of each bottle.
- Enter either the inorganic traffic report number, the organic traffic report number, or the SAS number for each station number in the remarks column.
- Enter the tag number from the bottom of the sample identification tag in the remarks column for each station location.
- Make sure that the person receiving the sample signs the "Received by" entry, or enter the name of the carrier (e.g., UPS, Federal Express) under "Received by." Receiving laboratory will sign "Received for Laboratory by" on the lower line and enter the date and time.
- Enter the bill-of-lading or Federal Express airbill number under "Remarks," in the bottom right corner, if appropriate.
- Place the original (top, signed copy) of the Chain-of-Custody Record Form in the appropriate sample shipping package. Retain the pink copy with field records.
- Sign and date the custody seal, a 1- by 3-inch white paper label with black lettering and an adhesive backing. Attachment G is an example of a custody seal. The custody seal is part of the chain-of-custody process and is used to prevent tampering with samples after they have been collected in the field. Custody seals are provided by ZPMO on an as-needed basis.
- Place the seal across the shipping container opening so that it would be broken if the container is opened.
- Complete other carrier-required shipping papers.

The custody record is completed using black waterproof ink. Any corrections are made by drawing a line through and initialing and dating the change, then entering the correct information. Erasures are not permitted.

Common carriers will usually not accept responsibility for handling Chain-of-Custody Record Forms; this necessitates packing the record in the sample container (enclosed with other documentation in a plastic zip-lock bag). As long as custody forms are sealed inside the sample container and the custody seals are intact, commercial carriers are not required to sign off on the custody form.

If sent by mail, the package will be registered with return receipt requested. If sent by common carrier or air freight, proper documentation must be maintained.

The laboratory representative who accepts the incoming sample shipment signs and dates the Chain-of-Custody Record, completing the sample transfer process. It is then the laboratory's responsibility to maintain internal logbooks and custody records throughout sample preparation and analysis.

5.3.3 Receipt for Samples Form

Whenever samples are split with a private party or government agency, a separate Receipt for Samples Record Form is prepared for those samples and marked to indicate with whom the samples are being split. The person relinquishing the samples to the party or agency shall require the signature of a representative of the appropriate party acknowledging receipt of the samples. If a representative is unavailable or refuses to sign, this is noted in the "Received by" space. When appropriate, as in the case where the representative is unavailable, the custody record shall contain a statement that the samples were delivered to the designated location at the designated time. This form must be completed and a copy given to the owner, operator, or agent-in-charge even if the offer for split samples is declined. The original is retained by the Field Operations Leader.

6.0 REFERENCES

U.S. EPA, 1984. User's Guide to the Contract Laboratory Program, Office of Emergency and Remedial Response, Washington, D.C.

7.0 ATTACHMENTS

Attachment A - Chain-of-Custody Record Form for use in Region I
Attachment B - Chain-of-Custody Record Form for use in Region II
Attachment C - Chain-of-Custody Record Form for use in Region III
Attachment D - Chain-of-Custody Record Form for use in Region IV
Attachment E - Sample Label
Attachment F - Sample Identification Tag
Attachment G - Chain-of-Custody Seal

ATTACHMENT A
CHAIN-OF-CUSTODY RECORD FORM FOR USE IN REGION I
(Original is 8-1/2 by 11)

PROJECT NAME							
SAMPLERS: (Signature)						NO. OF CON-TAINERS	REMARKS
STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION		

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks:	

ATTACHMENT B
CHAIN-OF-CUSTODY RECORD FORM FOR USE IN REGION II
(Original is 8 by 10-1/2)

CHAIN OF CUSTODY RECORD

ENVIRONMENTAL PROTECTION AGENCY – REGION II
SURVEILLANCE & ANALYSIS DIVISION
EDISON, NEW JERSEY 08817

Name of Unit and Address		
Sample Number	Number of Containers	Description of Samples

Person Assuming Responsibility for Sample	Time	Date

Sample Number	Relinquished By	Received By	Time	Date	Reason for Change of Custody

Sample Number	Relinquished By	Received By	Time	Date	Reason for Change of Custody

Sample Number	Relinquished By	Received By	Time	Date	Reason for Change of Custody

Sample Number	Relinquished By	Received By	Time	Date	Reason for Change of Custody

ATTACHMENT C
CHAIN-OF-CUSTODY RECORD FORM FOR USE IN REGION III
(Original is 8-1/2 x 11-3/4")

ENVIRONMENTAL PROTECTION AGENCY
Office of Enforcement

CHAIN OF CUSTODY RECORD

REGION 3
Curtis Bldg., 6th & Walnut Sts.
Philadelphia, Pennsylvania 19106

PROJ. NO.	PROJECT NAME					NO. OF CON-TAINERS								REMARKS
SAMPLERS: (Signature)														
STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION									

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks	

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

3-15966

ATTACHMENT D
CHAIN-OF-CUSTODY RECORD FORM FOR USE IN REGION IV
(Original is 8-1/2 by 14)

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 4

CHAIN OF CUSTODY RECORD

ENVIRONMENTAL SERVICES DIVISION
COLLEGE STATION ROAD
ATHENS, GEORGIA

Nº 4 3526

ATTACHMENT E
SAMPLE LABEL

PROJECT: ________________

STATION LOCATION: ________________

DATE: ___/___/___ TIME: __________ hrs.

MEDIA: WATER ☐ SOIL ☐ SEDIMENT ☐ __________ ☐

CONCENTRATION: LOW ☐ MED ☐ HIGH ☐

TYPE: GRAB ☐ COMPOSITE ☐

ANALYSIS	PRESERVATION
VOA ☐ SNA's ☐	Cool to 4°C ☐
PCB's ☐ PESTICIDES ☐	HNO_3 to pH <2 ☐
METALS: TOTAL ☐ DISSOLVED ☐	NAOH to pH>12 ☐
CYANIDE ☐	__________ ☐
__________ ☐	

Sampled by: ________________

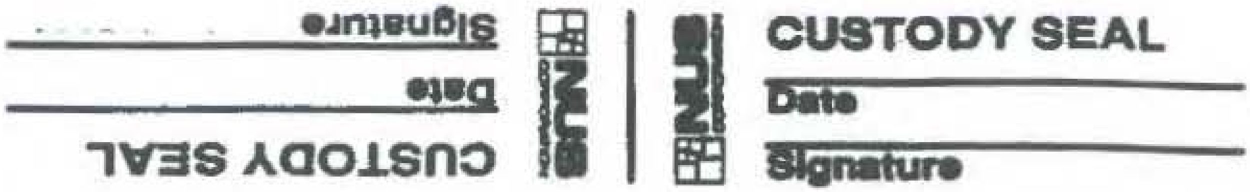
Case No.: ________ Traffic Report No.: ________

Remarks:

ACFILE: FORMS\SOTLABL

ATTACHMENT F
SAMPLE IDENTIFICATION TAG

ATTACHMENT G
CHAIN-OF-CUSTODY SEAL


CUSTODY SEAL
Date
Signature
CUSTODY SEAL
Date
Signature

H.2 SA-6.2

NUS CORPORATION ENVIRONMENTAL MANAGEMENT GROUP	STANDARD OPERATING PROCEDURES	Number SA-6.2	Page 1 of 12
		Effective Date 05/04/90	Revision 2
		Applicability EMG	
		Prepared Earth Sciences	
Subject SAMPLE PACKAGING AND SHIPPING		Approved D. Senovich	

TABLE OF CONTENTS

1.0 PURPOSE

This procedure provides instruction for sample packaging and shipping in accordance with U.S. Department of Transportation (DOT) regulations.

2.0 SCOPE

Samples collected at hazardous waste sites usually have to be transported elsewhere for analysis. This requires that the samples be appropriately preserved to prevent or minimize chemical alteration prior to analysis, and be transported to protect their integrity, as well as to protect against any detrimental effects from leakage or breakage. Regulations for packaging, marking, labeling, and shipping hazardous materials and wastes are promulgated by the U.S. Department of Transportation and described in the Code of Federal Regulations (49 CFR 171 through 177, in particular 172.402h, Packages Containing Samples). In general, these regulations were not intended to cover shipment of samples collected at controlled or uncontrolled hazardous waste sites or samples collected during emergency responses. However, the EPA has agreed through a memorandum of agreement to package, mark, label, and ship samples observing DOT procedures. The information presented here is for general guidance.

This procedure is applicable to all samples taken from uncontrolled hazardous substance sites for analysis at laboratories away from the site.

3.0 GLOSSARY

Carrier - A person or firm engaged in the transportation of passengers or property.

Hazardous Material - A substance or material in a quantity and form which may pose an unreasonable risk to health and safety or property when transported in commerce ("commerce" here to include any traffic or transportation). Defined and regulated by DOT (49 CFR 173.2) and listed in Attachment A of this guideline.

Hazardous Waste - Any substance listed in 40 CFR Subpart D (¥261.20 et seq) or otherwise characterized as ignitable, corrosive, reactive, or EP toxic as specified under 40 CFR Subpart C (¥261.20 et seq) that would be subject to manifest requirements specified in 40 CFR 262. Defined and regulated by EPA.

Marking - Applying the descriptive name, instruction, cautions, weight, or specification marks or combination thereof required to be placed outside containers of hazardous materials.

n.o.i. - Not otherwise indicated.

n.o.s. - Not otherwise specified.

ORM - Other regulated material.

Packaging - The assembly of one or more containers and any other components necessary to assure compliance with the minimum packaging requirements of 49 CFR 174, including containers (other than freight containers or overpacks), portable tanks, cargo tanks, tank cars, multiunit tank car tanks.

Placard - Color-coded, pictorial sign depicting the hazard class symbol and name to be placed on all four sides of a vehicle transporting certain hazardous materials.

Reportable Quantity (RQ) - A parenthetical note of the form "(RQ-1000/454)" following an entry in the DOT Hazardous Materials table (49 CFR 172.101) indicates the reportable quantity of the substance in pounds and kilograms. If a spill of that amount or more of the substance occurs during transit or storage, a report must be filed with DOT according to ¥171.15-15 concerning hazardous materials incidents reports. If the material spilled is a hazardous waste, a report must always be filed, regardless of the amount, and must include a copy of the manifest. If the RQ notation appears, it must be shown either immediately before or after the proper shipping name on the shipping paper (or manifest). Most shipping papers and manifests will have a column designated "HM" which may be used for this purpose.

4.0 RESPONSIBILITIES

Field Operations Leader or Team Sampling Leader - responsible for determining that samples are properly packaged and shipped.

Sampling Personnel - responsible for implementing the packaging and shipping requirements.

5.0 PROCEDURES

5.1 INTRODUCTION

Samples collected for shipment from a site shall be classified as either environmental or hazardous material (or waste) samples. In general, environmental samples are collected off-site (for example from streams, ponds, or wells) and are not expected to be grossly contaminated with high levels of hazardous materials. On-site samples (for example, soil, water, and materials from drums or bulk storage tanks, obviously contaminated ponds, lagoons, pools, and leachates from hazardous waste sites) are considered hazardous. A distinction must be made between the two types of samples in order to:

- Determine appropriate procedures for transportation of samples. If there is any doubt, a sample shall be considered hazardous and shipped accordingly.
- Protect the health and safety of laboratory personnel receiving the samples. Special precautions are used at laboratories when samples other than environmental samples are received.

5.2 ENVIRONMENTAL SAMPLES

5.2.1 Packaging

Environmental samples may be packaged following the procedures outlined in Section 5.4 for samples classified as "flammable liquids" or "flammable solids." Requirements for marking, labeling, and shipping papers do not apply.

Environmental samples may also be packed without being placed inside metal cans as required for flammable liquids or solids.

- Place sample container, properly identified and with a sealed lid, in a polyethylene bag, and seal the bag.
- Place sample in a fiberboard container or metal picnic cooler which has been lined with a large polyethylene bag.
- Pack with enough noncombustible, absorbent, cushioning materials to minimize the possibility of the container breaking.
- Seal large bag.
- Seal or close outside container.

5.2.2 Marking Labeling

Sample containers must have a completed sample identification tag and the outside container must be marked "Environmental Sample." The appropriate side of the container must be marked "This End Up" and arrows placed appropriately. No DOT marking or labeling are required.

5.2.3 Shipping Papers

No DOT shipping papers are required. However, the appropriate chain-of-custody forms must be included with the shipment.

5.2.4 Transportation

There are no DOT restrictions on mode of transportation.

5.3 DETERMINATION OF SHIPPING CLASSIFICATION FOR HAZARDOUS MATERIAL SAMPLES

Samples not determined to be environmental samples, or samples known or expected to contain hazardous materials, must be considered hazardous material samples and transported according to the requirements listed below.

5.3.1 Known Substances

If the substance in the sample is known or can be identified, package, mark, label and ship according to the specific instructions for that material (if it is listed) in the DOT Hazardous Materials Table, 49 CFR 172.101.

Unz and Company have published the following steps to help in locating a proper shipping name from the Hazardous Materials Table, 49 CFR 172.101.

1. Look first for the chemical or technical name of the material, for example, ethyl alcohol. Note that many chemicals have more than one technical name, for example, perchloroethylene (not listed in 172.101) is also called tetrachloroethylene (listed 172.101). It may be useful to consult a chemist for all possible technical names a material can have. If your material is not listed by its technical name then. . . . . . .

2. Look for the chemical family name. For example, pentyl alcohol is not listed but the chemical family name is: alcohol, n.o.s. (not otherwise specified). If the chemical family name is not listed then. . . . .

3. Look for a generic name based on end use. For example, Paint, n.o.s or Fireworks, n.o.s. If a generic name based on end use is not listed then. . . . .

4. Look for a generic family name based on end use, for example, drugs, n.o.s. or cosmetics, n.o.s. Finally, if your material is not listed by a generic family name but you suspect or know the material is hazardous because it meets the definition of one or more hazardous classes, then. . . . .

5. You will have to go the the general hazard class for a proper shipping name. For example, Flammable Liquid, n.o.s, or Oxidizer, n.o.s.

5.3.2 Unknown Substances

For samples of hazardous substances of unknown content, select the appropriate transportation category according to the DOT Hazardous Materials Classification (Attachment A), a priority system of transportation categories.

The correct shipping classification for an unknown sample is selected through a process of elimination, utilizing Attachment A. Unless known or demonstrated otherwise (through the use of radiation survey instruments), the sample is considered radioactive and appropriate shipping regulations for "radioactive material" followed.

If a radioactive material is eliminated, the sample is considered to contain "Poison A" materials (Attachment B), the next classification on the list. DOT defines "Poison A" as extremely dangerous poisonous gases or liquids of such a nature that a very small amount of gas, or vapor of the liquids, mixed with air is dangerous to life. Most Poison A materials are gases or compressed gases and would not be found in drum-type containers. Liquid Poison A would be found only in closed containers; however,all samples taken from closed drums do not have to be shipped as Poison A, which provides for a "worst case" situation. Based upon information available, a judgment must be made whether a sample from a closed container is a Poison A.

If Poison A is eliminated as a shipment category, the next two classifications are "flammable" or "nonflammable" gases. Since few gas samples are collected, "flammable liquid" would be the next applicable category. With the elimination of radioactive material, Poison A, flammable gas, and nonflammable gas, the sample can be classified as flammable liquid (or solid) and shipped accordingly. These procedures would also suffice for shipping any other samples classified below flammable liquids in the DOT classification table (Attachment A). For samples containing unknown materials, categories listed below flammable liquids/solids on Attachment A are generally not used because showing that these materials are not flammable liquids (or solids) requires flashpoint testing, which may be impractical and possibly dangerous at a site. Thus, unless the sample is known to consist of materials listed as less hazardous than flammable liquid (or solid) on Attachment A, it is considered a flammable liquid (or solid) and shipped as such.

For any hazardous material shipment, utilize the shipping checklist (Attachment C) as a guideline to ensure that all sample-handling requirements are satisfied.

5.4 PACKAGING AND SHIPPING OF SAMPLES CLASSIFIED AS FLAMMABLE LIQUID (OR SOLID)

5.4.1 Packaging

Applying the word "flammable" to a sample does not imply that it is in fact flammable. The word prescribes the class of packaging according to DOT regulations.

1. Collect sample in the prescribed container with a nonmetallic, Teflon-lined screw cap. To prevent leakage, fill container no more than 90 percent full.

2. Complete sample label and sample identification tag and attach securely to sample container.

3. Seal container and place in 2-mil thick (or thicker) polyethylene bag, one sample per bag. Position sample identification tag so that it can be read through bag. Seal bag.

4. Place sealed bag inside metal can and cushion it with enough noncombustible, absorbent material (for example, vermiculite or diatomaceous earth) between the bottom and sides of the can and bag to prevent breakage and absorb leakage. Pack one bag per can. Use clips, tape, or other positive means to hold can lid securely, tightly and permanently. Mark can as indicated in Paragraph 1 of Section 5.4.2, below.

5. Place one or more metal cans (or single 1-gallon bottle) into a strong outside container, such as a metal picnic cooler or a DOT-approved fiberboard box. Surround cans with noncombustible, absorbent cushioning materials for stability during transport. Mark container as indicated in Paragraph 2 of Section 5.4.2.

5.4.2 Marking/Labeling

1. Use abbreviations only where specified. Place the following information, either hand-printed or in label form, on the metal can (or 1-gallon bottle):

   - Laboratory name and address.

   - "Flammable Liquid, n.o.s. UN1993" or "Flammable Solid, n.o.s. UN1325."

Not otherwise specified (n.o.s) is not used if the flammable liquid (or solid) is identified. Then the name of the specific material is listed before the category (for example, Acetone, Flammable Liquid), followed by its appropriate UN number found in the DOT Hazardous Materials table (49 CFR 172.101).

2. Place all information on outside shipping container as on can (or bottle), specifically:

   - Proper shipping name.
   - UN or NA number.
   - Proper label(s).
   - Addressee and sender.

   Place the following labels on the outside shipping container: "Cargo Aircraft Only" and "Flammable Liquid" (or "Flammable Solid"). "Dangerous When Wet" label shall be used if the solid has not been exposed to a wet environment. "Laboratory Samples" and "THIS SIDE UP" or "THIS END UP" shall also be marked on the top of the outside container, and upward-pointing arrows shall be placed on all four sides of the container.

5.4.3 Shipping Papers

1. Use abbreviations only where specified. Complete the carrier-provided bill of lading and sign certification statement (if carrier does not provide, use standard industry form, see Attachment D). Provide the following information in the order listed (one form may be used for more than one exterior container).

   - "Flammable Liquid, n.o.s. UN1993" or "Flammable Solid, n.o.s. UN1325."
   - "Limited Quantity" (or "Ltd. Qty.").
   - "Cargo Aircraft Only."
   - Net weight (wt) or net volume (vol), just before or just after "Flammable Liquid, n.o.s." or "Flammable Solid, n.o.s.," by item, if more than one metal can is inside an exterior container.
   - "Laboratory Samples" (if applicable).

2. Include Chain-of-Custody Record, properly executed in outside container.

3. "Limited Quantity" of "Flammable Liquid, n.o.s." is limited to one pint per inner container. For "Flammable Solid, n.o.s.," net weight of inner container plus sample shall not exceed one pound; total package weight shall not exceed 25 pounds.

5.4.4 Transportation

1. Transport unknown hazardous substance samples classified as flammable liquids by rented or common carrier truck, railroad, or express overnight package services. Do not transport by any passenger-carrying air transport system, even if they have cargo-only aircraft. DOT regulations permit regular airline cargo-only aircraft, but difficulties with most suggest avoiding them. Instead, ship by airline carriers that only carry cargo.

2. For transport by government-owned vehicle, including aircraft, DOT regulations do not apply. However, procedures described above, with the exception of execution of the bill of lading with certification, shall still be used.

6.0 REFERENCES

U.S. Department of Transportation, 1983. Hazardous Materials Regulations, 49 CRF 171-177.

NUS Standard Operating Procedure SA-6.1 - Sample Identification and Chain-of-Custody

NUS Standard Operating Procedure SA-1.2 - Sample Preservation

NUS Standard Operating Procedure SF-1.5 - Compatibility Testing

7.0 ATTACHMENTS

Attachment A - DOT Hazardous Material Classification (49 CFR 173.2)
Attachment B - DOT List of Class "A" Poisons (49 CFR 172.101)
Attachment C - Hazardous Materials Shipping Checklist
Attachment D - Standard Industry Certification Form

ATTACHMENT A

DOT HAZARDOUS MATERIAL CLASSIFICATION (49 CFR 173.2)

1. Radioactive material (except a limited quantity)
2. Poison A
3. Flammable gas
4. Nonflammable gas
5. Flammable liquid
6 Oxidizer
7. Flammable Solid
8. Corrosive material (liquid)
9. Poison B
10. Corrosive material (solid)
11. Irritating material
12. Combustible liquid (in containers having capacities exceeding 110 gallons [416 liters])
13. ORM-B
14. ORM-A
15. Combustible liquid (in containers having capacities of 110 gallons [416 liters] or less)
16. ORM-E

ATTACHMENT B

DOT LIST OF CLASS "A" POISON (49 CFR 172.101)

Material	Physical State at Standard Temperature
Arsine	Gas
Bromoacetone	Liquid
Chloropicrin and methyl chloride mixture	Gas
Chloropicrin and nonflammable,nonliquefied compressed gas mixture	Gas
Cyanogen chloride	Gas (> 13.1°C)
Cyanogen gas	Gas
Gas identification set	Gas
Gelatin dynamite (H. E. Germaine)	----
Grenade (with Poison "A" gas charge)	----
Hexaethyl tetraphosphate/compressed gas mixture	Gas
Hydrocyanic (prussic) acid solution	Liquid
Hydrocyanic acid, liquefied	Gas
Insecticide (liquefied) gas containing Poison "A" or Poison "B" material	Gas
Methyldichloroarsine	Liquid
Nitric oxide	Gas
Nitrogen peroxide	Gas
Nitrogen tetroxide	Gas
Nitrogen dioxide, liquid	Gas
Parathion/compressed gas mixture	Gas
Phosgene (diphosgene)	Liquid

ATTACHMENT C
HAZARDOUS MATERIALS SHIPPING CHECKLIST

PACKAGING

1. Check DOT 172.500 table for appropriate type of package for hazardous substance.
2. Check for container integrity, especially the closure.
3. Check for sufficient absorbent material in package.
4. Check for sample tags and log sheets for each sample, and chain-of-custody record.

SHIPPING PAPERS

1. Check that entries contain only approved DOT abbreviations.
2. Check that entries are in English.
3. Check that hazardous material entries are specially marked to differentiate them from any nonhazardous materials being sent using same shipping paper.
4. Be careful all hazardous classes are shown for multiclass materials.
5. Check total amounts by weight, quantity, or other measures used.
6. Check that any limited-quantity exemptions are so designated on the shipping paper.
7. Offer driver proper placards for transporting vehicle.
8. Check that certification is signed by shipper.
9. Make certain driver signs for shipment.

RCRA MANIFEST

1. Check that approved state/federal manifests are prepared.
2. Check that transporter has the following: valid EPA identification number, valid driver's license, valid vehicle registration, insurance protection, and proper DOT labels for materials being shipped.
3. Check that destination address is correct.
4. Check that driver knows where shipment is going.
5. Check that the driver is aware of emergency procedures for spills and accidents.
6. Make certain driver signs for shipment
7. Make certain one copy of executed manifest and shipping document is retained by shipper.

ATTACHMENT D

STANDARD INDUSTRY CERTIFICATION FORM

NO PCS	SIZE	GROSS WEIGHT	[illegible]	D.O.T. PROPER SHIPPING NAME	HAZARD CLASS	[illegible]	[illegible]	CONTAINER NUMBERS	[illegible]	[illegible]
1	55 gal	300 lbs.	[illegible]	[illegible]	[illegible]	[illegible]	C	1	✓	
1	55 gal	450 lbs	[illegible]	Flammable liquid, n.o.s.	Flammable liquid	[illegible]	—	2		✓
1	55 gal	250 lbs	[illegible]	Flammable liquid, n.o.s.	Flammable liquid	[illegible]	B	3	✓	
1	[illegible]	12 lbs.	[illegible]	[illegible]	[illegible]	[illegible]	C	4	✓	

SHIPPER'S CERTIFICATION

This is to certify that the above named materials are properly classified, described, packaged, marked and labeled and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.

Shipper's Signature

Placards Req'd ______

Shipment Date ______ [illegible] No. ______

[illegible] ______

[illegible] ______

[illegible]

APPENDIX I

ANALYTICAL RESULTS

Summary of Soil Analytical Results - SWMU 5
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER: DEPTH (feet): LOCATION: SAMPLE DATE:	S05-MW01-01 0 - 2 MW01 9/20/95	S05-MW01-02 4 - 6 MW01 9/20/95	FD03 0 - 2 MW01 9/20/95	FD04 4 - 6 MW01 9/20/95	-	-	-
VOLATILES (UG/KG)							
1,1,1,2-TETRACHLOROETHANE	5.5 U	5.7 U		5.5 UJ			
1,1,1-TRICHLOROETHANE	0.19 U	0.19 U		0.19 UJ			
1,1,2,2-TETRACHLOROETHANE	0.58 U	0.60 U		0.58 UJ			
1,1,2-TRICHLOROETHANE	0.50 U	0.51 U		0.49 UJ			
1,1-DICHLOROETHANE	0.36 U	0.37 U		0.36 UJ			
1,1-DICHLOROETHENE	0.31 U	0.32 U		0.31 UJ			
1,2,3-TRICHLOROPROPANE	5.5 U	5.7 U		5.5 UJ			
1,2-DIBROMO-3-CHLOROPROPANE	110 U	113 U		109 UJ			
1,2-DIBROMOETHANE	5.5 U	5.7 U		5.5 UJ			
1,2-DICHLOROETHANE	5.5 U	5.7 U		5.5 UJ			
1,2-DICHLOROPROPANE	5.5 U	5.7 U		5.5 UJ			
1,4-DICHLORO-2-BUTENE	110 UJ	113 UJ		109 UJ			
1,4-DIOXANE	165 UR	170 UR		164 UR			
2-BUTANONE	4.2 UR	4.3 UR		4.1 UR			
2-HEXANONE	2.5 U	2.5 U		2.4 UJ			
4-METHYL-2-PENTANONE	1.5 J	1.7 U		1.7 UJ			
ACETONE	23.1 B	29.2 B		44.0 B			
ACETONITRILE	110 U	113 U		109 UJ			
ACROLEIN	12.7 U	13.1 U		12.6 UJ			
ACRYLONITRILE	5.5 U	5.7 U		5.5 UJ			
ALLYL CHLORIDE	5.5 U	5.7 U		5.5 UJ			
BENZENE	0.28 U	0.28 U		0.27 UJ			
BROMODICHLOROMETHANE	0.21 U	0.22 U		0.21 UJ			
BROMOFORM	2.9 U	3.0 U		2.9 UJ			
BROMOMETHANE	0.21 U	0.22 U		0.21 UJ			
CARBON DISULFIDE	1.3 U	1.3 U		1.3 UJ			
CARBON TETRACHLORIDE	0.13 U	0.14 U		0.13 UJ			
CHLOROBENZENE	0.40 U	0.41 U		0.39 UJ			
CHLOROETHANE	0.45 U	0.47 U		0.45 UJ			
CHLOROFORM	2.5 J	1.1 J		3.5 J			
CHLOROMETHANE	0.54 U	0.56 U		0.54 UJ			
CHLOROPRENE	5.5 UR	5.7 UR		5.5 UR			
CIS-1,3-DICHLOROPROPENE	0.30 U	0.31 U		0.30 UJ			

Summary of Soil Analytical Results - SWMU 5
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER: DEPTH (feet): LOCATION: SAMPLE DATE:	S05-MW01-01 0 - 2 MW01 9/20/95	S05-MW01-02 4 - 6 MW01 9/20/95	FD03 0 - 2 MW01 9/20/95	FD04 4 - 6 MW01 9/20/95	-	-	-
VOLATILES (UG/KG)							
DIBROMOCHLOROMETHANE	0.24 U	0.25 U		0.24 UJ			
DIBROMOMETHANE	5.5 U	5.7 U		5.5 UJ			
DICHLORODIFLUOROMETHANE	0.23 U	0.24 U		0.23 UJ			
ETHYLBENZENE	1.5 U	1.5 U		1.5 UJ			
IODOMETHANE	5.5 U	5.7 U		5.5 UJ			
ISOBUTYL ALCOHOL	55.0 U	56.7 U		54.6 UJ			
METHACRYLONITRILE	5.5 U	5.7 U		5.5 UJ			
METHYL METHACRYLATE	5.5 U	5.7 U		5.5 UJ			
METHYLENE CHLORIDE	16.8 B	26.6 B		66.5 B			
PENTACHLOROETHANE	5.5 U	5.7 U		5.5 UJ			
PROPIONITRILE	55.0 U	56.7 U		54.6 UJ			
STYRENE	0.33 U	0.34 U		0.33 UJ			
TETRACHLOROETHENE	0.96 U	0.99 U		0.95 UJ			
TOLUENE	0.30	0.31 U		1.3 J			
TRANS-1,2-DICHLOROETHENE	0.31 U	0.32 U		0.31 UJ			
TRANS-1,3-DICHLOROPROPENE	0.54 U	0.56 U		0.54 UJ			
TRICHLOROETHENE	0.29 U	0.30 U		0.28 UJ			
TRICHLOROFLUOROMETHANE	0.32 U	0.33 U		0.32 UJ			
VINYL ACETATE	0.31 UJ	0.32 UJ		0.31 UJ			
VINYL CHLORIDE	0.36 U	0.37 U		0.36 UJ			
XYLENES, TOTAL	0.76 U	0.78 U		0.75 UJ			
SEMIVOLATILES (UG/KG)							
1,2,4,5-TETRACHLOROBENZENE	363 U	373 U		360 U			
1,2,4-TRICHLOROBENZENE	34.7 U	35.7 U		34.4 U			
1,3,5-TRINITROBENZENE	363 U	373 U		360 U			
1,3-DINITROBENZENE	363 U	373 U		360 U			
1,4-NAPHTHOQUINONE	363 U	373 U		360 U			
1-NAPHTHYLAMINE	363 U	373 U		360 U			
2,2'-OXYBIS(1-CHLOROPROPANE)	363 U	373 U		360 U			
2,3,4,6-TETRACHLOROPHENOL	363 U	373 U		360 U			
2,4,5-TRICHLOROPHENOL	51.0 U	52.4 U		50.5 U			
2,4,6-TRICHLOROPHENOL	70.4 U	72.3 U		69.7 U			
2,4-DICHLOROPHENOL	50.5 U	51.9 U		50.0 U			

Summary of Soil Analytical Results - SWMU 5
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER: DEPTH (feet): LOCATION: SAMPLE DATE:	S05 MW01 01 0 - 2 MW01 9/20/95	S05 MW01 02 4 - 6 MW01 9/20/95	FD03 0 - 2 MW01 9/20/95	FD04 4 - 6 MW01 9/20/95	-	-	-
SEMIVOLATILES (UG/KG)							
2,4-DIMETHYLPHENOL	113 U	116 U		112 U			
2,4-DINITROPHENOL	178 U	183 U		177 U			
2,4-DINITROTOLUENE	518	25.4 U		24.5 U			
2,6-DICHLOROPHENOL	363 U	373 U		360 U			
2,6-DINITROTOLUENE	15.6 U	16.0 U		15.4 U			
2-ACETYLAMINOFLUORENE	363 U	373 U		360 U			
2-CHLORONAPHTHALENE	27.1 U	27.8 U		26.8 U			
2-CHLOROPHENOL	64.7 U	66.4 U		64.1 U			
2-METHYLNAPHTHALENE	43.8 U	45.0 U		43.4 U			
2-METHYLPHENOL	53.3 U	54.8 U		52.8 U			
2-NAPHTHYLAMINE	363 U	373 U		360 U			
2-NITROANILINE	56.2 U	57.8 U		55.7 U			
2-NITROPHENOL	64.7 U	66.4 U		64.1 U			
2-PICOLINE	363 U	373 U		360 U			
3,3'-DICHLOROBENZIDINE	356 U	365 U		352 U			
3,3'-DIMETHYLBENZIDINE	363 U	373 U		360 U			
3-METHYLCHOLANTHRENE	363 U	373 U		360 U			
3-METHYLPHENOL	363 U	373 U		360 U			
3-NITROANILINE	136 U	140 U		135 U			
4,6-DINITRO-2-METHYLPHENOL	62.6 U	64.3 U		62.0 U			
4-AMINOBIPHENYL	726 U	746 U		719 U			
4-BROMOPHENYL PHENYL ETHER	28.9 U	29.7 U		28.6 U			
4-CHLORO-3-METHYLPHENOL	57.7 U	59.2 U		57.1 U			
4-CHLOROANILINE	82.0 U	84.3 U		81.3 U			
4-CHLOROPHENYL PHENYL ETHER	21.8 U	22.4 U		21.6 U			
4-METHYLPHENOL	41.8 U	43.0 U		41.5 U			
4-NITROANILINE	64.1 U	65.9 U		63.6 U			
4-NITROPHENOL	128 U	131 U		126 U			
4-NITROQUINOLINE-1-OXIDE	1450 UR	1490 UR		1440 UR			
5-NITRO-O-TOLUIDINE	363 U	373 U		360 U			
7,12-DIMETHYLBENZ(A)ANTHRACENE	363 U	373 U		360 U			
A,A-DIMETHYLPHENETHYLAMINE	363 U	373 U		360 U			
ACENAPHTHENE	37.7 U	38.7 U		37.3 U			

Summary of Soil Analytical Results - SWMU 5
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER: DEPTH (feet): LOCATION: SAMPLE DATE:	S05-MW01-01 0 - 2 MW01 9/20/95	S05-MW01-02 4 - 6 MW01 9/20/95	FD03 0 - 2 MW01 9/20/95	FD04 4 - 6 MW01 9/20/95	- 	- 	-
SEMIVOLATILES (UG/KG)							
ACENAPHTHYLENE	37.2 U	38.3 U		36.9 U			
ACETOPHENONE	363 U	373 U		360 U			
ANILINE	363 U	373 U		360 U			
ANTHRACENE	25.5 U	26.2 U		25.3 U			
ARAMITE	726 U	746 U		719 U			
BENZO(A)ANTHRACENE	13.2 U	13.6 U		13.1 U			
BENZO(A)PYRENE	16.5 U	16.9 U		16.3 U			
BENZO(B)FLUORANTHENE	49.0 U	50.3 U		48.6 U			
BENZO(G,H,I)PERYLENE	50.4 U	51.8 U		50.0 U			
BENZO(K)FLUORANTHENE	40.4 U	41.6 U		40.1 U			
BENZYL ALCOHOL	49.4 U	50.8 U		49.0 U			
BIS(2-CHLOROETHOXY)METHANE	51.5 U	52.9 U		51.0 U			
BIS(2-CHLOROETHYL)ETHER	77.9 U	80.0 U		77.2 U			
BIS(2-ETHYLHEXYL)PHTHALATE	71.0 U	72.9 U		41.5 B			
BUTYL BENZYL PHTHALATE	102 U	105 U		102 U			
CHLOROBENZILATE	363 U	373 U		360 U			
CHRYSENE	20.5 U	21.0 U		20.3 U			
DI-N-BUTYL PHTHALATE	740	69.2 B		58.6 U			
DI-N-OCTYL PHTHALATE	52.1 U	53.5 U		51.6 U			
DIALLATE	363 UR	373 UR		360 UR			
DIBENZO(A,H)ANTHRACENE	41.7 U	42.8 U		41.3 U			
DIBENZOFURAN	28.0 U	28.7 U		27.7 U			
DIETHYL PHTHALATE	39.5 U	40.6 U		39.2 U			
DIMETHOATE	726 U	746 U		719 U			
DIMETHYL PHTHALATE	18.3 U	18.8 U		18.2 U			
DIPHENYLAMINE	363 U	373 U		360 U			
ETHYL METHACRYLATE	363 U	373 U		360 U			
FAMPHUR	726 UJ	746 UJ		719 UJ			
FLUORANTHENE	49.3 U	50.7 U		48.9 U			
FLUORENE	26.4 U	27.1 U		26.1 U			
HEXACHLOROBENZENE	21.6 U	22.2 U		21.4 U			
HEXACHLOROBUTADIENE	39.9 U	41.0 U		39.6 U			
HEXACHLOROCYCLOPENTADIENE	66.7 U	68.5 U		66.1 U			

Summary of Soil Analytical Results - SWMU 5
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER: DEPTH (feet): LOCATION: SAMPLE DATE:	S05-MW01-01 0 - 2 MW01 9/20/95	S05-MW01-02 4 - 6 MW01 9/20/95	FD03 0 - 2 MW01 9/20/95	FD04 4 - 6 MW01 9/20/95	- -	- -	- -
SEMIVOLATILES (UG/KG)							
HEXACHLOROETHANE	23.6 U	24.3 U		23.4 U			
HEXACHLOROPHENE	1820 UR	1860 UR		1800 UR			
HEXACHLOROPROPENE	363 U	373 U		360 U			
INDENO(1,2,3-CD)PYRENE	45.1 U	46.4 U		44.7 U			
ISODRIN	726 U	746 U		719 U			
ISOPHORONE	52.9 U	54.4 U		52.4 U			
ISOSAFROLE	363 U	373 U		360 U			
KEPONE	726 UR	746 UR		719 UR			
METHAPYRILENE	3630 U	3730 U		3600 U			
METHYL METHANESULFONATE	544 U	559 U		540 U			
N-NITROSO-DI-N-PROPYLAMINE	62.5 U	64.2 U		61.9 U			
N-NITROSODI-N-BUTYLAMINE	363 U	373 U		360 U			
N-NITROSODIETHYLAMINE	726 U	746 U		719 U			
N-NITROSODIMETHYLAMINE	54.7 U	56.2 U		54.2 U			
N-NITROSODIPHENYLAMINE	36.6 U	37.6 U		36.3 U			
N-NITROSOMETHYLETHYLAMINE	363 U	373 U		360 U			
N-NITROSOMORPHOLINE	363 U	373 U		360 U			
N-NITROSOPIPERIDINE	726 U	746 U		719 U			
N-NITROSOPYRROLIDINE	363 U	373 U		360 U			
NAPHTHALENE	33.6 U	34.5 U		33.2 U			
NITROBENZENE	49.5 U	50.8 U		49.0 U			
O,O,O-TRIETHYLPHOSPHOROTHIOATE	363 U	373 U		360 U			
O,O-DIETHYL-O-2-PYRAZINYLPHOSPHOROT	363 U	373 U		360 U			
O-TOLUIDINE	363 U	373 U		360 U			
P-DIMETHYLAMINOAZOBENZENE	363 U	373 U		360 U			
P-PHENYLENEDIAMINE	363 U	373 U		360 U			
PENTACHLOROBENZENE	363 U	373 U		360 U			
PENTACHLORONITROBENZENE	363 U	373 U		360 U			
PENTACHLOROPHENOL	116 U	119 U		114 U			
PHENACETIN	726 U	746 U		719 U			
PHENANTHRENE	41.0 U	42.1 U		40.6 U			
PHENOL	151 U	155 U		149 U			
PHORATE	363 U	373 U		360 U			

Summary of Soil Analytical Results - SWMU 5
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER: DEPTH (feet): LOCATION: SAMPLE DATE:	S05-MW01-01 0 - 2 MW01 9/20/95	S05-MW01-02 4 - 6 MW01 9/20/95	FD03 0 - 2 MW01 9/20/95	FD04 4 - 6 MW01 9/20/95	-	-	-
SEMIVOLATILES (UG/KG)							
PRONAMIDE	363 U	373 U		360 U			
PYRENE	90.6 U	93.0 U		89.8 U			
PYRIDINE	363 U	373 U		360 U			
SAFROLE	363 U	373 U		360 U			
EXPLOSIVES (UG/KG)							
1,3 DINITROBENZENE	37.2 U	37.2 U	37.2 U				
1,3,5 TRINITROBENZENE	40.2 U	40.2 U	40.2 U				
2,4 DINITROTOLUENE	51.6 U	51.6 U	51.6 U				
2,4,6-TRINITROTOLUENE	1560	1430	28400				
2,6 DINITROTOLUENE	47.6 U	47.6 U	47.6 U				
2-AMINO-4,6-DINITROTOLUENE	488 J	560 J	403 J				
2-NITROTOLUENE	81.4 U	81.4 U	81.4 U				
3-NITROTOLUENE	81.7 U	81.7 U	81.7 U				
4-AMINO-2,6-DINITROTOLUENE	40.8 U	40.8 U	40.8 U				
4-NITROTOLUENE	87.2 U	87.2 U	87.2 U				
HMX	597	511	516				
NITRO-BENZENE	35.2 U	35.2 U	35.2 U				
NITROCELLULOSE	5.9 U	7.3 U	7.3 U				
NITROGLYCERIN	10000 U	10000 U	10000 U				
NITROGUANIDINE	63.0 U	63.0 U	63.0 U				
PENTAERYTHRITOL TETRANITRATE	250 U	250 U	250 U				
RDX	3380	3350	1610				
TETRYL	163 U	163 U	163 U				
INORGANICS (MG/KG)							
ALUMINUM	6290	6130	5880				
ANTIMONY	0.19 UL	0.59 L	0.23 L				
ARSENIC	2.6	3.8	2.9				
BARIUM	26.4	30.3	20.2				
BERYLLIUM	0.25	0.29	0.19				
CADMIUM	0.96 L	1.1	1.4				
CALCIUM	87.5 B	126 K	78.4 B				
CHROMIUM	12.6	14.7	13.3				
COBALT	3.6	5.4	3.3				

Summary of Soil Analytical Results - SWMU 5
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER: DEPTH (feet): LOCATION: SAMPLE DATE:	S05 MW01-01 0 - 2 MW01 9/20/95	S05 MW01-02 4 - 6 MW01 9/20/95	FD03 0 - 2 MW01 9/20/95	FD04 4 - 6 MW01 9/20/95	-	-	-
INORGANICS (MG/KG)							
COPPER	54.3	37.9	41.3				
CYANIDE	1.1 U	1.1 U	1.1 U				
IRON	14300 J	12900 J	14400 J				
LEAD	30.3 L	38.9 L	25.2 L				
MAGNESIUM	323	377	281				
MANGANESE	82.6	97.4	89.9				
MERCURY	0.14 L	0.14 L	0.13 L				
NICKEL	4.9 J	8.2	6.2 J				
POTASSIUM	311	307	257				
SELENIUM	0.17 U	0.17 K	0.16 U				
SILVER	0.27	0.22	0.22				
SODIUM	37.8 B	28.0 B	37.5 B				
THALLIUM	0.28 U	0.28 U	0.27 U				
TIN	4.4 UJ	4.5 UJ	4.4 UJ				
VANADIUM	17.9	17.7	19.2				
ZINC	32.6	32.7	39.7				
INDICATOR PARAMETERS (MG/KG)							
AMMONIA	16.1 L	23.1 L	21.6 L				
NITRATE/NITRITE	3.8	3.0	3.0				
TOTAL ORGANIC CARBON	1400	2540	2770				

Summary of Groundwater Analytical Results - SWMU 5
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER:	5MW01	FD09	5MW01-F	FD09-F			
FILTERING:	Unfiltered	Unfiltered	Filtered	Filtered			
LOCATION:	5MW01	5MW01	5MW01	5MW01			
SAMPLE DATE:	10/04/95	10/04/95	10/04/95	10/04/95			
VOLATILES (UG/L)							
1,1,1,2-TETRACHLOROETHANE	5.0 UJ	5.0 UJ					
1,1,1-TRICHLOROETHANE	0.28 UJ	0.28 UJ					
1,1,2,2-TETRACHLOROETHANE	0.49 UJ	0.49 UJ					
1,1,2-TRICHLOROETHANE	0.28 UJ	0.28 UJ					
1,1-DICHLOROETHANE	0.29 UJ	0.29 UJ					
1,1-DICHLOROETHENE	0.37 UJ	0.37 UJ					
1,2,3-TRICHLOROPROPANE	5.0 UJ	5.0 UJ					
1,2-DIBROMO-3-CHLOROPROPANE	100 UJ	100 UJ					
1,2-DIBROMOETHANE	5.0 UJ	5.0 UJ					
1,2-DICHLOROETHANE	0.13 UJ	0.13 UJ					
1,2-DICHLOROPROPANE	0.23 UJ	0.23 UJ					
1,4-DICHLORO-2-BUTENE	100 UJ	100 UJ					
1,4-DIOXANE	150 UR	150 UR					
2-BUTANONE	1.5 UR	1.5 UR					
2-HEXANONE	0.67 UJ	0.67 UJ					
4-METHYL-2-PENTANONE	0.52 UJ	0.52 UJ					
ACETONE	3.1 B	1.6 B					
ACETONITRILE	100 UJ	100 UJ					
ACROLEIN	2.6 UJ	2.6 UJ					
ACRYLONITRILE	2.0 UJ	2.0 UJ					
ALLYL CHLORIDE	5.0 UJ	5.0 UJ					
BENZENE	0.14 UJ	0.14 UJ					
BROMODICHLOROMETHANE	0.16 UJ	0.16 UJ					
BROMOFORM	0.16 UJ	0.16 UJ					
BROMOMETHANE	0.41 UJ	0.41 UJ					
CARBON DISULFIDE	0.48 UJ	0.48 UJ					
CARBON TETRACHLORIDE	0.27 UJ	0.27 UJ					
CHLOROBENZENE	0.30 UJ	0.30 UJ					
CHLOROETHANE	0.49 UJ	0.49 UJ					
CHLOROFORM	0.18 UJ	0.18 UJ					
CHLOROMETHANE	0.32 UJ	0.32 UJ					
CHLOROPRENE	5.0 UR	5.0 UR					
CIS-1,3-DICHLOROPROPENE	0.21 UJ	0.21 UJ					

Summary of Groundwater Analytical Results - SWMU 5
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER: FILTERING: LOCATION: SAMPLE DATE:	5MW01 Unfiltered 5MW01 10/04/95	FD09 Unfiltered 5MW01 10/04/95	5MW01-F Filtered 5MW01 10/04/95	FD09-F Filtered 5MW01 10/04/95			
VOLATILES (UG/L)							
DIBROMOCHLOROMETHANE	0.18 UJ	0.18 UJ					
DIBROMOMETHANE	5.0 UJ	5.0 UJ					
DICHLORODIFLUOROMETHANE	2.6 UJ	2.6 UJ					
ETHYLBENZENE	0.23 UJ	0.23 UJ					
IODOMETHANE	5.0 UJ	5.0 UJ					
ISOBUTYL ALCOHOL	50.0 UJ	50.0 UJ					
METHACRYLONITRILE	5.0 UJ	5.0 UJ					
METHYL METHACRYLATE	5.0 UJ	5.0 UJ					
METHYLENE CHLORIDE	2.1 B	1.8 B					
PENTACHLOROETHANE	5.0 UJ	5.0 UJ					
PROPIONITRILE	50.0 UJ	50.0 UJ					
STYRENE	0.29 UJ	0.29 UJ					
TETRACHLOROETHENE	0.23 UJ	0.23 UJ					
TOLUENE	0.17 UJ	0.17 UJ					
TRANS-1,2-DICHLOROETHENE	0.31 UJ	0.31 UJ					
TRANS-1,3-DICHLOROPROPENE	0.28 UJ	0.28 UJ					
TRICHLOROETHENE	0.15 UJ	0.15 UJ					
TRICHLOROFLUOROMETHANE	0.44 UJ	0.44 UJ					
VINYL ACETATE	0.28 UJ	0.28 UJ					
VINYL CHLORIDE	0.56 UJ	0.56 UJ					
XYLENES, TOTAL	0.24 UJ	0.24 UJ					
SEMIVOLATILES (UG/L)							
1,2,4,5-TETRACHLOROBENZENE	12.4 U	11.0 U					
1,2,4-TRICHLOROBENZENE	2.8 U	2.5 U					
1,3,5-TRINITROBENZENE	12.4 U	11.0 U					
1,3-DINITROBENZENE	12.4 U	11.0 U					
1,4-NAPHTHOQUINONE	12.4 U	11.0 U					
1-NAPHTHYLAMINE	12.4 U	11.0 U					
2,2'-OXYBIS(1-CHLOROPROPANE)	12.4 U	11.0 U					
2,3,4,6-TETRACHLOROPHENOL	12.4 U	11.0 U					
2,4,5-TRICHLOROPHENOL	1.0 U	0.91 U					
2,4,6-TRICHLOROPHENOL	2.7 U	2.4 U					
2,4-DICHLOROPHENOL	2.4 U	2.1 U					

Summary of Groundwater Analytical Results - SWMU 5
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER: FILTERING: LOCATION: SAMPLE DATE:	5MW01 Unfiltered 5MW01 10/04/95	FD09 Unfiltered 5MW01 10/04/95	5MW01F Filtered 5MW01 10/04/95	FD09-F Filtered 5MW01 10/04/95			
SEMIVOLATILES (UG/L)							
2,4-DIMETHYLPHENOL	8.4 U	7.5 U					
2,4-DINITROPHENOL	2.8 U	2.5 U					
2,4-DINITROTOLUENE	6.0	6.7					
2,6-DICHLOROPHENOL	12.4 U	11.0 U					
2,6-DINITROTOLUENE	1.4 U	2.5					
2-ACETYLAMINOFLUORENE	24.8 U	22.0 U					
2-CHLORONAPHTHALENE	2.1 U	1.8 U					
2-CHLOROPHENOL	1.6 U	1.5 U					
2-METHYLNAPHTHALENE	2.7 U	2.4 U					
2-METHYLPHENOL	1.5 U	1.3 U					
2-NAPHTHYLAMINE	12.4 U	11.0 U					
2-NITROANILINE	1.8 U	1.6 U					
2-NITROPHENOL	1.8 U	1.6 U					
2-PICOLINE	12.4 U	11.0 U					
3,3'-DICHLOROBENZIDINE	12.3 U	10.9 U					
3,3'-DIMETHYLBENZIDINE	12.4 U	11.0 U					
3-METHYLCHOLANTHRENE	12.4 U	11.0 U					
3-METHYLPHENOL	12.4 U	11.0 U					
3-NITROANILINE	6.6 J	7.3 J					
4,6-DINITRO-2-METHYLPHENOL	6.3 U	5.6 U					
4-AMINOBIPHENYL	24.8 U	22.0 U					
4-BROMOPHENYL PHENYL ETHER	1.5 U	1.3 U					
4-CHLORO-3-METHYLPHENOL	2.8 U	2.5 U					
4-CHLOROANILINE	0.81 U	0.72 U					
4-CHLOROPHENYL PHENYL ETHER	1.6 U	1.4 U					
4-METHYLPHENOL	1.4 U	1.2 U					
4-NITROANILINE	4.6 U	4.1 U					
4-NITROPHENOL	3.2 U	2.8 U					
4-NITROQUINOLINE-1-OXIDE	49.6 UR	44.0 UR					
5-NITRO-O-TOLUIDINE	12.4 U	11.0 U					
7,12-DIMETHYLBENZ(A)ANTHRACENE	12.4 U	11.0 U					
A,A-DIMETHYLPHENETHYLAMINE	12.4 U	11.0 U					
ACENAPHTHENE	1.7 U	1.5 U					

Summary of Groundwater Analytical Results - SWMU 5
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER:	5MW01	FD09	5MW01-F	FD09-F			
FILTERING:	Unfiltered	Unfiltered	Filtered	Filtered			
LOCATION:	5MW01	5MW01	5MW01	5MW01			
SAMPLE DATE:	10/04/95	10/04/95	10/04/95	10/04/95			
SEMIVOLATILES (UG/L)							
ACENAPHTHYLENE	1.8 U	1.6 U					
ACETOPHENONE	12.4 U	11.0 U					
ANILINE	12.4 U	11.0 U					
ANTHRACENE	1.5 U	1.4 U					
ARAMITE	24.8 U	22.0 U					
BENZO(A)ANTHRACENE	1.6 U	1.4 U					
BENZO(A)PYRENE	1.2 U	1.1 U					
BENZO(B)FLUORANTHENE	1.0 U	0.92 U					
BENZO(G,H,I)PERYLENE	4.5 U	4.0 U					
BENZO(K)FLUORANTHENE	2.2 U	1.9 U					
BENZYL ALCOHOL	2.8 U	2.5 U					
BIS(2-CHLOROETHOXY)METHANE	1.5 U	1.3 U					
BIS(2-CHLOROETHYL)ETHER	1.0 U	0.89 U					
BIS(2-ETHYLHEXYL)PHTHALATE	1.8 J	1.6 J					
BUTYL BENZYL PHTHALATE	5.6 U	5.0 U					
CHLOROBENZILATE	12.4 U	11.0 U					
CHRYSENE	1.5 U	1.3 U					
DI-N-BUTYL PHTHALATE	1.5 U	1.3 U					
DI-N-OCTYL PHTHALATE	2.2 U	1.9 U					
DIALLATE	12.4 UR	11.0 UR					
DIBENZO(A,H)ANTHRACENE	1.6 U	1.4 U					
DIBENZOFURAN	1.8 U	1.6 U					
DIETHYL PHTHALATE	0.48 U	0.43 U					
DIMETHOATE	24.8 U	22.0 U					
DIMETHYL PHTHALATE	0.09 U	0.08 U					
DIPHENYLAMINE	12.4 U	11.0 U					
ETHYL METHACRYLATE	12.4 U	11.0 U					
FAMPHUR	24.8 UJ	22.0 UJ					
FLUORANTHENE	1.8 U	1.6 U					
FLUORENE	1.9 U	1.7 U					
HEXACHLOROBENZENE	0.96 U	0.85 U					
HEXACHLOROBUTADIENE	2.9 U	2.6 U					
HEXACHLOROCYCLOPENTADIENE	1.2 U	1.0 U					

Summary of Groundwater Analytical Results - SWMU 5
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER: FILTERING: LOCATION: SAMPLE DATE:	5MW01 Unfiltered 5MW01 10/04/95	FD09 Unfiltered 5MW01 10/04/95	5MW01-F Filtered 5MW01 10/04/95	FD09-F Filtered 5MW01 10/04/95			
SEMIVOLATILES (UG/L)							
HEXACHLOROETHANE	2.3 U	2.1 U					
HEXACHLOROPHENE	62.0 UR	55.0 UR					
HEXACHLOROPROPENE	12.4 U	11.0 U					
INDENO(1,2,3-CD)PYRENE	1.6 U	1.5 U					
ISODRIN	24.8 U	22.0 U					
ISOPHORONE	1.4 U	1.2 U					
ISOSAFROLE	12.4 U	11.0 U					
KEPONE	24.8 UR	22.0 UR					
METHAPYRILENE	124 U	110 U					
METHYL METHANESULFONATE	18.6 U	16.5 U					
N-NITROSO-DI-N-PROPYLAMINE	2.1 U	1.9 U					
N-NITROSODI-N-BUTYLAMINE	12.4 U	11.0 U					
N-NITROSODIETHYLAMINE	24.8 U	22.0 U					
N-NITROSODIMETHYLAMINE	4.0 U	3.5 U					
N-NITROSODIPHENYLAMINE	1.8 U	1.6 U					
N-NITROSOMETHYLETHYLAMINE	12.4 U	11.0 U					
N-NITROSOMORPHOLINE	12.4 U	11.0 U					
N-NITROSOPIPERIDINE	24.8 U	22.0 U					
N-NITROSOPYRROLIDINE	12.4 U	11.0 U					
NAPHTHALENE	1.9 U	1.7 U					
NITROBENZENE	1.6 U	1.4 U					
O,O,O-TRIETHYLPHOSPHOROTHIOATE	12.4 U	11.0 U					
O,O-DIETHYL-O-2-PYRAZINYLPHOSPHOROT	12.4 U	11.0 U					
O-TOLUIDINE	12.4 U	11.0 U					
P-DIMETHYLAMINOAZOBENZENE	12.4 U	11.0 U					
P-PHENYLENEDIAMINE	12.4 U	11.0 U					
PENTACHLOROBENZENE	12.4 U	11.0 U					
PENTACHLORONITROBENZENE	24.8 U	22.0 U					
PENTACHLOROPHENOL	2.7 U	2.4 U					
PHENACETIN	24.8 U	22.0 U					
PHENANTHRENE	1.9 U	1.7 U					
PHENOL	2.6 U	2.3 U					
PHORATE	12.4 UR	11.0 UR					

Summary of Groundwater Analytical Results - SWMU 5
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER:	5MW01	FD09	5MW01-F	FD09-F			
FILTERING:	Unfiltered	Unfiltered	Filtered	Filtered			
LOCATION:	5MW01	5MW01	5MW01	5MW01			
SAMPLE DATE	10/04/95	10/04/95	10/04/95	10/04/95			
SEMIVOLATILES (UG/L)							
PRONAMIDE	12.4 U	11.0 U					
PYRENE	2.0 U	1.7 U					
PYRIDINE	12.4 U	11.0 U					
SAFROLE	12.4 U	11.0 U					
EXPLOSIVES (UG/L)							
1,3 DINITROBENZENE	4.4 J	4.5 J					
1,3,5 TRINITROBENZENE	3.7 U	4.6 U					
2,4 DINITROTOLUENE	17.3 J	16.2 J					
2,4,6-TRINITROTOLUENE	242 J	173 J					
2,6 DINITROTOLUENE	3.7 U	4.6 U					
2-AMINO-4,6-DINITROTOLUENE	4230 J	4700 J					
2-NITROTOLUENE	7.4 U	9.1 U					
3-NITROTOLUENE	7.4 U	9.1 U					
4-AMINO-2,6-DINITROTOLUENE	3.7 U	4.6 U					
4-NITROTOLUENE	7.4 U	9.1 U					
HMX	7.4 U	9.1 U					
NITRO-BENZENE	3.7 U	4.6 U					
NITROCELLULOSE	0.18 UL	0.16 UL					
NITROGLYCERIN	2960 U	3640 U					
NITROGUANIDINE	42.1	50.2					
PENTAERYTHRITOL TETRANITRATE	0.37 U	0.46 U					
RDX	658 J	426 J					
TETRYL	7.4 U	9.1 U					
INORGANICS (UG/L)							
ALUMINUM	7980 J	12600 J	110 UL	110 UL			
ANTIMONY	1.7 U	1.7 U	1.7 U	1.7 U			
ARSENIC	1.9 UL	1.9 UL	1.9 U	1.9 U			
BARIUM	98.1	131	43.7	42.0			
BERYLLIUM	0.90 U	0.90 U	0.90 U	0.90 U			
CADMIUM	5.0 UL	5.0 UL	5.0 UL	5.0 UL			
CALCIUM	9830 K	10400	10200	10600			
CHROMIUM	16.0 L	29.6	10.0 UL	10.0 UL			
COBALT	28.1	31.8	22.2	18.7			

Summary of Groundwater Analytical Results - SWMU 5
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER: FILTERING: LOCATION: SAMPLE DATE:	SMW01 Unfiltered SMW01 10/04/95	FD09 Unfiltered SMW01 10/04/95	SMW01 F Filtered SMW01 10/04/95	FD09-F Filtered SMW01 10/04/95			
INORGANICS (UG/L)							
COPPER	32.9	40.8	15.0 U	15.0 U			
CYANIDE	5.0 U	5.0 U					
IRON	19600	29000	6900	6320			
LEAD	27.3	19.1	0.60 U	0.60 U			
MAGNESIUM	8930 K	9700 K	9930 K	9840 K			
MANGANESE	1360	1400	1600	1610			
MERCURY	0.29 B	0.34 B	0.10 U	0.12			
NICKEL	53.4 B	39.1 B	33.7 B	17.7 B			
POTASSIUM	3990	4110	3760	3870			
SELENIUM	1.5 UL	1.5 UL	1.5 U	1.5 U			
SILVER	1.0 UL	1.0 UL	1.0 U	1.0 U			
SODIUM	18600	18700	20100	20700			
THALLIUM	2.5 UJ	2.5 UJ	2.5 U	2.6 K			
TIN	33.6 U	33.6 U	33.6 U	33.6 U			
VANADIUM	25.8	43.8	22.0 U	22.0 U			
ZINC	79.6	64.4 B	18.5	19.2			
INDICATOR PARAMETERS (MG/L)							
AMMONIA	1.9	1.8					
NITRATE/NITRITE	0.05 UL	0.05 UL					
PHOSPHORUS	0.37	0.12					
SULFATE	38.5 L	38.5 L					
TOTAL KJELDAHL NITROGEN	2.2 L	1.9 L					
TOTAL ORGANIC CARBON	5.6	4.2					
TOTAL ORGANIC HALIDES (UG/L)	43.0 L	23.8 L					

Summary of Soil Analytical Results - SWMU 25
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER:	S25-MW01-01	FD02	S25-MW01-02	FD01	S25-MW02-001	S25-MW02-002	S25-MW03-001
DEPTH (feet):	0 - 2	7 - 11	7 - 11	0 - 2	0 - 2	6 - 8	0 - 2
LOCATION:	MW01	MW01	MW01	MW01	MW02	MW02	MW03
SAMPLE DATE:	9/19/95	9/19/95	9/19/95	9/19/95	9/22/95	9/22/95	9/25/95
VOLATILES (UG/KG)							
1,1,1,2-TETRACHLOROETHANE		6.3 U	6.2 U			5.4 UJ	
1,1,1-TRICHLOROETHANE		0.22 U	0.21 U			0.19 UJ	
1,1,2,2-TETRACHLOROETHANE		0.67 U	0.66 U			0.57 UJ	
1,1,2-TRICHLOROETHANE		0.57 U	0.56 U			0.48 UJ	
1,1-DICHLOROETHANE		0.42 U	0.41 U			0.35 UJ	
1,1-DICHLOROETHENE		0.36 U	0.35 U			0.30 UJ	
1,2,3-TRICHLOROPROPANE		6.3 U	6.2 U			5.4 UJ	
1,2-DIBROMO-3-CHLOROPROPANE		126 U	124 U			107 UJ	
1,2-DIBROMOETHANE		6.3 U	6.2 U			5.4 UJ	
1,2-DICHLOROETHANE		6.3 U	6.2 U			5.4 UJ	
1,2-DICHLOROPROPANE		6.3 U	6.2 U			5.4 UJ	
1,4-DICHLORO-2-BUTENE		126 UJ	124 UJ			107 UJ	
1,4-DIOXANE		189 UR	186 UR			161 UR	
2-BUTANONE		4.8 UR	4.7 UR			4.1 UR	
2-HEXANONE		2.8 U	2.8 U			2.4 UJ	
4-METHYL-2-PENTANONE		1.9 U	1.9 U			1.6 UJ	
ACETONE		12.0 J	5.5 J			4.1 UJ	
ACETONITRILE		126 U	124 U			107 UJ	
ACROLEIN		14.6 U	14.3 U			12.4 UJ	
ACRYLONITRILE		6.3 U	6.2 U			5.4 UJ	
ALLYL CHLORIDE		6.3 U	6.2 U			5.4 UJ	
BENZENE		0.32 U	0.31 U			0.27 UJ	
BROMODICHLOROMETHANE		0.24 U	0.24 U			0.20 UJ	
BROMOFORM		3.4 U	3.3 U			2.9 UJ	
BROMOMETHANE		0.24 U	0.24 U			0.20 UJ	
CARBON DISULFIDE		1.5 U	2.6 J			1.14 B	
CARBON TETRACHLORIDE		0.15 U	0.15 U			0.13 UJ	
CHLOROBENZENE		0.46 U	0.45 U			0.39 UJ	
CHLOROETHANE		0.52 U	0.51 U			0.44 UJ	
CHLOROFORM		2.8 J	3.2			0.40 UJ	
CHLOROMETHANE		0.62 U	0.61 U			0.53 UJ	
CHLOROPRENE		6.3 UR	6.2 UR			5.4 UR	
CIS-1,3-DICHLOROPROPENE		0.34 U	0.33 U			0.29 UJ	

Summary of Soil Analytical Results - SWMU 25
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER:	S25-MW01-01	FD02	S25-MW01-02	FD01	S25-MW02-001	S25-MW02-002	S25-MW03-001
DEPTH (feet):	0 - 2	7-11	7 - 11	0-2	0 - 2	6 - 8	0 - 2
LOCATION:	MW01	MW01	MW01	MW01	MW02	MW02	MW03
SAMPLE DATE:	9/19/95	9/19/95	9/19/95	9/19/95	9/22/95	9/22/95	9/25/95
VOLATILES (UG/KG)							
DIBROMOCHLOROMETHANE		0.28 U	0.27 U			0.24 UJ	
DIBROMOMETHANE		6.3 U	6.2 U			5.4 UJ	
DICHLORODIFLUOROMETHANE		0.27 U	0.26 U			0.23 UJ	
ETHYLBENZENE		1.7 U	1.7 U			1.5 UJ	
IODOMETHANE		6.3 U	6.2 U			5.4 UJ	
ISOBUTYL ALCOHOL		63.2 U	62.0 U			53.6 UJ	
METHACRYLONITRILE		6.3 U	6.2 U			5.4 UJ	
METHYL METHACRYLATE		6.3 U	6.2 U			5.4 UJ	
METHYLENE CHLORIDE		61.8 B	89.1 B			7.0 B	
PENTACHLOROETHANE		6.3 U	6.2 U			5.4 UJ	
PROPIONITRILE		63.2 U	62.0 U			53.6 UJ	
STYRENE		0.38 U	0.37 U			0.32 UJ	
TETRACHLOROETHENE		1.1 U	1.1 U			0.93 UJ	
TOLUENE		0.34 U	0.34 U			0.32 UJ	
TRANS-1,2-DICHLOROETHENE		0.35 U	0.35 U			0.30 UJ	
TRANS-1,3-DICHLOROPROPENE		0.62 U	0.61 U			0.53 UJ	
TRICHLOROETHENE		0.33 U	0.33 U			0.28 UJ	
TRICHLOROFLUOROMETHANE		0.37 U	0.36 U			0.31 UJ	
VINYL ACETATE		0.35 UJ	0.35 UJ			0.30 UJ	
VINYL CHLORIDE		0.42 U	0.41 U			0.35 UJ	
XYLENES, TOTAL		0.87 U	0.86 U			0.74 UJ	
SEMIVOLATILES (UG/KG)							
1,2,4,5-TETRACHLOROBENZENE		416 U	409 U			353 UJ	
1,2,4-TRICHLOROBENZENE		39.8 U	39.2 U			33.8 UJ	
1,3,5-TRINITROBENZENE		416 U	409 U			353 UJ	
1,3-DINITROBENZENE		416 U	409 U			353 UJ	
1,4-NAPHTHOQUINONE		416 U	409 U			353 UJ	
1-NAPHTHYLAMINE		416 U	409 U			353 UJ	
2,2'-OXYBIS(1-CHLOROPROPANE)		416 U	409 U			353 UJ	
2,3,4,6-TETRACHLOROPHENOL		416 U	409 U			353 UJ	
2,4,5-TRICHLOROPHENOL		58.4 U	57.5 U			49.6 UJ	
2,4,6-TRICHLOROPHENOL		80.8 U	79.3 U			68.4 UJ	
2,4-DICHLOROPHENOL		57.8 U	56.9 U			49.1 UJ	

Summary of Soil Analytical Results - SWMU 25
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER:	S25-MW01-01	FD02	S25-MW01-02	FD01	S25-MW02-001	S25-MW02-002	S25-MW03-001
DEPTH (feet):	0 - 2	7 - 11	7 - 11	0 - 2	0 - 2	6 - 8	0 - 2
LOCATION:	MW01	MW01	MW01	MW01	MW02	MW02	MW03
SAMPLE DATE:	9/19/95	9/19/95	9/19/95	9/19/95	9/22/95	9/22/95	9/25/95
SEMIVOLATILES (UG/KG)							
2,4-DIMETHYLPHENOL		130 U	128 U			110 UJ	
2,4-DINITROPHENOL		204 U	201 U			174 UJ	
2,4-DINITROTOLUENE		28.4 U	27.9 U			24.1 UJ	
2,6-DICHLOROPHENOL		416 U	409 U			353 UJ	
2,6-DINITROTOLUENE		17.9 U	17.6 U			15.2 UJ	
2-ACETYLAMINOFLUORENE		416 U	409 U			353 UJ	
2-CHLORONAPHTHALENE		31.0 U	30.5 U			26.4 UJ	
2-CHLOROPHENOL		74.1 U	72.9 U			62.9 UJ	
2-METHYLNAPHTHALENE		50.2 U	49.4 U			42.7 UJ	
2-METHYLPHENOL		61.1 U	60.1 U			51.9 UJ	
2-NAPHTHYLAMINE		416 U	409 U			353 UJ	
2-NITROANILINE		64.4 U	63.4 U			54.7 UJ	
2-NITROPHENOL		74.1 U	72.9 U			62.9 UJ	
2-PICOLINE		416 U	409 U			353 UJ	
3,3'-DICHLOROBENZIDINE		407 U	401 U			346 UJ	
3,3'-DIMETHYLBENZIDINE		416 U	409 U			353 UJ	
3-METHYLCHOLANTHRENE		416 U	409 U			353 UJ	
3-METHYLPHENOL		416 U	409 U			353 UJ	
3-NITROANILINE		156 U	153 U			132 UR	
4,6-DINITRO-2-METHYLPHENOL		71.7 U	70.5 U			60.9 UJ	
4-AMINOBIPHENYL		832 U	818 U			706 UJ	
4-BROMOPHENYL PHENYL ETHER		33.1 U	32.6 U			28.1 UJ	
4-CHLORO-3-METHYLPHENOL		66.1 U	65.0 U			56.1 UJ	
4-CHLOROANILINE		94.0 U	92.5 U			79.8 UJ	
4-CHLOROPHENYL PHENYL ETHER		25.0 U	24.6 U			21.2 UJ	
4-METHYLPHENOL		47.9 U	47.2 U			40.7 UJ	
4-NITROANILINE		73.5 U	72.3 U			62.4 UJ	
4-NITROPHENOL		146 U	144 U			124 UJ	
4-NITROQUINOLINE-1-OXIDE		1660 UR	1640 UR			1410 UR	
5-NITRO-O-TOLUIDINE		416 U	409 U			353 UJ	
7,12-DIMETHYLBENZ(A)ANTHRACENE		416 U	409 U			353 UJ	
A,A-DIMETHYLPHENETHYLAMINE		416 U	409 U			353 UJ	
ACENAPHTHENE		43.2 U	42.5 U			36.6 UJ	

Summary of Soil Analytical Results - SWMU 25
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER:	S25-MW01-01	FD02	S25-MW01-02	FD01	S25-MW02-001	S25-MW02-002	S25-MW03-001
DEPTH (feet):	0 - 2	7 - 11	7 - 11	~~7-11~~ 0-2	0 - 2	6 - 8	0 - 2
LOCATION:	MW01	MW01	MW01	MW01	MW02	MW02	MW03
SAMPLE DATE:	9/19/95	9/19/95	9/19/95	9/19/95	9/22/95	9/22/95	9/25/95
SEMIVOLATILES (UG/KG)							
ACENAPHTHYLENE		42.7 U	42.0 U			36.2 UJ	
ACETOPHENONE		416 U	409 U			353 UJ	
ANILINE		416 U	409 U			353 UJ	
ANTHRACENE		29.2 U	28.8 U			24.8 UJ	
ARAMITE		832 U	818 U			706 UJ	
BENZO(A)ANTHRACENE		15.2 U	14.9 U			12.9 UJ	
BENZO(A)PYRENE		18.9 U	18.6 U			16.0 UJ	
BENZO(B)FLUORANTHENE		56.1 U	55.2 U			47.7 UJ	
BENZO(G,H,I)PERYLENE		57.8 U	56.8 U			49.0 UJ	
BENZO(K)FLUORANTHENE		46.3 U	45.6 U			39.4 UJ	
BENZYL ALCOHOL		56.6 U	55.7 U			48.1 UJ	
BIS(2-CHLOROETHOXY)METHANE		59.0 U	58.1 U			50.1 UJ	
BIS(2-CHLOROETHYL)ETHER		89.2 U	87.8 U			75.8 UJ	
BIS(2-ETHYLHEXYL)PHTHALATE		81.3 U	80.0 U			69.0 UJ	
BUTYL BENZYL PHTHALATE		117 U	116 U			99.8 UJ	
CHLOROBENZILATE		416 U	409 U			353 UJ	
CHRYSENE		23.5 U	23.1 U			19.9 UJ	
DI-N-BUTYL PHTHALATE		68.9 U	67.8 U			58.5 UJ	
DI-N-OCTYL PHTHALATE		59.6 U	58.7 U			50.6 UJ	
DIALLATE		416 UR	409 UR			353 UR	
DIBENZO(A,H)ANTHRACENE		47.8 U	47.0 U			40.6 UJ	
DIBENZOFURAN		32.0 U	31.5 U			27.2 UJ	
DIETHYL PHTHALATE		45.3 U	44.6 U			38.5 UJ	
DIMETHOATE		832 U	816 U			706 UJ	
DIMETHYL PHTHALATE		21.0 U	20.7 U			17.8 UJ	
DIPHENYLAMINE		416 U	409 U			353 UJ	
ETHYL METHACRYLATE		416 U	409 U			353 UJ	
FAMPHUR		832 UJ	818 UJ			706 UR	
FLUORANTHENE		56.5 U	55.6 U			48.0 UJ	
FLUORENE		30.2 U	29.7 U			25.6 UJ	
HEXACHLOROBENZENE		24.8 U	24.4 U			21.0 UJ	
HEXACHLOROBUTADIENE		45.7 U	45.0 U			38.8 UJ	
HEXACHLOROCYCLOPENTADIENE		76.4 U	75.2 U			64.9 UJ	

Summary of Soil Analytical Results - SWMU 25
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER:	S25-MW01-01	FD02	S25-MW01-02	FD01	S25-MW02-001	S25-MW02-002	S25-MW03-001
DEPTH (feet):	0 - 2	7 - 11	7 - 11	~~7-11~~ 0-2	0 - 2	6 - 8	0 - 2
LOCATION:	MW01	MW01	MW01	MW01	MW02	MW02	MW03
SAMPLE DATE:	9/19/95	9/19/95	9/19/95	9/19/95	9/22/95	9/22/95	9/25/95
SEMIVOLATILES (UG/KG)							
HEXACHLOROETHANE		27.1 U	26.6 U			23.0 UJ	
HEXACHLOROPHENE		2080 UR	2050 UR			1760 UR	
HEXACHLOROPROPENE		416 U	409 U			353 UJ	
INDENO(1,2,3-CD)PYRENE		51.7 U	50.9 U			43.9 UJ	
ISODRIN		832 U	818 U			706 UJ	
ISOPHORONE		60.6 U	59.6 U			51.5 UJ	
ISOSAFROLE		416 U	409 U			353 UJ	
KEPONE		832 UR	818 UR			706 UR	
METHAPYRILENE		4160 U	4090 U			3530 UJ	
METHYL METHANESULFONATE		624 U	614 U			530 UJ	
N-NITROSO-DI-N-PROPYLAMINE		71.6 U	70.4 U			60.8 UJ	
N-NITROSODI-N-BUTYLAMINE		416 U	409 U			353 UJ	
N-NITROSODIETHYLAMINE		832 U	818 U			706 UJ	
N-NITROSODIMETHYLAMINE		62.6 U	61.6 U			53.2 UJ	
N-NITROSODIPHENYLAMINE		42.0 U	41.3 U			35.6 UJ	
N-NITROSOMETHYLETHYLAMINE		416 U	409 U			353 UJ	
N-NITROSOMORPHOLINE		416 U	409 U			353 UJ	
N-NITROSOPIPERIDINE		832 U	818 U			706 UJ	
N-NITROSOPYRROLIDINE		416 U	409 U			353 UJ	
NAPHTHALENE		38.4 U	37.8 U			32.6 UJ	
NITROBENZENE		56.7 U	55.8 U			48.1 UJ	
O,O,O-TRIETHYLPHOSPHOROTHIOATE		416 U	409 U			353 UJ	
O,O-DIETHYL-O-2-PYRAZINYLPHOSPHOROT		416 U	409 U			353 UJ	
O-TOLUIDINE		416 U	409 U			353 UJ	
P-DIMETHYLAMINOAZOBENZENE		416 U	409 U			353 UJ	
P-PHENYLENEDIAMINE		416 U	409 U			353 UJ	
PENTACHLOROBENZENE		416 U	409 U			353 UJ	
PENTACHLORONITROBENZENE		416 U	409 U			353 UJ	
PENTACHLOROPHENOL		132 U	130 U			112 UJ	
PHENACETIN		832 U	818 U			706 UJ	
PHENANTHRENE		47.0 U	46.2 U			39.9 UJ	
PHENOL		172 U	170 U			146 UJ	
PHORATE		416 U	409 U			353 UJ	

Summary of Soil Analytical Results - SWMU 25
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Indian Head, Maryland

SAMPLE NUMBER:	S25-MW01-01	FD02	S25-MW01-02	FD01	S25-MW02-001	S25-MW02-002	S25-MW03-001
DEPTH (feet):	0 - 2	7 - 11	7 - 11	~~7-11~~ 0-2	0 - 2	6 - 8	0 - 2
LOCATION:	MW01	MW01	MW01	MW01	MW02	MW02	MW03
SAMPLE DATE:	9/19/95	9/19/95	9/19/95	9/19/95	9/22/95	9/22/95	9/25/95
SEMIVOLATILES (UG/KG)							
PRONAMIDE		416 U	409 U			353 UJ	
PYRENE		104 U	102 U			88.1 UJ	
PYRIDINE		416 U	409 U			353 UJ	
SAFROLE		416 U	409 U			353 UJ	
EXPLOSIVES (UG/KG)							
1,3 DINITROBENZENE	37.2 U		37.2 U	37.2 U	37.2 U	37.2 U	37.2 U
1,3,5 TRINITROBENZENE	40.2 U		40.2 U	40.2 U	40.2 U	40.2 U	40.2 U
2,4 DINITROTOLUENE	51.6 U		51.6 U	51.6 U	51.6 U	51.6 U	51.6 U
2,4,6-TRINITROTOLUENE	35.6 U		35.6 U	35.6 U	35.6 U	35.6 U	35.6 U
2,6 DINITROTOLUENE	47.6 U		47.6 U	47.6 U	47.6 U	47.6 U	47.6 U
2-AMINO-4,6-DINITROTOLUENE	46.7 U		46.7 U	46.7 U	46.7 U	46.7 U	46.7 U
2-NITROTOLUENE	81.4 U		81.4 U	81.4 U	81.4 U	81.4 U	81.4 U
3-NITROTOLUENE	81.7 U		81.7 U	81.7 U	81.7 U	81.7 U	81.7 U
4-AMINO-2,6-DINITROTOLUENE	40.8 U		40.8 U	40.8 U	40.8 U	40.8 U	40.8 U
4-NITROTOLUENE	87.2 U		87.2 U	87.2 U	87.2 U	87.2 U	87.2 U
HMX	70.5 U		70.5 U	70.5 U	70.5 U	70.5 U	70.5 U
NITRO-BENZENE	35.2 U		35.2 U	35.2 U	35.2 U	35.2 U	35.2 U
NITROCELLULOSE	6.8 U		7.1 U	7.3 U	17.3 UL	15.2 UL	16.8 UL
NITROGLYCERIN	10000 U		10000 U	10000 U	10000 U	10000 U	10000 U
NITROGUANIDINE	63.0 U		63.0 U	63.0 U	63.0 U	63.0 U	63.0 U
PENTAERYTHRITOL TETRANITRATE	250 U		250 U	250 U	250 U	250 U	250 U
RDX	50.9 U		50.9 U	50.9 U	50.9 U	50.9 U	50.9 U
TETRYL	163 U		163 U	163 U	163 U	163 U	163 U
INORGANICS (MG/KG)							
ALUMINUM	2970		1780	3100	4900 J	6020 J	4010 J
ANTIMONY	0.21 UL		0.21 UL	0.21 UL	0.18 UL	0.18 UL	0.18 UL
ARSENIC	0.78 K		0.67 K	1.7 K	1.5 L	3.9 L	2.2
BARIUM	24.1		18.7	23.0	45.6	18.6	29.8
BERYLLIUM	0.11 U		0.32	0.11 U	0.32	0.24	0.20
CADMIUM	0.62 U		0.62 U	0.62 U	0.53 UL	0.54 UL	0.54 UL
CALCIUM	74.9 K		233 K	30.5 K	81.1 B	43.2 B	101 B
CHROMIUM	5.1		4.5	6.6	8.3	10.6	10.5
COBALT	1.8		3.5	1.7 U	5.2	3.9	3.5

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SAMPLE NUMBER:	S25-MW01-01	FD02	S25-MW01-02	FD01	S25-MW02-001	S25-MW02-002	S25-MW03-001
DEPTH (feet):	0 - 2	~~0-2~~ 7-11	7 - 11	~~7-11~~ 0-2	0 - 2	6 - 8	0 - 2
LOCATION:	MW01	MW01	MW01	MW01	MW02	MW02	MW03
SAMPLE DATE:	9/19/95	9/19/95	9/19/95	9/19/95	9/22/95	9/22/95	9/25/95
INORGANICS (MG/KG)							
COPPER	1.8 U		5.1	2.1	3.5	4.4	2.5 L
CYANIDE	1.2 U		1.2 U	1.3 U	1.5	1.1	1.1 U
IRON	3410 J		2300 J	5280 J	8920 J	17800 J	7930
LEAD	5.0 L		5.1 L	4.8 L	7.7 J	5.4 J	10.0
MAGNESIUM	176		217	178	292 J	276 J	236 J
MANGANESE	9.5		17.3	11.7	116 J	78.1 J	123 J
MERCURY	0.05 UL		0.05 UL	0.05 UL	0.05 U	0.05 U	0.08 B
NICKEL	2.1 U		2.1 U	2.1 U	4.8 J	4.2 J	2.3 J
POTASSIUM	158		335	160	273	387	221
SELENIUM	0.18 U		0.19 U	0.19 U	0.39 B	0.55 B	0.17 L
SILVER	0.12 U		0.12 U	0.12 U	0.10 U	0.11 U	0.11 U
SODIUM	77.4 B		54.3 B	56.6 B	18.9 U	19.3 U	19.2 U
THALLIUM	0.31 U		0.31 U	0.31 U	0.26 U	0.27 U	0.27 U
TIN	4.1 U		4.2 U	4.2 U	4.2 UJ	4.3 UJ	4.3 UJ
VANADIUM	6.6		5.5	9.8	13.3	19.4	9.8 L
ZINC	7.1		5.0 B	6.1 B	12.5 J	15.8 J	11.4
INDICATOR PARAMETERS (MG/KG)							
AMMONIA	10.8 UL		11.6 UL	12.0 UL	66.5	28.5	21.9
NITRATE/NITRITE	0.53 U		0.87 U	0.98 U	2.3 UL	2.0 UL	1.9
TOTAL ORGANIC CARBON	1840		698	682	2650	1270	1620

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Indian Head, Maryland

SAMPLE NUMBER:	S25-MW03-002	S25-SB01-001	S25-SB01-002	S25-SB02-001	S25-SB02-002	S25-SB03-001	S25-SB03-002
DEPTH (feet):	3 - 5	0 - 2	4 - 6	0 - 2	2 - 4	0 - 2	2 - 4
LOCATION:	MW03	SB01	SB01	SB02	SB02	SB03	SB03
SAMPLE DATE:	9/25/95	9/21/95	9/21/95	10/03/95	10/03/95	10/03/95	10/03/95
VOLATILES (UG/KG)							
1,1,1,2-TETRACHLOROETHANE			5.7 UJ		5.2 U		5.3 U
1,1,1-TRICHLOROETHANE			0.19 UJ		0.18 U		0.18 U
1,1,2,2-TETRACHLOROETHANE			0.60 UJ		0.55 U		0.56 U
1,1,2-TRICHLOROETHANE			0.51 UJ		0.46 U		0.48 U
1,1-DICHLOROETHANE			0.38 UJ		0.34 U		0.35 U
1,1-DICHLOROETHENE			0.32 UJ		0.29 U		0.30 U
1,2,3-TRICHLOROPROPANE			5.7 UJ		5.2 U		5.3 U
1,2-DIBROMO-3-CHLOROPROPANE			114 UJ		103 U		105 U
1,2-DIBROMOETHANE			5.7 UJ		5.2 U		5.3 U
1,2-DICHLOROETHANE			5.7 UJ		5.2 U		5.3 U
1,2-DICHLOROPROPANE			5.7 UJ		5.2 U		5.3 U
1,4-DICHLORO-2-BUTENE			114 UJ		103 U		105 U
1,4-DIOXANE			171 UR		155 UR		158 UR
2-BUTANONE			4.3 UJ		3.9 UR		4.0 UR
2-HEXANONE			2.5 UJ		2.3 U		2.4 U
4-METHYL-2-PENTANONE			1.7 UJ		1.6 U		1.6 U
ACETONE			4.4 UJ		4.0 U		17.0 B
ACETONITRILE			114 UJ		103 U		105 U
ACROLEIN			13.2 UJ		11.9 U		12.2 UJ
ACRYLONITRILE			5.7 UJ		5.2 U		5.3 UJ
ALLYL CHLORIDE			5.7 UJ		5.2 U		5.3 U
BENZENE			0.29 UJ		0.26 U		0.26 U
BROMODICHLOROMETHANE			0.22 UJ		0.20 U		0.20 U
BROMOFORM			3.0 UJ		2.8 U		2.8 U
BROMOMETHANE			0.22 UJ		0.20 U		0.20 U
CARBON DISULFIDE			1.3 UJ		1.4 B		1.2 U
CARBON TETRACHLORIDE			0.14 UJ		0.12 U		0.13 U
CHLOROBENZENE			0.41 UJ		0.37 U		0.38 U
CHLOROETHANE			0.47 UJ		0.42 U		0.43 U
CHLOROFORM			0.42 UJ		1.2		0.39 U
CHLOROMETHANE			0.56 UJ		0.51 U		0.52 U
CHLOROPRENE			5.7 UR		5.2 UR		5.3 UR
CIS-1,3-DICHLOROPROPENE			0.31 UJ		0.28 U		0.29 U

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SAMPLE NUMBER:	S25-MW03-002	S25-SB01-001	S25-SB01-002	S25-SB02-001	S25-SB02-002	S25-SB03-001	S25-SB03-002
DEPTH (feet):	3 - 5	0 - 2	4 - 6	0 - 2	2 - 4	0 - 2	2 - 4
LOCATION:	MW03	SB01	SB01	SB02	SB02	SB03	SB03
SAMPLE DATE:	9/25/95	9/21/95	9/21/95	10/03/95	10/03/95	10/03/95	10/03/95
VOLATILES (UG/KG)							
DIBROMOCHLOROMETHANE			0.25 UJ		0.23 U		0.23 U
DIBROMOMETHANE			5.7 UJ		5.2 U		5.3 U
DICHLORODIFLUOROMETHANE			0.24 UJ		0.22 U		0.22 U
ETHYLBENZENE			1.6 UJ		1.4 U		1.4 U
IODOMETHANE			5.7 UJ		5.2 U		5.3 U
ISOBUTYL ALCOHOL			57.0 UJ		51.6 U		52.7 U
METHACRYLONITRILE			5.7 UJ		5.2 U		5.3 U
METHYL METHACRYLATE			5.7 UJ		5.2 U		5.3 U
METHYLENE CHLORIDE			5.0 J		32.8 B		18.8 B
PENTACHLOROETHANE			5.7 UJ		5.2 U		5.3 U
PROPIONITRILE			57.0 UJ		51.6 UJ		52.7 UJ
STYRENE			0.34 UJ		0.31 U		0.32 U
TETRACHLOROETHENE			0.99 UJ		0.90 U		0.92 U
TOLUENE			7.8 B		1.3 B		6.8 B
TRANS-1,2-DICHLOROETHENE			0.32 UJ		0.29 U		0.30 U
TRANS-1,3-DICHLOROPROPENE			0.56 UJ		0.51 U		0.52 U
TRICHLOROETHENE			1.9 J		0.27 U		0.27 U
TRICHLOROFLUOROMETHANE			0.33 UJ		0.30 U		0.31 U
VINYL ACETATE			0.32 UJ		0.29 U		0.30 U
VINYL CHLORIDE			0.38 UJ		0.34 U		0.35 U
XYLENES, TOTAL			0.79 UJ		2.1		0.73 U
SEMIVOLATILES (UG/KG)							
1,2,4,5-TETRACHLOROBENZENE			376 UJ		340 UJ		346 UJ
1,2,4-TRICHLOROBENZENE			36.0 UJ		32.5 UJ		33.2 UJ
1,3,5-TRINITROBENZENE			376 UJ		340 UJ		346 UJ
1,3-DINITROBENZENE			376 UJ		340 UJ		346 UJ
1,4-NAPHTHOQUINONE			376 UJ		340 UJ		346 UJ
1-NAPHTHYLAMINE			376 UJ		340 UJ		346 UJ
2,2'-OXYBIS(1-CHLOROPROPANE)			376 UJ		340 UJ		346 UJ
2,3,4,6-TETRACHLOROPHENOL			376 UJ		340 UJ		346 UJ
2,4,5-TRICHLOROPHENOL			52.9 UJ		47.8 UJ		48.7 UJ
2,4,6-TRICHLOROPHENOL			72.9 UJ		65.9 UJ		67.2 UJ
2,4-DICHLOROPHENOL			52.3 UJ		47.3 UJ		48.2 UJ

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SAMPLE NUMBER:	S25-MW03-002	S25-SB01-001	S25-SB01-002	S25-SB02-001	S25-SB02-002	S25-SB03-001	S25-SB03-002
DEPTH (feet):	3 - 5	0 - 2	4 - 6	0 - 2	2 - 4	0 - 2	2 - 4
LOCATION:	MW03	SB01	SB01	SB02	SB02	SB03	SB03
SAMPLE DATE:	9/25/95	9/21/95	9/21/95	10/03/95	10/03/95	10/03/95	10/03/95
SEMIVOLATILES (UG/KG)							
2,4-DIMETHYLPHENOL			118 UJ		106 UJ		108 UJ
2,4-DINITROPHENOL			185 UJ		167 UJ		170 UJ
2,4-DINITROTOLUENE			25.7 UJ		23.2 UJ		23.6 UJ
2,6-DICHLOROPHENOL			376 UJ		340 UJ		346 UJ
2,6-DINITROTOLUENE			16.2 UJ		14.6 UJ		14.9 UJ
2-ACETYLAMINOFLUORENE			376 UJ		340 UJ		346 UJ
2-CHLORONAPHTHALENE			28.1 UJ		25.4 UJ		25.9 UJ
2-CHLOROPHENOL			67.0 UJ		60.6 UJ		61.8 UJ
2-METHYLNAPHTHALENE			45.4 UJ		41.1 UJ		41.9 UJ
2-METHYLPHENOL			55.2 UJ		49.9 UJ		50.9 UJ
2-NAPHTHYLAMINE			376 UJ		340 UJ		346 UJ
2-NITROANILINE			58.3 UJ		52.7 UJ		53.7 UJ
2-NITROPHENOL			67.0 UJ		60.6 UJ		61.7 UJ
2-PICOLINE			376 UJ		340 UJ		346 UJ
3,3'-DICHLOROBENZIDINE			368 UJ		333 UJ		339 UJ
3,3'-DIMETHYLBENZIDINE			376 UJ		340 UJ		346 UJ
3-METHYLCHOLANTHRENE			376 UJ		340 UJ		346 UJ
3-METHYLPHENOL			376 UJ		340 UJ		346 UJ
3-NITROANILINE			141 UJ		127 UJ		130 UJ
4,6-DINITRO-2-METHYLPHENOL			64.8 UJ		58.6 UJ		59.7 UJ
4-AMINOBIPHENYL			752 UJ		680 UJ		693 UJ
4-BROMOPHENYL PHENYL ETHER			29.9 UJ		27.0 UJ		27.6 UJ
4-CHLORO-3-METHYLPHENOL			59.8 UJ		54.0 UJ		55.0 UJ
4-CHLOROANILINE			85.0 UJ		76.8 UJ		78.3 UJ
4-CHLOROPHENYL PHENYL ETHER			22.6 UJ		20.4 UJ		20.8 UJ
4-METHYLPHENOL			43.4 UJ		39.2 UJ		39.9 UJ
4-NITROANILINE			66.5 UJ		60.0 UJ		61.2 UJ
4-NITROPHENOL			132 UJ		120 UJ		122 UJ
4-NITROQUINOLINE-1-OXIDE			1500 UJ		1360 UR		1390 UR
5-NITRO-O-TOLUIDINE			376 UJ		340 UJ		346 UJ
7,12-DIMETHYLBENZ(A)ANTHRACENE			376 UJ		340 UJ		346 UJ
A,A-DIMETHYLPHENETHYLAMINE			376 UJ		340 UJ		346 UJ
ACENAPHTHENE			39.0 UJ		35.3 UJ		36.0 UJ

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SAMPLE NUMBER:	S25-MW03-002	S25-SB01-001	S25-SB01-002	S25-SB02-001	S25-SB02-002	S25-SB03-001	S25-SB03-002
DEPTH (feet):	3 - 5	0 - 2	4 - 6	0 - 2	2 - 4	0 - 2	2 - 4
LOCATION:	MW03	SB01	SB01	SB02	SB02	SB03	SB03
SAMPLE DATE:	9/25/95	9/21/95	9/21/95	10/03/95	10/03/95	10/03/95	10/03/95
SEMIVOLATILES (UG/KG)							
ACENAPHTHYLENE			38.6 UJ		34.9 UJ		35.6 UJ
ACETOPHENONE			376 UJ		340 UJ		346 UJ
ANILINE			376 UJ		340 UJ		346 UJ
ANTHRACENE			26.4 UJ		23.9 UJ		24.4 UJ
ARAMITE			752 UJ		680 UJ		693 UJ
BENZO(A)ANTHRACENE			13.7 UJ		12.4 UJ		12.6 UJ
BENZO(A)PYRENE			17.1 UJ		15.4 UJ		15.7 UJ
BENZO(B)FLUORANTHENE			50.8 UJ		45.9 UJ		46.8 UJ
BENZO(G,H,I)PERYLENE			52.2 UJ		47.2 UJ		48.1 UJ
BENZO(K)FLUORANTHENE			41.9 UJ		37.9 UJ		38.6 UJ
BENZYL ALCOHOL			51.2 UJ		46.3 UJ		47.2 UJ
BIS(2-CHLOROETHOXY)METHANE			53.4 UJ		48.2 UJ		49.2 UJ
BIS(2-CHLOROETHYL)ETHER			80.7 UJ		72.9 UJ		74.4 UJ
BIS(2-ETHYLHEXYL)PHTHALATE			73.6 UJ		66.5 UJ		67.8 UJ
BUTYL BENZYL PHTHALATE			106 UJ		98.0 UJ		97.9 UJ
CHLOROBENZILATE			376 UJ		340 UJ		346 UJ
CHRYSENE			21.2 UJ		19.2 UJ		19.6 UJ
DI-N-BUTYL PHTHALATE			62.3 UJ		56.3 UJ		57.4 UJ
DI-N-OCTYL PHTHALATE			54.0 UJ		48.7 UJ		49.7 UJ
DIALLATE			376 UJ		340 UR		346 UR
DIBENZO(A,H)ANTHRACENE			43.2 UJ		39.0 UJ		39.8 UJ
DIBENZOFURAN			29.0 UJ		26.2 UJ		26.7 UJ
DIETHYL PHTHALATE			41.0 UJ		37.0 UJ		37.8 UJ
DIMETHOATE			752 UJ		680 UJ		693 UJ
DIMETHYL PHTHALATE			19.0 UJ		17.2 UJ		17.5 UJ
DIPHENYLAMINE			376 UJ		340 UJ		346 UJ
ETHYL METHACRYLATE			376 UJ		340 UJ		346 UJ
FAMPHUR			752 UJ		680 UJ		693 UJ
FLUORANTHENE			51.1 UJ		46.2 UJ		47.1 UJ
FLUORENE			27.3 UJ		24.7 UJ		25.2 UJ
HEXACHLOROBENZENE			22.4 UJ		20.3 UJ		20.7 UJ
HEXACHLOROBUTADIENE			41.4 UJ		37.4 UJ		38.1 UJ
HEXACHLOROCYCLOPENTADIENE			69.1 UJ		62.4 UJ		63.7 UJ

Summary of Soil Analytical Results - SWMU 25
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER:	S25-MW03-002	S25-SB01-001	S25-SB01-002	S25-SB02-001	S25-SB02-002	S25-SB03-001	S25-SB03-002
DEPTH (feet):	3 - 5	0 - 2	4 - 6	0 - 2	2 - 4	0 - 2	2 - 4
LOCATION:	MW03	SB01	SB01	SB02	SB02	SB03	SB03
SAMPLE DATE:	9/25/95	9/21/95	9/21/95	10/03/95	10/03/95	10/03/95	10/03/95
SEMIVOLATILES (UG/KG)							
HEXACHLOROETHANE			24.5 UJ		22.1 UJ		22.6 UJ
HEXACHLOROPHENE			1880 UR		1700 UR		1730 UR
HEXACHLOROPROPENE			376 UJ		340 UJ		346 UJ
INDENO(1,2,3-CD)PYRENE			46.8 UJ		42.3 UJ		43.1 UJ
ISODRIN			752 UJ		680 UJ		693 UJ
ISOPHORONE			54.8 UJ		49.5 UJ		50.5 UJ
ISOSAFROLE			376 UJ		340 UJ		346 UJ
KEPONE			752 UR		680 UR		693 UR
METHAPYRILENE			3760 UJ		3400 UJ		3460 UJ
METHYL METHANESULFONATE			564 UJ		510 UJ		520 UJ
N-NITROSO-DI-N-PROPYLAMINE			64.8 UJ		58.5 UJ		59.7 UJ
N-NITROSODI-N-BUTYLAMINE			376 UJ		340 UJ		346 UJ
N-NITROSODIETHYLAMINE			752 UJ		680 UJ		693 UJ
N-NITROSODIMETHYLAMINE			56.7 UJ		51.2 UJ		52.2 UJ
N-NITROSODIPHENYLAMINE			38.0 UJ		34.3 UJ		35.0 UJ
N-NITROSOMETHYLETHYLAMINE			376 UJ		340 UJ		346 UJ
N-NITROSOMORPHOLINE			376 UJ		340 UJ		346 UJ
N-NITROSOPIPERIDINE			752 UJ		680 UJ		693 UJ
N-NITROSOPYRROLIDINE			376 UJ		340 UJ		346 UJ
NAPHTHALENE			34.8 UJ		31.4 UJ		32.0 UJ
NITROBENZENE			51.3 UJ		46.3 UJ		47.2 UJ
O,O,O-TRIETHYLPHOSPHOROTHIOATE			376 UJ		340 UJ		346 UJ
O,O-DIETHYL-O-2-PYRAZINYLPHOSPHOROT			376 UJ		340 UJ		346 UJ
O-TOLUIDINE			376 UJ		340 UJ		346 UJ
P-DIMETHYLAMINOAZOBENZENE			376 UJ		340 UJ		346 UJ
P-PHENYLENEDIAMINE			376 UJ		340 UJ		346 UJ
PENTACHLOROBENZENE			376 UJ		340 UJ		346 UJ
PENTACHLORONITROBENZENE			376 UJ		340 UJ		346 UJ
PENTACHLOROPHENOL			120 UJ		108 UJ		110 UJ
PHENACETIN			752 UJ		680 UJ		693 UJ
PHENANTHRENE			42.5 UJ		38.4 UJ		39.2 UJ
PHENOL			156 UJ		141 UJ		144 UJ
PHORATE			376 UJ		340 UR		346 UR

Summary of Soil Analytical Results - SWMU 25
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER:	S25-MW03-002	S25-SB01-001	S25-SB01-002	S25-SB02-001	S25-SB02-002	S25-SB03-001	S25-SB03-002
DEPTH (feet):	3 - 5	0 - 2	4 - 8	0 - 2	2 - 4	0 - 2	2 - 4
LOCATION:	MW03	SB01	SB01	SB02	SB02	SB03	SB03
SAMPLE DATE:	9/25/95	9/21/95	9/21/95	10/03/95	10/03/95	10/03/95	10/03/95
SEMIVOLATILES (UG/KG)							
PRONAMIDE			376 UJ		340 UJ		346 UJ
PYRENE			93.9 UJ		84.8 UJ		86.4 UJ
PYRIDINE			376 UJ		340 UJ		346 UJ
SAFROLE			376 UJ		340 UJ		346 UJ
EXPLOSIVES (UG/KG)							
1,3 DINITROBENZENE	37.2 U	37.2 U	37.2 U	37.2 U	37.2 U	37.2 U	37.2 U
1,3,5 TRINITROBENZENE	40.2 U	40.2 U	40.2 U	40.2 U	40.2 U	40.2 U	40.2 U
2,4 DINITROTOLUENE	51.6 U	51.6 U	51.6 U	51.6 U	51.6 U	51.6 U	51.6 U
2,4,6-TRINITROTOLUENE	35.6 U	35.6 U	35.6 U	35.6 U	35.6 U	35.6 U	35.6 U
2,6 DINITROTOLUENE	47.6 U	47.6 U	47.6 U	47.6 U	47.6 U	47.6 U	47.6 U
2-AMINO-4,6-DINITROTOLUENE	46.7 U	46.7 U	46.7 U	46.7 U	46.7 U	46.7 U	46.7 U
2-NITROTOLUENE	81.4 U	81.4 U	81.4 U	81.4 U	81.4 U	81.4 U	81.4 U
3-NITROTOLUENE	81.7 U	81.7 U	81.7 U	81.7 U	81.7 U	81.7 U	81.7 U
4-AMINO-2,6-DINITROTOLUENE	40.8 U	40.8 U	40.8 U	40.8 U	40.8 U	40.8 U	40.8 U
4-NITROTOLUENE	87.2 U	87.2 U	87.2 U	87.2 U	87.2 U	87.2 U	87.2 U
HMX	70.5 U	70.5 U	70.5 U	70.5 U	70.5 U	70.5 U	70.5 U
NITRO-BENZENE	35.2 U	35.2 U	35.2 U	35.2 U	35.2 U	35.2 U	35.2 U
NITROCELLULOSE	15.8 UL	5.0 U	5.1 U	15.6 UL	15.8 UL	16.3 UL	15.9 UL
NITROGLYCERIN	10000 U	10000 U	10000 U	10000 U	10000 U	10000 U	10000 U
NITROGUANIDINE	63.0 U	63.0 U	63.0 U	63.0 U	63.0 U	63.0 U	63.0 U
PENTAERYTHRITOL TETRANITRATE	250 U	250 U	250 U	250 U	250 U	250 U	250 U
RDX	50.9 U	50.9 U	50.9 U	50.9 U	50.9 U	50.9 U	50.9 U
TETRYL	163 U	163 U	163 U	163 U	163 U	163 U	163 U
INORGANICS (MG/KG)							
ALUMINUM	3070 J	2310	6340	5410	5710	3490	2290
ANTIMONY	0.17 UL	0.51 L	0.19 UL	0.18 UR	0.18 UR	0.18 UR	0.18 UR
ARSENIC	3.7	1.3 L	2.4 L	1.3 L	2.5 L	12.4 L	10.2 L
BARIUM	9.1	24.2	55.0	20.3	20.7	20.6	13.4
BERYLLIUM	0.14	0.24	0.84	0.24	0.30	0.40	0.39
CADMIUM	0.51 UL	0.53 UL	0.57 UL	0.53 UL	0.52 UL	0.56 L	0.61 L
CALCIUM	113 B	59.9 K	303 K	46.4 B	48.1 B	41.3 B	39.7 B
CHROMIUM	8.5	17.2	18.4	16.8 J	9.3 J	8.7 J	7.3 J
COBALT	3.3	4.1	21.2	2.8 L	2.9 L	5.4	3.7 L

Summary of Soil Analytical Results - SWMU 25
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER:	S25-MW03-002	S25-SB01-001	S25-SB01-002	S25-SB02-001	S25-SB02-002	S25-SB03-001	S25-SB03-002
DEPTH (feet):	3 - 5	0 - 2	4 - 6	0 - 2	2 - 4	0 - 2	2 - 4
LOCATION:	MW03	SB01	SB01	SB02	SB02	SB03	SB03
SAMPLE DATE:	9/25/95	9/21/95	9/21/95	10/03/95	10/03/95	10/03/95	10/03/95
INORGANICS (MG/KG)							
COPPER	1.5 UL	4.4 L	20.0	3.2 B	3.5 B	3.1 B	1.6 B
CYANIDE	1.0 U	1.1 U	1.1 U	1.1 U	1.0 U	1.1 U	1.1 U
IRON	10200	7280	34900	10600 J	12400 J	23400 J	26900 J
LEAD	3.1	5.6 J	8.2 J	2.2 L	1.9 L	3.0 L	2.0 L
MAGNESIUM	215J	146 K	1540	365 K	381 K	102 K	63.1 K
MANGANESE	50.1J	58.7	77.8	171 J	49.8 J	82.5 J	56.6 J
MERCURY	0.05 U	0.05 UL	0.06 UL	0.05 U	0.05 U	0.05 U	0.05 U
NICKEL	3.3 J	9.8	25.4	5.8 B	4.0 B	1.9 B	3.0 B
POTASSIUM	250	153	761	292	330	232	153
SELENIUM	0.15 U	0.19 B	0.17 U	0.19 B	0.15 U	0.45 B	0.31 B
SILVER	0.10 U	0.11 U	0.11 U	0.11 U	0.10 U	0.11 U	0.11 U
SODIUM	18.4 U	19.0 U	26.2	19.3 U	18.8 U	19.4 U	19.0 U
THALLIUM	0.26 U	0.26 U	0.29 U	0.27 U	0.26 U	0.27 U	0.26 U
TIN	4.1 UJ	4.2 UJ	4.6 UJ	3.6 UL	3.5 UL	3.6 UL	3.5 UL
VANADIUM	9.8 L	9.2 B	34.3	13.7	14.4	11.0	7.8
ZINC	11.3	8.4	92.1	10.3	13.2	9.8	7.2
INDICATOR PARAMETERS (MG/KG)							
AMMONIA	7.6	52.3 L	14.9 L	30.9	49.0	25.4	12.5
NITRATE/NITRITE	1.8 U	0.72 UJ	0.68 UJ	1.7 UL	1.6 UL	1.7 UL	1.6 UL
TOTAL ORGANIC CARBON	87.5 U	5250	713	2640 L	1390 L	1900 L	1260 L

Summary of Sediment Analytical Results - SWMU 25
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER:	S25-SD001	FD05	S25-SD002	S25-SD003	S25-SD004		
LOCATION:	SD001	SD001	SD002	SD003	SD004		
SAMPLE DATE:	09/22/95	09/22/95	09/21/95	09/22/95	09/25/95		
VOLATILES (UG/KG)							
1,1,1,2-TETRACHLOROETHANE	6.2 UJ	6.4 UJ	6.1 U	6.2 UJ	6.8 U		
1,1,1-TRICHLOROETHANE	0.23 UJ	0.22 UJ	0.21 U	0.23 UJ	0.23 U		
1,1,2,2-TETRACHLOROETHANE	0.66 UJ	0.67 UJ	0.65 UJ	0.66 UJ	0.72 U		
1,1,2-TRICHLOROETHANE	0.56 UJ	0.57 UJ	0.55 U	0.56 UJ	0.61 U		
1,1-DICHLOROETHANE	0.41 UJ	0.42 UJ	0.40 U	0.41 UJ	0.45 U		
1,1-DICHLOROETHENE	0.35 UJ	0.36 UJ	0.34 U	0.35 UJ	0.38 U		
1,2,3-TRICHLOROPROPANE	6.2 UJ	6.4 UJ	6.1 U	6.2 UJ	6.6 U		
1,2-DIBROMO-3-CHLOROPROPANE	124 UJ	127 UJ	122 UJ	125 UJ	136 U		
1,2-DIBROMOETHANE	6.2 UJ	6.4 UJ	6.1 U	6.2 UJ	6.8 U		
1,2-DICHLOROETHANE	6.2 UJ	6.4 UJ	6.1 U	6.2 UJ	6.8 U		
1,2-DICHLOROPROPANE	6.2 UJ	6.4 UJ	6.1 U	6.2 UJ	6.8 U		
1,4-DICHLORO-2-BUTENE	124 UJ	127 UJ	122 U	125 UJ	136 U		
1,4-DIOXANE	185 UR	191 UR	183 UR	187 UR	204 UR		
2-BUTANONE	4.7 UR	4.8 UR	4.6 U	4.7 UR	5.1 UR		
2-HEXANONE	2.8 UJ	2.8 UJ	2.7 UJ	2.8 UJ	3.0 U		
4-METHYL-2-PENTANONE	1.9 UJ	1.9 UJ	1.8 U	1.9 UJ	2.1 U		
ACETONE	4.8 UJ	4.9 UJ	22.0 B	13.5 B	5.2 UJ		
ACETONITRILE	124 UJ	127 UJ	122 U	125 UJ	136 U		
ACROLEIN	14.3 UJ	14.7 UJ	14.1 U	14.4 UJ	15.6 U		
ACRYLONITRILE	6.2 UJ	6.4 UJ	6.1 U	6.2 UJ	6.8 U		
ALLYL CHLORIDE	6.2 UJ	6.4 UJ	6.1 U	6.2 UJ	6.8 U		
BENZENE	0.31 UJ	0.32 UJ	0.31 U	0.31 UJ	0.34 U		
BROMODICHLOROMETHANE	0.24 UJ	0.24 UJ	0.23 U	0.24 UJ	0.26 U		
BROMOFORM	3.3 UJ	3.4 UJ	3.3 U	3.3 UJ	3.6 U		
BROMOMETHANE	0.24 UJ	0.24 UJ	0.23 U	0.24 UJ	0.26 U		
CARBON DISULFIDE	1.5 UJ	1.5 UJ	1.4 U	1.5 UJ	1.6 U		
CARBON TETRACHLORIDE	0.15 UJ	0.15 UJ	0.15 U	0.15 UJ	0.16 U		
CHLOROBENZENE	0.45 UJ	0.46 UJ	0.44 U	0.45 UJ	0.49 U		
CHLOROETHANE	0.51 UJ	0.52 UJ	0.50 U	0.51 UJ	0.56 U		
CHLOROFORM	0.46 UJ	0.47 UJ	0.45 U	0.46 UJ	0.50 U		
CHLOROMETHANE	0.61 UJ	0.62 UJ	0.60 U	0.61 UJ	0.67 U		
CHLOROPRENE	6.2 UR	6.4 UR	6.1 UR	6.2 UR	6.8 UR		
CIS-1,3-DICHLOROPROPENE	0.33 UJ	0.34 UJ	0.33 U	0.34 UJ	0.37 U		
DIBROMOCHLOROMETHANE	0.27 UJ	0.28 UJ	0.27 U	0.27 UJ	0.30 U		

Summary of Sediment Analytical Results - SWMU 25
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER: LOCATION: SAMPLE DATE:	S25-SD001 SD001 09/22/95	F005 SD001 09/22/95	S25-SD002 SD002 09/21/95	S25-SD003 SD003 09/22/95	S25-SD004 SD004 09/25/95		
VOLATILES (UG/KG)							
DIBROMOMETHANE	6.2 UJ	6.4 UJ	6.1 U	6.2 UJ	6.8 U		
DICHLORODIFLUOROMETHANE	0.26 UJ	0.27 UJ	0.26 U	0.26 UJ	0.29 U		
ETHYLBENZENE	1.7 UJ	1.7 UJ	1.7 U	1.7 UJ	1.8 U		
IODOMETHANE	6.2 UJ	6.4 UJ	6.1 U	6.2 UJ	6.8 U		
ISOBUTYL ALCOHOL	61.8 UJ	63.6 UJ	61.0 U	62.4 UJ	67.6 U		
METHACRYLONITRILE	6.2 UJ	6.4 UJ	6.1 U	6.2 UJ	6.8 U		
METHYL METHACRYLATE	6.2 UJ	6.4 UJ	6.1 U	6.2 UJ	6.8 U		
METHYLENE CHLORIDE	7.3 B	6.1 B	0.89 U	2.5 B	87.8 B		
PENTACHLOROETHANE	6.2 UJ	6.4 UJ	6.1 U	6.2 UJ	6.8 U		
PROPIONITRILE	61.8 UJ	63.6 UJ	61.0 U	62.4 UJ	67.8 U		
STYRENE	0.37 UJ	0.38 UJ	0.37 U	0.37 UJ	0.41 U		
TETRACHLOROETHENE	1.1 UJ	1.1 UJ	1.1 U	1.1 UJ	1.2 U		
TOLUENE	0.34 UJ	0.34 UJ	0.33 U	0.34 UJ	0.37 U		
TRANS-1,2-DICHLOROETHENE	0.35 UJ	0.36 UJ	0.34 U	0.35 UJ	0.38 U		
TRANS-1,3-DICHLOROPROPENE	0.61 UJ	0.62 UJ	0.60 U	0.61 UJ	0.67 U		
TRICHLOROETHENE	0.32 UJ	0.33 UJ	0.32 U	0.32 UJ	0.35 U		
TRICHLOROFLUOROMETHANE	0.36 UJ	0.37 UJ	0.35 U	0.36 UJ	0.39 U		
VINYL ACETATE	0.35 UJ	0.36 UJ	0.34 U	0.35 UJ	0.38 U		
VINYL CHLORIDE	0.41 UJ	0.42 UJ	0.40 U	0.41 UJ	0.45 U		
XYLENES, TOTAL	0.85 UJ	0.88 UJ	0.84 U	0.86 UJ	0.94 U		
SEMIVOLATILES (UG/KG)							
1,2,4,5-TETRACHLOROBENZENE	409 UJ	419 UJ	403 UJ	412 UJ	449 UJ		
1,2,4-TRICHLOROBENZENE	39.2 UJ	40.1 UJ	38.5 UJ	39.5 UJ	42.9 UJ		
1,3,5-TRINITROBENZENE	40.2 U	40.2 U	40.2 U	40.2 U	449 UJ		
1,3-DINITROBENZENE	37.2 U	37.2 U	37.2 U	37.2 U	449 UJ		
1,4-NAPHTHOQUINONE	409 UJ	419 UJ	403 UJ	412 UJ	449 UJ		
1-NAPHTHYLAMINE	409 UJ	419 UJ	403 UJ	412 UJ	449 UJ		
2,2'-OXYBIS(1-CHLOROPROPANE)	409 UJ	419 UJ	403 UJ	412 UJ	449 UJ		
2,3,4,6-TETRACHLOROPHENOL	409 UJ	419 UJ	403 UJ	412 UJ	449 UJ		
2,4,5-TRICHLOROPHENOL	57.5 UJ	58.9 UJ	56.6 UJ	58.0 UJ	63.1 UJ		
2,4,6-TRICHLOROPHENOL	79.3 UJ	81.2 UJ	78.0 UJ	80.0 UJ	87.0 UJ		
2,4-DICHLOROPHENOL	56.9 UJ	58.3 UJ	56.0 UJ	57.4 UJ	62.4 UJ		
2,4-DIMETHYLPHENOL	128 UJ	131 UJ	126 UJ	129 UJ	140 UJ		
2,4-DINITROPHENOL	201 UJ	206 UJ	198 UJ	203 UJ	221 UJ		

Summary of Sediment Analytical Results - SWMU 25
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER:	S25-SD001	FD05	S25-SD002	S25-SD003	S25-SD004		
LOCATION:	SD001	SD001	SD002	SD003	SD004		
SAMPLE DATE:	09/22/95	09/22/95	09/21/95	09/22/95	09/25/95		
SEMIVOLATILES (UG/KG)							
2,4-DINITROTOLUENE	51.6 U	51.6 U	51.6 U	51.6 U	30.6 UJ		
2,6-DICHLOROPHENOL	409 UJ	419 UJ	403 UJ	412 UJ	449 UJ		
2,6-DINITROTOLUENE	47.6 U	47.6 U	47.6 U	47.6 U	19.3 UJ		
2-ACETYLAMINOFLUORENE	409 UJ	419 UJ	403 UJ	412 UJ	449 UJ		
2-CHLORONAPHTHALENE	30.5 UJ	31.3 UJ	30.0 UJ	30.8 UJ	33.5 UJ		
2-CHLOROPHENOL	72.9 UJ	74.7 UJ	71.7 UJ	73.5 UJ	80.0 UJ		
2-METHYLNAPHTHALENE	49.4 UJ	50.6 UJ	48.6 UJ	49.8 UJ	54.2 UJ		
2-METHYLPHENOL	60.1 UJ	61.6 UJ	59.1 UJ	60.6 UJ	65.9 UJ		
2-NAPHTHYLAMINE	409 UJ	419 UJ	403 UJ	412 UJ	449 UJ		
2-NITROANILINE	63.4 UJ	64.9 UJ	62.4 UJ	63.9 UJ	69.5 UJ		
2-NITROPHENOL	72.9 UJ	74.7 UJ	71.7 UJ	73.5 UJ	80.0 UJ		
2-PICOLINE	409 UJ	419 UJ	403 UJ	412 UJ	449 UJ		
3,3'-DICHLOROBENZIDINE	401 UJ	411 UJ	394 UJ	404 UJ	440 UJ		
3,3'-DIMETHYLBENZIDINE	409 UJ	419 UJ	403 UJ	412 UJ	449 UJ		
3-METHYLCHOLANTHRENE	409 UJ	419 UJ	403 UJ	412 UJ	449 UJ		
3-METHYLPHENOL	409 UJ	419 UJ	403 UJ	412 UJ	449 UJ		
3-NITROANILINE	153 UR	157 UJ	151 UJ	155 UR	168 UJ		
4,6-DINITRO-2-METHYLPHENOL	70.5 UJ	72.2 UJ	69.4 UJ	71.1 UJ	77.4 UJ		
4-AMINOBIPHENYL	818 UJ	838 UJ	805 UJ	825 UJ	898 UJ		
4-BROMOPHENYL PHENYL ETHER	32.6 UJ	33.3 UJ	32.0 UJ	32.8 UJ	35.7 UJ		
4-CHLORO-3-METHYLPHENOL	65.0 UJ	66.6 UJ	64.0 UJ	65.5 UJ	71.3 UJ		
4-CHLOROANILINE	92.5 UJ	94.7 UJ	91.0 UJ	93.2 UJ	101 UJ		
4-CHLOROPHENYL PHENYL ETHER	24.6 UJ	25.2 UJ	24.2 UJ	24.8 UJ	27.0 UJ		
4-METHYLPHENOL	47.2 UJ	48.3 UJ	46.4 UJ	47.6 UJ	51.7 UJ		
4-NITROANILINE	72.3 UJ	74.0 UJ	71.1 UJ	72.9 UJ	79.3 UJ		
4-NITROPHENOL	144 UJ	147 UJ	142 UJ	145 UJ	158 UJ		
4-NITROQUINOLINE-1-OXIDE	1640 UR	1680 UR	1610 UJ	1650 UR	1800 UR		
5-NITRO-O-TOLUIDINE	409 UJ	419 UJ	403 UJ	412 UJ	449 UJ		
7,12-DIMETHYLBENZ(A)ANTHRACENE	409 UJ	419 UJ	403 UJ	412 UJ	449 UJ		
A,A-DIMETHYLPHENETHYLAMINE	409 UJ	419 UJ	403 UJ	412 UJ	449 UJ		
ACENAPHTHENE	42.5 UJ	43.5 UJ	41.8 UJ	42.8 UJ	46.6 UJ		
ACENAPHTHYLENE	42.0 UJ	43.0 UJ	41.3 UJ	42.3 UJ	46.1 UJ		
ACETOPHENONE	409 UJ	419 UJ	403 UJ	412 UJ	449 UJ		
ANILINE	409 UJ	419 UJ	403 UJ	412 UJ	449 UJ		

Summary of Sediment Analytical Results - SWMU 25
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER: LOCATION: SAMPLE DATE:	S25-SD001 SD001 09/22/95	FD05 SD001 09/22/95	S25-SD002 SD002 09/21/95	S25-SD003 SD003 09/22/95	S25-SD004 SD004 09/25/95		
SEMIVOLATILES (UG/KG)							
ANTHRACENE	28.8 UJ	29.5 UJ	28.3 UJ	29.0 UJ	31.8 UJ		
ARAMITE	818 UJ	838 UJ	805 UJ	825 UJ	898 UJ		
BENZO(A)ANTHRACENE	14.9 UJ	15.3 UJ	14.7 UJ	15.1 UJ	16.4 UJ		
BENZO(A)PYRENE	18.6 UJ	19.0 UJ	18.3 UJ	170	20.4 UJ		
BENZO(B)FLUORANTHENE	55.2 UJ	56.6 UJ	54.4 UJ	55.7 UJ	60.6 UJ		
BENZO(G,H,I)PERYLENE	58.8 UJ	58.2 UJ	55.9 UJ	57.3 UJ	62.3 UJ		
BENZO(K)FLUORANTHENE	45.6 UJ	46.7 UJ	44.9 UJ	46.0 UJ	50.0 UJ		
BENZYL ALCOHOL	55.7 UJ	57.1 UJ	54.8 UJ	56.2 UJ	61.1 UJ		
BIS(2-CHLOROETHOXY)METHANE	58.1 UJ	59.5 UJ	57.1 UJ	58.6 UJ	63.7 UJ		
BIS(2-CHLOROETHYL)ETHER	87.8 UJ	89.9 UJ	86.4 UJ	88.5 UJ	96.3 UJ		
BIS(2-ETHYLHEXYL)PHTHALATE	73.8 J	82.0 UJ	78.7 UJ	80.7 UJ	87.8 UJ		
BUTYL BENZYL PHTHALATE	116 UJ	118 UJ	114 UJ	116 UJ	127 UJ		
CHLOROBENZILATE	409 UJ	419 UJ	403 UJ	412 UJ	449 UJ		
CHRYSENE	23.1 UJ	23.7 UJ	22.7 UJ	23.3 UJ	25.3 UJ		
DI-N-BUTYL PHTHALATE	67.8 UJ	69.4 UJ	66.7 UJ	68.4 UJ	74.4 UJ		
DI-N-OCTYL PHTHALATE	58.7 UJ	60.1 UJ	57.7 UJ	59.2 UJ	64.4 UJ		
DIALLATE	409 UR	419 UR	403 UJ	412 UR	449 UR		
DIBENZO(A,H)ANTHRACENE	47.0 UJ	48.2 UJ	46.3 UJ	47.4 UJ	51.6 UJ		
DIBENZOFURAN	31.5 UJ	32.3 UJ	31.0 UJ	31.8 UJ	34.6 UJ		
DIETHYL PHTHALATE	44.6 UJ	45.7 UJ	43.9 UJ	45.0 UJ	49.0 UJ		
DIMETHOATE	818 UJ	838 UJ	805 UJ	825 UJ	898 UJ		
DIMETHYL PHTHALATE	20.7 UJ	21.2 UJ	20.3 UJ	20.8 UJ	22.7 UJ		
DIPHENYLAMINE	409 UJ	419 UJ	403 UJ	412 UJ	449 UJ		
ETHYL METHACRYLATE	409 UJ	419 UJ	403 UJ	412 UJ	449 UJ		
FAMPHUR	818 UR	838 UJ	805 UJ	825 UR	898 UJ		
FLUORANTHENE	55.6 UJ	57.0 UJ	54.7 UJ	56.1 UJ	61.0 UJ		
FLUORENE	29.7 UJ	30.4 UJ	29.2 UJ	30.0 UJ	32.6 UJ		
HEXACHLOROBENZENE	24.4 UJ	25.0 UJ	24.0 UJ	24.6 UJ	26.8 UJ		
HEXACHLOROBUTADIENE	45.0 UJ	46.1 UJ	44.3 UJ	45.4 UJ	49.4 UJ		
HEXACHLOROCYCLOPENTADIENE	75.2 UJ	77.0 UJ	74.0 UJ	75.8 UJ	82.4 UJ		
HEXACHLOROETHANE	26.6 UJ	27.3 UJ	26.2 UJ	26.9 UJ	29.2 UJ		
HEXACHLOROPHENE	2050 UR	2100 UR	2010 UR	2060 UR	2240 UR		
HEXACHLOROPROPENE	409 UJ	419 UJ	403 UJ	412 UJ	449 UJ		
INDENO(1,2,3-CD)PYRENE	50.9 UJ	52.1 UJ	50.1 UJ	51.3 UJ	55.8 UJ		

Summary of Sediment Analytical Results - SWMU 25
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER:	S25-SD001	FD05	S25-SD002	S25-SD003	S25-SD004		
LOCATION:	SD001	SD001	SD002	SD003	SD004		
SAMPLE DATE:	09/22/95	09/22/95	09/21/95	09/22/95	09/25/95		
SEMIVOLATILES (UG/KG)							
ISODRIN	818 UJ	838 UJ	805 UJ	825 UJ	898 UJ		
ISOPHORONE	59.6 UJ	61.1 UJ	58.7 UJ	60.1 UJ	65.4 UJ		
ISOSAFROLE	409 UJ	419 UJ	403 UJ	412 UJ	449 UJ		
KEPONE	818 UR	838 UR	805 UR	825 UR	898 UR		
METHAPYRILENE	4090 UJ	4190 UJ	4030 UJ	4120 UJ	4490 UJ		
METHYL METHANESULFONATE	614 UJ	629 UJ	604 UJ	619 UJ	673 UJ		
N-NITROSO-DI-N-PROPYLAMINE	70.4 UJ	72.2 UJ	69.3 UJ	71.0 UJ	77.3 UJ		
N-NITROSODI-N-BUTYLAMINE	409 UJ	419 UJ	403 UJ	412 UJ	449 UJ		
N-NITROSODIETHYLAMINE	818 UJ	838 UJ	805 UJ	825 UJ	898 UJ		
N-NITROSODIMETHYLAMINE	61.6 UJ	63.1 UJ	60.6 UJ	62.2 UJ	67.6 UJ		
N-NITROSODIPHENYLAMINE	41.3 UJ	42.3 UJ	40.6 UJ	41.6 UJ	45.3 UJ		
N-NITROSOMETHYLETHYLAMINE	409 UJ	419 UJ	403 UJ	412 UJ	449 UJ		
N-NITROSOMORPHOLINE	409 UJ	419 UJ	403 UJ	412 UJ	449 UJ		
N-NITROSOPIPERIDINE	818 UJ	838 UJ	805 UJ	825 UJ	898 UJ		
N-NITROSOPYRROLIDINE	409 UJ	419 UJ	403 UJ	412 UJ	449 UJ		
NAPHTHALENE	80.7 J	85.9 J	37.2 UJ	38.1 UJ	41.5 UJ		
NITROBENZENE	35.2 U	35.2 U	35.2 U	35.2 U	61.2 UJ		
O,O,O-TRIETHYLPHOSPHOROTHIOATE	409 UJ	419 UJ	403 UJ	412 UJ	449 UJ		
O,O-DIETHYL-O-2-PYRAZINYLPHOSPHOROT	409 UJ	419 UJ	403 UJ	412 UJ	449 UJ		
O-TOLUIDINE	409 UJ	419 UJ	403 UJ	412 UJ	449 UJ		
P-DIMETHYLAMINOAZOBENZENE	409 UJ	419 UJ	403 UJ	412 UJ	449 UJ		
P-PHENYLENEDIAMINE	409 UJ	419 UJ	403 UJ	412 UJ	449 UJ		
PENTACHLOROBENZENE	409 UJ	419 UJ	403 UJ	412 UJ	449 UJ		
PENTACHLORONITROBENZENE	409 UJ	419 UJ	403 UJ	412 UJ	449 UJ		
PENTACHLOROPHENOL	130 UJ	133 UJ	128 UJ	131 UJ	143 UJ		
PHENACETIN	818 UJ	838 UJ	805 UJ	825 UJ	898 UJ		
PHENANTHRENE	50.5 J	56.8 J	45.5 UJ	46.6 UJ	50.7 UJ		
PHENOL	170 UJ	174 UJ	167 UJ	171 UJ	186 UJ		
PHORATE	409 UJ	419 UR	403 UJ	412 UJ	449 UR		
PRONAMIDE	409 UJ	419 UJ	403 UJ	412 UJ	449 UJ		
PYRENE	102 UJ	104 UJ	100 UJ	103 UJ	112 UJ		
PYRIDINE	409 UJ	419 UJ	403 UJ	412 UJ	449 UJ		
SAFROLE	409 UJ	419 UJ	403 UJ	412 UJ	449 UJ		
EXPLOSIVES (UG/KG)							

Summary of Sediment Analytical Results - SWMU 25
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER:	S25-SD001	FD05	S25-SD002	S25-SD003	S25-SD004		
LOCATION:	SD001	SD001	SD002	SD003	SD004		
SAMPLE DATE:	09/22/95	09/22/95	09/21/95	09/22/95	09/25/95		
EXPLOSIVES (UG/KG)							
2,4,6-TRINITROTOLUENE	35.6 U	35.6 U	35.6 U	35.6 U	35.6 U		
2-AMINO-4,6-DINITROTOLUENE	46.7 U	46.7 U	46.7 U	46.7 U	46.7 U		
2-NITROTOLUENE	81.4 U	81.4 U	81.4 U	81.4 U	81.4 U		
3-NITROTOLUENE	81.7 U	81.7 U	81.7 U	81.7 U	81.7 U		
4-AMINO-2,6-DINITROTOLUENE	40.8 U	40.8 U	40.8 U	40.8 U	40.8 U		
4-NITROTOLUENE	87.2 U	87.2 U	87.2 U	87.2 U	87.2 U		
HMX	70.5 U	70.5 U	70.5 U	70.5 U	70.5 U		
NITROCELLULOSE	15.4 UL	15.1 UL	6.9 U	15.8 UL	17.6 UL		
NITROGLYCERIN	10000 U	10000 U	10000 U	10000 U	10000 U		
NITROGUANIDINE	126 U	126 U	63.0 U	126 U	63.0 U		
PENTAERYTHRITOL TETRANITRATE	250 U	250 U	250 U	250 U	250 U		
RDX	50.9 U	50.9 U	50.9 U	50.9 U	50.9 U		
TETRYL	163 U	163 U	163 U	163 U	163 U		
INORGANICS (MG/KG)							
ALUMINUM	6930 J	4960 J	8530	5070 J	4230 J		
ANTIMONY	0.21 UL	0.39 L	0.21 UL	0.21 UL	0.23 UL		
ARSENIC	2.3 L	5.5 L	3.2 L	1.8 L	1.8		
BARIUM	31.2	26.2	51.8	37.9	18.6		
BERYLLIUM	0.23	0.26	0.32	0.29	0.21		
CADMIUM	0.62 UL	0.64 UL	0.61 UL	0.62 UL	0.68 UL		
CALCIUM	124 B	121 B	269 K	106 B	432 J		
CHROMIUM	10.3	9.0	13.2	6.9	26.8		
COBALT	4.3	4.2	7.0	3.4	1.9 U		
COPPER	16.8	44.6	7.3	3.0	2.0 UL		
CYANIDE	32.2	1.3 U	3.1	23.5	1.4 U		
IRON	14200 J	12000 J	16000	4830 J	8120		
LEAD	12.9 J	15.2 J	9.6 J	7.9 J	6.0		
MAGNESIUM	374 J	288 J	519 K	294 J	562 J		
MANGANESE	129 J	104 J	132	17.9 J	33.5 J		
MERCURY	0.16	0.21	0.19 L	0.06 U	0.06 B		
NICKEL	5.1 J	3.4 J	4.9 J	5.2 J	4.3 J		
POTASSIUM	400	363	768	277	505		
SELENIUM	0.38 B	0.33 B	0.18 U	0.19 U	0.20 U		
SILVER	0.12 U	0.39	0.12 U	0.12 U	0.13 U		

Summary of Sediment Analytical Results - SWMU 25
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER: LOCATION: SAMPLE DATE:	S25-SD001 SD001 09/22/95	FD05 SD001 09/22/95	S25-SD002 SD002 09/21/95	S25-SD003 SD003 09/22/95	S25-SD004 SD004 09/25/95		
INORGANICS (MG/KG)							
SODIUM	22.2 U	22.9 U	29.0	22.5 U	171		
THALLIUM	0.31 U	0.32 U	0.31 U	0.31 U	0.34 U		
TIN	4.9 UJ	5.1 UJ	4.9 UJ	5.0 UJ	5.4 UJ		
VANADIUM	20.6	15.2	21.2	10.3 B	10.8		
ZINC	19.2 J	18.0 J	21.8	10.7 J	7.1		
INDICATOR PARAMETERS (MG/KG)							
AMMONIA	128	193	29.1 L	109	102		
NITRATE/NITRITE	2.4 L	2.0 UL	0.92 UJ	2.7 UL	3.3 U		
TOTAL ORGANIC CARBON	3580	3410	1350	4130	1920		

Summary of Groundwater Analytical Results - SWMU 25
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER: FILTERING: LOCATION: SAMPLE DATE:	25MW01 Unfiltered 25MW01 10/04/95	25MW01-F Filtered 25MW01 10/04/95	25MW02 Unfiltered 25MW02 10/04/95	25MW02-F Filtered 25MW02 10/04/95	25MW03 Unfiltered 25MW03 10/04/95	25MW03-F Filtered 25MW03 10/04/95	
VOLATILES (UG/L)							
1,1,1,2-TETRACHLOROETHANE	5.0 U		5.0 U		5.0 U		
1,1,1-TRICHLOROETHANE	0.28 U		0.28 U		0.28 U		
1,1,2,2-TETRACHLOROETHANE	0.49 U		0.49 U		0.49 U		
1,1,2-TRICHLOROETHANE	0.28 U		0.28 U		0.28 U		
1,1-DICHLOROETHANE	0.29 U		0.29 U		0.29 U		
1,1-DICHLOROETHENE	0.37 U		0.37 U		0.37 U		
1,2,3-TRICHLOROPROPANE	5.0 U		5.0 U		5.0 U		
1,2-DIBROMO-3-CHLOROPROPANE	100 U		100 U		100 U		
1,2-DIBROMOETHANE	5.0 U		5.0 U		5.0 U		
1,2-DICHLOROETHANE	0.13 U		0.13 U		0.13 U		
1,2-DICHLOROPROPANE	0.23 U		0.23 U		0.23 U		
1,4-DICHLORO-2-BUTENE	100 U		100 U		100 U		
1,4-DIOXANE	150 UR		150 UR		150 UR		
2-BUTANONE	1.5 U		1.5 U		1.5 U		
2-HEXANONE	0.67 U		0.67 U		0.67 U		
4-METHYL-2-PENTANONE	0.52 U		0.52 U		0.52 U		
ACETONE	10.3 B		18.4 B		2.9 UJ		
ACETONITRILE	100 U		100 U		100 U		
ACROLEIN	2.6 UR		2.6 UR		2.6 UR		
ACRYLONITRILE	2.0 U		2.0 U		2.0 U		
ALLYL CHLORIDE	5.0 U		5.0 U		5.0 U		
BENZENE	0.14 U		0.14 U		0.14 U		
BROMODICHLOROMETHANE	0.16 U		0.16 U		0.16 U		
BROMOFORM	0.16 U		0.16 U		0.16 U		
BROMOMETHANE	0.41 U		0.41 U		0.41 U		
CARBON DISULFIDE	0.48 U		0.48 U		0.48 U		
CARBON TETRACHLORIDE	0.27 U		0.27 U		0.27 U		
CHLOROBENZENE	0.30 U		0.30 U		0.30 U		
CHLOROETHANE	0.49 U		0.49 U		0.49 U		
CHLOROFORM	1.6		2.7		2.6 J		
CHLOROMETHANE	0.32 U		0.32 U		0.32 U		
CHLOROPRENE	5.0 UR		5.0 UR		5.0 UR		
CIS-1,3-DICHLOROPROPENE	0.21 U		0.21 U		0.21 U		

Summary of Groundwater Analytical Results - SWMU 25
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER: FILTERING: LOCATION: SAMPLE DATE:	25MW01 Unfiltered 25MW01 10/04/95	25MW01-F Filtered 25MW01 10/04/95	25MW02 Unfiltered 25MW02 10/04/95	25MW02-F Filtered 25MW02 10/04/95	25MW03 Unfiltered 25MW03 10/04/95	25MW03-F Filtered 25MW03 10/04/95	
VOLATILES (UG/L)							
DIBROMOCHLOROMETHANE	0.18 U		0.18 U		0.18 U		
DIBROMOMETHANE	5.0 U		5.0 U		5.0 U		
DICHLORODIFLUOROMETHANE	2.6 U		2.6 U		2.6 U		
ETHYLBENZENE	0.23 U		0.23 U		0.23 U		
IODOMETHANE	5.0 U		5.0 U		5.0 U		
ISOBUTYL ALCOHOL	50.0 U		50.0 U		50.0 U		
METHACRYLONITRILE	5.0 U		5.0 U		5.0 U		
METHYL METHACRYLATE	5.0 U		5.0 U		5.0 U		
METHYLENE CHLORIDE	1.6 B		1.4 B		1.2 B		
PENTACHLOROETHANE	5.0 U		5.0 U		5.0 U		
PROPIONITRILE	50.0 UJ		50.0 UJ		50.0 UJ		
STYRENE	0.29 U		0.29 U		0.29 U		
TETRACHLOROETHENE	0.23 U		0.23 U		0.23 U		
TOLUENE	0.17 U		0.17 U		0.17 U		
TRANS-1,2-DICHLOROETHENE	0.31 U		0.31 U		0.31 U		
TRANS-1,3-DICHLOROPROPENE	0.28 U		0.28 U		0.28 U		
TRICHLOROETHENE	0.15 U		0.15 U		0.15 U		
TRICHLOROFLUOROMETHANE	0.44 U		0.44 U		0.44 U		
VINYL ACETATE	0.28 U		0.28 U		0.28 U		
VINYL CHLORIDE	0.56 U		0.56 U		0.56 U		
XYLENES, TOTAL	0.24 U		0.24 U		0.24 U		
SEMIVOLATILES (UG/L)							
1,2,4,5-TETRACHLOROBENZENE	10.3 U		10.5 UJ		16.7 U		
1,2,4-TRICHLOROBENZENE	2.3 U		2.4 UJ		3.7 U		
1,3,5-TRINITROBENZENE	10.3 U		10.5 UJ		16.7 U		
1,3-DINITROBENZENE	10.3 U		10.5 UJ		16.7 U		
1,4-NAPHTHOQUINONE	10.3 U		10.5 UJ		16.7 U		
1-NAPHTHYLAMINE	10.3 U		10.5 UJ		16.7 U		
2,2'-OXYBIS(1-CHLOROPROPANE)	10.3 U		10.5 UJ		16.7 U		
2,3,4,6-TETRACHLOROPHENOL	10.3 U		10.5 UJ		16.7 U		
2,4,5-TRICHLOROPHENOL	0.86 U		0.87 UJ		1.4 U		
2,4,6-TRICHLOROPHENOL	2.3 U		2.3 UJ		3.7 U		
2,4-DICHLOROPHENOL	2.0 U		2.0 UJ		3.2 U		

Summary of Groundwater Analytical Results - SWMU 25
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER: FILTERING: LOCATION: SAMPLE DATE:	25MW01 Unfiltered 25MW01 10/04/95	25MW01-F Filtered 25MW01 10/04/95	25MW02 Unfiltered 25MW02 10/04/95	25MW02-F Filtered 25MW02 10/04/95	25MW03 Unfiltered 25MW03 10/04/95	25MW03-F Filtered 25MW03 10/04/95	
SEMIVOLATILES (UG/L)							
2,4-DIMETHYLPHENOL	7.0 U		7.2 UJ		11.4 U		
2,4-DINITROPHENOL	2.3 U		2.4 UJ		3.8 U		
2,4-DINITROTOLUENE	0.93 U		0.95 UJ		1.5 U		
2,6-DICHLOROPHENOL	10.3 U		10.5 UJ		16.7 U		
2,6-DINITROTOLUENE	1.1 U		1.2 UJ		1.8 U		
2-ACETYLAMINOFLUORENE	20.6 U		21.0 UJ		33.4 U		
2-CHLORONAPHTHALENE	1.7 U		1.7 UJ		2.8 U		
2-CHLOROPHENOL	1.4 U		1.4 UJ		2.2 U		
2-METHYLNAPHTHALENE	2.2 U		2.3 UJ		3.8 U		
2-METHYLPHENOL	1.2 U		1.3 UJ		2.0 U		
2-NAPHTHYLAMINE	10.3 U		10.5 UJ		16.7 U		
2-NITROANILINE	1.5 U		1.5 UJ		2.4 U		
2-NITROPHENOL	1.5 U		1.5 UJ		2.5 U		
2-PICOLINE	10.3 U		10.5 UJ		16.7 U		
3,3'-DICHLOROBENZIDINE	10.2 U		10.4 UJ		16.5 U		
3,3'-DIMETHYLBENZIDINE	10.3 U		10.5 UJ		16.7 U		
3-METHYLCHOLANTHRENE	10.3 U		10.5 UJ		16.7 U		
3-METHYLPHENOL	10.3 U		10.5 UR		16.7 U		
3-NITROANILINE	4.3 UJ		4.3 UJ		6.9 UJ		
4,6-DINITRO-2-METHYLPHENOL	5.2 U		5.3 UJ		8.5 U		
4-AMINOBIPHENYL	20.6 U		21.0 UJ		33.4 U		
4-BROMOPHENYL PHENYL ETHER	1.2 U		1.2 UJ		2.0 U		
4-CHLORO-3-METHYLPHENOL	2.4 U		2.4 UJ		3.8 U		
4-CHLOROANILINE	0.67 U		0.68 UJ		1.1 U		
4-CHLOROPHENYL PHENYL ETHER	1.3 U		1.3 UJ		2.1 U		
4-METHYLPHENOL	1.1 U		1.2 UJ		1.9 U		
4-NITROANILINE	3.8 U		3.9 UJ		6.2 U		
4-NITROPHENOL	2.6 U		2.7 UJ		4.3 UJ		
4-NITROQUINOLINE-1-OXIDE	41.2 UR		42.0 UR		66.8 UR		
5-NITRO-O-TOLUIDINE	10.3 U		10.5 UJ		16.7 U		
7,12-DIMETHYLBENZ(A)ANTHRACENE	10.3 U		10.5 UJ		16.7 U		
A,A-DIMETHYLPHENETHYLAMINE	10.3 U		10.5 UJ		16.7 U		
ACENAPHTHENE	1.4 U		1.4 UJ		2.3 U		

Summary of Groundwater Analytical Results - SWMU 25
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER: FILTERING: LOCATION: SAMPLE DATE:	25MW01 Unfiltered 25MW01 10/04/95	25MW01-F Filtered 25MW01 10/04/95	25MW02 Unfiltered 25MW02 10/04/95	25MW02-F Filtered 25MW02 10/04/95	25MW03 Unfiltered 25MW03 10/04/95	25MW03-F Filtered 25MW03 10/04/95	
SEMIVOLATILES (UG/L)							
ACENAPHTHYLENE	1.5 U		1.5 UJ		2.4 U		
ACETOPHENONE	10.3 U		10.5 UJ		16.7 U		
ANILINE	10.3 U		10.5 UJ		16.7 U		
ANTHRACENE	1.3 U		1.3 UJ		2.1 U		
ARAMITE	20.6 U		21.0 UJ		33.4 U		
BENZO(A)ANTHRACENE	1.3 U		1.3 UJ		2.1 U		
BENZO(A)PYRENE	1.0 U		1.0 UJ		1.7 U		
BENZO(B)FLUORANTHENE	0.87 U		0.88 UJ		1.4 U		
BENZO(G,H,I)PERYLENE	3.8 U		3.8 UJ		6.1 U		
BENZO(K)FLUORANTHENE	1.8 U		1.8 UJ		2.9 U		
BENZYL ALCOHOL	2.3 U		2.3 UJ		3.7 U		
BIS(2-CHLOROETHOXY)METHANE	1.3 U		1.3 UJ		2.0 U		
BIS(2-CHLOROETHYL)ETHER	0.83 U		0.85 UJ		1.4 U		
BIS(2-ETHYLHEXYL)PHTHALATE	2.8 U		2.8 UJ		3.3 J		
BUTYL BENZYL PHTHALATE	4.7 U		4.8 UJ		7.6 U		
CHLOROBENZILATE	10.3 U		10.5 UJ		16.7 U		
CHRYSENE	1.2 U		1.3 UJ		2.0 U		
DI-N-BUTYL PHTHALATE	1.2 U		1.2 UJ		2.0 U		
DI-N-OCTYL PHTHALATE	1.8 U		1.9 UJ		2.9 U		
DIALLATE	10.3 UR		10.5 UR		16.7 UR		
DIBENZO(A,H)ANTHRACENE	1.3 U		1.3 UJ		2.1 U		
DIBENZOFURAN	1.5 U		1.5 UJ		2.4 U		
DIETHYL PHTHALATE	0.40 U		0.41 UJ		0.65 U		
DIMETHOATE	20.6 U		21.0 UJ		33.4 U		
DIMETHYL PHTHALATE	0.07 U		0.07 UJ		0.12 U		
DIPHENYLAMINE	10.3 U		10.5 UJ		16.7 U		
ETHYL METHACRYLATE	10.3 U		10.5 UJ		16.7 U		
FAMPHUR	20.6 UJ		21.0 UR		33.4 UJ		
FLUORANTHENE	1.5 U		1.5 UJ		2.5 U		
FLUORENE	1.6 U		1.6 UJ		2.6 U		
HEXACHLOROBENZENE	0.79 U		0.81 UJ		1.3 U		
HEXACHLOROBUTADIENE	2.4 U		2.5 UJ		3.9 U		
HEXACHLOROCYCLOPENTADIENE	0.97 U		0.99 UJ		1.6 U		

Summary of Groundwater Analytical Results - SWMU 25
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER:	25MW01	25MW01-F	25MW02	25MW02-F	25MW03	25MW03-F	
FILTERING:	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	
LOCATION:	25MW01	25MW01	25MW02	25MW02	25MW03	25MW03	
SAMPLE DATE:	10/04/95	10/04/95	10/04/95	10/04/95	10/04/95	10/04/95	
SEMIVOLATILES (UG/L)							
HEXACHLOROETHANE	1.9 U		2.0 UJ		3.1 U		
HEXACHLOROPHENE	51.5 UR		52.5 UR		83.5 UR		
HEXACHLOROPROPENE	10.3 U		10.5 UJ		16.7 U		
INDENO(1,2,3-CD)PYRENE	1.4 U		1.4 UJ		2.2 U		
ISODRIN	20.6 U		21.0 UJ		33.4 U		
ISOPHORONE	1.2 U		1.2 UJ		1.9 U		
ISOSAFROLE	10.3 U		10.5 UJ		16.7 U		
KEPONE	20.6 UR		21.0 UR		33.4 UR		
METHAPYRILENE	103 U		105 UJ		167 U		
METHYL METHANESULFONATE	15.4 U		15.8 UJ		25.0 U		
N-NITROSO-DI-N-PROPYLAMINE	1.8 U		1.8 UJ		2.9 U		
N-NITROSODI-N-BUTYLAMINE	10.3 U		10.5 UJ		16.7 U		
N-NITROSODIETHYLAMINE	20.6 U		21.0 UJ		33.4 U		
N-NITROSODIMETHYLAMINE	3.3 U		3.4 UJ		5.4 U		
N-NITROSODIPHENYLAMINE	1.5 U		1.5 UJ		2.4 U		
N-NITROSOMETHYLETHYLAMINE	10.3 U		10.5 UJ		16.7 U		
N-NITROSOMORPHOLINE	10.3 U		10.5 UJ		16.7 U		
N-NITROSOPIPERIDINE	20.6 U		21.0 UJ		33.4 U		
N-NITROSOPYRROLIDINE	10.3 U		10.5 UJ		16.7 U		
NAPHTHALENE	1.6 U		1.6 UJ		2.6 U		
NITROBENZENE	1.3 U		1.4 UJ		2.2 U		
O,O,O-TRIETHYLPHOSPHOROTHIOATE	10.3 U		10.5 UJ		16.7 U		
O,O-DIETHYL-O-2-PYRAZINYLPHOSPHOROT	10.3 U		10.5 UJ		16.7 U		
O-TOLUIDINE	10.3 U		10.5 UJ		16.7 U		
P-DIMETHYLAMINOAZOBENZENE	10.3 U		10.5 UJ		16.7 U		
P-PHENYLENEDIAMINE	10.3 U		10.5 UJ		16.7 U		
PENTACHLOROBENZENE	10.3 U		10.5 UJ		16.7 U		
PENTACHLORONITROBENZENE	20.6 U		21.0 UJ		33.4 U		
PENTACHLOROPHENOL	2.2 U		2.3 UJ		3.6 U		
PHENACETIN	20.6 U		21.0 UJ		33.4 U		
PHENANTHRENE	1.6 U		1.6 UJ		2.6 U		
PHENOL	2.2 U		2.2 UJ		3.5 U		
PHORATE	10.3 UR		10.5 UJ		16.7 UR		

Summary of Groundwater Analytical Results - SWMU 25
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER: FILTERING: LOCATION: SAMPLE DATE:	25MW01 Unfiltered 25MW01 10/04/95	25MW01-F Filtered 25MW01 10/04/95	25MW02 Unfiltered 25MW02 10/04/95	25MW02-F Filtered 25MW02 10/04/95	25MW03 Unfiltered 25MW03 10/04/95	25MW03-F Filtered 25MW03 10/04/95	
SEMIVOLATILES (UG/L)							
PRONAMIDE	10.3 U		10.5 UJ		16.7 U		
PYRENE	1.6 U		1.7 UJ		2.6 U		
PYRIDINE	10.3 U		10.5 UJ		16.7 U		
SAFROLE	10.3 U		10.5 UJ		16.7 U		
EXPLOSIVES (UG/L)							
1,3 DINITROBENZENE	0.28 UJ		0.25 U		0.40 U		
1,3,5 TRINITROBENZENE	0.28 UJ		0.25 U		0.40 U		
2,4 DINITROTOLUENE	0.28 UJ		0.25 U		0.40 U		
2,4,6-TRINITROTOLUENE	0.28 UJ		0.25 U		0.40 U		
2,6 DINITROTOLUENE	0.28 UJ		0.25 U		0.40 U		
2-AMINO-4,6-DINITROTOLUENE	0.28 UJ		0.25 U		0.40 U		
2-NITROTOLUENE	0.56 UJ		0.51 U		0.79 U		
3-NITROTOLUENE	0.56 UJ		0.51 U		0.79 U		
4-AMINO-2,6-DINITROTOLUENE	0.28 UJ		0.25 U		0.40 U		
4-NITROTOLUENE	0.56 UJ		0.51 U		0.79 U		
HMX	0.56 UJ		0.51 U		0.79 U		
NITRO-BENZENE	0.28 UJ		0.25 U		0.40 U		
NITROCELLULOSE	0.18 UL		0.18 UL		0.18 UL		
NITROGLYCERIN	11.2 UJ		10.1 U		15.8 U		
NITROGUANIDINE	5.0 UJ		5.0 U		5.0 U		
PENTAERYTHRITOL TETRANITRATE	0.28 UJ		0.25 U		0.40 U		
RDX	0.56 UJ		0.51 U		0.79 U		
TETRYL	0.56 UJ		0.51 U		0.79 U		
INORGANICS (UG/L)							
ALUMINUM	1300 J	110 UL	13800 J	110 UL	73400 J	110 UL	
ANTIMONY	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U	
ARSENIC	1.9 UL	1.9 U	1.9 UL	1.9 U	2.2 L	1.9 U	
BARIUM	67.8	16.9	101	16.0	688	51.2	
BERYLLIUM	0.90 U	0.90 U	1.0	0.90 U	11.0	0.90 U	
CADMIUM	5.0 UL	5.0 UL	5.0 UL	5.0 UL	6.4 L	5.0 UL	
CALCIUM	3570 K	3910 K	3080 K	2000 K	40300	9650 K	
CHROMIUM	10.0 UL	10.0 UL	40.4	10.0 UL	191	10.0 UL	
COBALT	14.0 U	14.0 U	14.0 U	14.0 U	169	14.0 U	

Summary of Groundwater Analytical Results - SWMU 25
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER:	25MW01	25MW01-F	25MW02	25MW02-F	25MW03	25MW03-F	
FILTERING:	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	
LOCATION:	25MW01	25MW01	25MW02	25MW02	25MW03	25MW03	
SAMPLE DATE:	10/04/95	10/04/95	10/04/95	10/04/95	10/04/95	10/04/95	
INORGANICS (UG/L)							
COPPER	15.0 U	15.0 U	28.4	15.0 U	108 L	15.0 U	
CYANIDE	5.0 U		5.0 U		5.0 U		
IRON	3710	938	17900	758	252000	47.0 U	
LEAD	4.2 B	0.60 U	11.9	0.60 U	51.0	0.60 U	
MAGNESIUM	1170 K	1250 K	1410 K	538 K	16800	3610 K	
MANGANESE	120	148	176	113	2290	288	
MERCURY	0.10 U	0.10 U	0.17 B	0.10 U	0.20 B	0.10 U	
NICKEL	17.7 B	17.0 U	27.7 B	17.0 U	100 K	17.0 U	
POTASSIUM	2940	4090	2010	1590	8430	3440	
SELENIUM	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	
SILVER	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	
SODIUM	6810	10500	14000	14300	8840	6790	
THALLIUM	2.5 UJ	2.5 U	2.5 UJ	2.5 U	2.5 UJ	2.5 U	
TIN	33.6 U	33.6 U	33.6 U	33.6 U	33.6 UL	33.6 U	
VANADIUM	22.0 U	22.0 U	54.6	22.0 U	281	22.0 U	
ZINC	15.6 B	8.0 U	38.4 B	8.0 U	483	8.0 U	
INDICATOR PARAMETERS (MG/L)							
AMMONIA	0.31		0.42		0.41		
NITRATE/NITRITE	0.05 UL		0.05 UL		0.05 UL		
PHOSPHORUS	0.17		0.41		1.5		
SULFATE	1.8 L		14.8 L		8.0 L		
TOTAL KJELDAHL NITROGEN	0.34 L		0.55 L		0.43 L		
TOTAL ORGANIC CARBON	1.0 U		1.0 U		1.0 U		
TOTAL ORGANIC HALIDES (UG/L)	10.0 UR		24.6 L		13.8 L		

Summary of Surface Water Analytical Results - SWMU 25
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Indian Head, Maryland

SAMPLE NUMBER:	S25-SW001	FD06	S25-SW001-F	FD06-F	S25-SW002	S25-SW002-F	S25-SW003
FILTERING:	Unfiltered	Unfiltered	Filtered	Filtered	Unfiltered	Filtered	Unfiltered
LOCATION:	SW001	SW001	SW001	SW001	SW002	SW002	SW003
SAMPLE DATE:	09/22/95	09/22/95	09/22/95	09/22/95	09/21/95	09/21/95	09/22/95
VOLATILES (UG/L)							
1,1,1,2-TETRACHLOROETHANE	5.0 U	5.0 U			5.0 U		5.0 U
1,1,1-TRICHLOROETHANE	5.4 B	5.3 B			0.28 U		5.2 B
1,1,2,2-TETRACHLOROETHANE	0.49 U	0.49 U			0.49 U		0.49 U
1,1,2-TRICHLOROETHANE	0.28 U	0.28 U			0.28 U		0.28 U
1,1-DICHLOROETHANE	0.29 U	0.29 U			0.29 U		0.29 U
1,1-DICHLOROETHENE	0.37 U	0.37 U			0.37 U		0.37 U
1,2,3-TRICHLOROPROPANE	5.0 U	5.0 U			5.0 U		5.0 U
1,2-DIBROMO-3-CHLOROPROPANE	100 U	100 U			100 U		100 U
1,2-DIBROMOETHANE	5.0 U	5.0 U			5.0 U		5.0 U
1,2-DICHLOROETHANE	0.13 U	0.13 U			0.13 U		0.13 U
1,2-DICHLOROPROPANE	0.23 U	0.23 U			0.23 U		0.23 U
1,4-DICHLORO-2-BUTENE	100 U	100 U			100 U		100 U
1,4-DIOXANE	150 UR	150 UR			150 UR		150 UR
2-BUTANONE	1.5 U	1.5 U			1.5 U		1.5 U
2-HEXANONE	0.67 U	0.67 U			0.67 U		0.67 U
4-METHYL-2-PENTANONE	0.52 U	0.52 U			0.52 U		0.52 U
ACETONE	2.9 UJ	3.6 B			2.9 UJ		7.5 B
ACETONITRILE	100 U	100 U			100 U		100 U
ACROLEIN	2.6 UR	2.6 UR			2.6 U		2.6 UR
ACRYLONITRILE	2.0 U	2.0 U			2.0 U		2.0 U
ALLYL CHLORIDE	5.0 U	5.0 U			5.0 U		5.0 U
BENZENE	0.14 U	0.14 U			0.14 U		0.14 U
BROMODICHLOROMETHANE	0.16 U	0.16 U			0.16 U		0.16 U
BROMOFORM	0.16 U	0.16 U			0.16 U		0.16 U
BROMOMETHANE	0.41 U	0.41 U			0.41 U		0.41 U
CARBON DISULFIDE	2.6 B	0.48 U			0.48 U		0.48 U
CARBON TETRACHLORIDE	0.27 U	0.27 U			0.27 U		0.27 U
CHLOROBENZENE	0.30 U	0.30 U			0.30 U		0.30 U
CHLOROETHANE	0.49 U	0.49 U			0.49 U		0.49 U
CHLOROFORM	0.18 U	0.18 U			0.18 U		0.18 U
CHLOROMETHANE	0.32 U	0.32 U			0.32 U		0.32 U
CHLOROPRENE	5.0 UR	5.0 UR			5.0 UR		5.0 UR
CIS-1,3-DICHLOROPROPENE	0.21 U	0.21 U			0.21 U		0.21 U

Summary of Surface Water Analytical Results - SWMU 25
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Indian Head, Maryland

SAMPLE NUMBER: FILTERING: LOCATION: SAMPLE DATE:	S25-SW001 Unfiltered SW001 09/22/95	FD06 Unfiltered SW001 09/22/95	S25-SW001-F Filtered SW001 09/22/95	FD06-F Filtered SW001 09/22/95	S25-SW002 Unfiltered SW002 09/21/95	S25-SW002-F Filtered SW002 09/21/95	S25-SW003 Unfiltered SW003 09/22/95
VOLATILES (UG/L)							
DIBROMOCHLOROMETHANE	0.18 U	0.18 U			0.18 U		0.18 U
DIBROMOMETHANE	5.0 U	5.0 U			5.0 U		5.0 U
DICHLORODIFLUOROMETHANE	2.6 U	2.6 U			2.6 U		2.6 U
ETHYLBENZENE	0.23 U	0.23 U			0.23 U		0.23 U
IODOMETHANE	5.0 U	5.0 U			5.0 U		5.0 U
ISOBUTYL ALCOHOL	50.0 U	50.0 U			50.0 U		50.0 U
METHACRYLONITRILE	5.0 U	5.0 U			5.0 U		5.0 U
METHYL METHACRYLATE	5.0 U	5.0 U			5.0 U		5.0 U
METHYLENE CHLORIDE	1.4 B	2.4 B			2.5 B		2.5 B
PENTACHLOROETHANE	5.0 U	5.0 U			5.0 U		5.0 U
PROPIONITRILE	50.0 U	50.0 U			50.0 U		50.0 U
STYRENE	0.29 U	0.29 U			0.29 U		0.29 U
TETRACHLOROETHENE	0.23 U	0.23 U			0.23 U		0.23 U
TOLUENE	0.17 U	0.17 U			0.17 U		0.17 U
TRANS-1,2-DICHLOROETHENE	0.31 U	0.31 U			0.31 U		0.31 U
TRANS-1,3-DICHLOROPROPENE	0.28 U	0.28 U			0.28 U		0.28 U
TRICHLOROETHENE	0.15 U	0.15 U			0.15 U		0.15 U
TRICHLOROFLUOROMETHANE	0.44 U	0.44 U			0.44 U		0.44 U
VINYL ACETATE	0.28 U	0.28 U			0.28 U		0.28 U
VINYL CHLORIDE	0.56 U	0.56 U			0.56 U		0.56 U
XYLENES, TOTAL	0.24 U	0.24 U			0.24 U		0.24 U
SEMIVOLATILES (UG/L)							
1,2,4,5-TETRACHLOROBENZENE	50.0 U	50.0 U			10.2 U		10.5 UL
1,2,4-TRICHLOROBENZENE	11.2 U	11.2 U			2.3 U		2.4 UL
1,3,5-TRINITROBENZENE	0.42 U	0.46 U			1.0 U		1.2 U
1,3-DINITROBENZENE	0.42 U	0.46 U			1.0 U		1.2 U
1,4-NAPHTHOQUINONE	50.0 U	50.0 U			10.2 U		10.5 UL
1-NAPHTHYLAMINE	50.0 U	50.0 U			10.2 U		10.5 UL
2,2'-OXYBIS(1-CHLOROPROPANE)	50.0 U	50.0 U			10.2 U		10.5 UL
2,3,4,6-TETRACHLOROPHENOL	50.0 U	50.0 U			10.2 U		10.5 U
2,4,5-TRICHLOROPHENOL	4.2 U	4.2 U			0.85 U		0.87 U
2,4,6-TRICHLOROPHENOL	11.0 U	11.0 U			2.3 U		2.3 U
2,4-DICHLOROPHENOL	9.6 U	9.6 U			2.0 U		2.0 U

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Indian Head, Maryland

SAMPLE NUMBER:	S25-SW001	FD06	S25-SW001-F	FD06-F	S25-SW002	S25-SW002-F	S25-SW003
FILTERING:	Unfiltered	Unfiltered	Filtered	Filtered	Unfiltered	Filtered	Unfiltered
LOCATION:	SW001	SW001	SW001	SW001	SW002	SW002	SW003
SAMPLE DATE:	09/22/95	09/22/95	09/22/95	09/22/95	09/21/95	09/21/95	09/22/95
SEMIVOLATILES (UG/L)							
2,4-DIMETHYLPHENOL	34.0 U	34.0 U			7.0 U		7.2 U
2,4-DINITROPHENOL	11.2 U	11.2 U			2.3 U		2.4 U
2,4-DINITROTOLUENE	0.42 U	0.46 U			1.0 U		1.2 U
2,6-DICHLOROPHENOL	50.0 U	50.0 U			10.2 U		10.5 U
2,6-DINITROTOLUENE	0.42 U	0.46 U			1.0 U		1.2 U
2-ACETYLAMINOFLUORENE	100 U	100 U			20.4 U		21.0 UL
2-CHLORONAPHTHALENE	8.3 U	8.3 U			1.7 U		1.7 UL
2-CHLOROPHENOL	6.6 U	6.6 U			1.4 U		1.4 U
2-METHYLNAPHTHALENE	10.8 U	10.8 U			2.2 U		2.3 UL
2-METHYLPHENOL	6.0 U	6.0 U			1.2 U		1.3 U
2-NAPHTHYLAMINE	50.0 U	50.0 U			10.2 U		10.5 UL
2-NITROANILINE	7.2 U	7.2 U			1.5 U		1.5 UL
2-NITROPHENOL	7.4 U	7.4 U			1.5 U		1.5 U
2-PICOLINE	50.0 U	50.0 U			10.2 U		10.5 UL
3,3'-DICHLOROBENZIDINE	49.4 U	49.4 U			10.1 U		10.4 UL
3,3'-DIMETHYLBENZIDINE	50.0 U	50.0 U			10.2 U		10.5 UL
3-METHYLCHOLANTHRENE	50.0 U	50.0 U			10.2 U		10.5 UL
3-METHYLPHENOL	50.0 U	50.0 U			10.2 U		10.5 U
3-NITROANILINE	20.6 U	20.6 U			4.2 U		4.3 UL
4,6-DINITRO-2-METHYLPHENOL	25.4 U	25.4 U			5.2 U		5.3 U
4-AMINOBIPHENYL	100 U	100 U			20.4 U		21.0 UL
4-BROMOPHENYL PHENYL ETHER	5.9 U	5.9 U			1.2 U		1.2 UL
4-CHLORO-3-METHYLPHENOL	11.4 U	11.4 U			2.3 U		2.4 U
4-CHLOROANILINE	3.3 U	3.3 U			0.66 U		0.68 UL
4-CHLOROPHENYL PHENYL ETHER	6.3 U	6.3 U			1.3 U		1.3 UL
4-METHYLPHENOL	5.6 U	5.6 U			1.1 U		1.2 U
4-NITROANILINE	18.6 U	18.6 U			3.8 U		3.9 UL
4-NITROPHENOL	12.8 U	12.8 U			2.6 U		2.7 U
4-NITROQUINOLINE-1-OXIDE	200 UR	200 UR			40.8 UR		42.0 UR
5-NITRO-O-TOLUIDINE	50.0 U	50.0 U			10.2 U		10.5 UL
7,12-DIMETHYLBENZ(A)ANTHRACENE	50.0 U	50.0 U			10.2 U		10.5 UL
A,A-DIMETHYLPHENETHYLAMINE	50.0 U	50.0 U			10.2 U		10.5 UL
ACENAPHTHENE	6.9 U	6.9 U			1.4 U		1.4 UL

Summary of Surface Water Analytical Results - SWMU 25
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER:	S25-SW001	FD06	S25-SW001-F	FD06-F	S25-SW002	S25-SW002-F	S25-SW003
FILTERING:	Unfiltered	Unfiltered	Filtered	Filtered	Unfiltered	Filtered	Unfiltered
LOCATION:	SW001	SW001	SW001	SW001	SW002	SW002	SW003
SAMPLE DATE:	09/22/95	09/22/95	09/22/95	09/22/95	09/21/95	09/21/95	09/22/95
SEMIVOLATILES (UG/L)							
ACENAPHTHYLENE	7.1 U	7.1 U			1.4 U		1.5 UL
ACETOPHENONE	50.0 U	50.0 U			10.2 U		10.5 UL
ANILINE	50.0 U	50.0 U			10.2 U		10.5 UL
ANTHRACENE	6.2 U	6.2 U			1.3 U		1.3 UL
ARAMITE	100 U	100 U			20.4 U		21.0 UL
BENZO(A)ANTHRACENE	6.3 U	6.3 U			1.3 U		1.3 UL
BENZO(A)PYRENE	5.0 U	5.0 U			1.0 U		1.0 UL
BENZO(B)FLUORANTHENE	4.2 U	4.2 U			0.86 U		0.88 UL
BENZO(G,H,I)PERYLENE	18.2 U	18.2 U			3.7 U		3.8 UL
BENZO(K)FLUORANTHENE	8.7 U	8.7 U			1.8 U		1.8 UL
BENZYL ALCOHOL	11.2 U	11.2 U			2.3 U		2.3 U
BIS(2-CHLOROETHOXY)METHANE	6.1 U	6.1 U			1.2 U		1.3 UL
BIS(2-CHLOROETHYL)ETHER	4.1 U	4.1 U			0.83 U		0.85 UL
BIS(2-ETHYLHEXYL)PHTHALATE	13.6 U	10.8 J			2.8 U		2.8 UL
BUTYL BENZYL PHTHALATE	22.6 U	22.6 U			4.6 U		4.8 UL
CHLOROBENZILATE	50.0 U	50.0 U			10.2 U		10.5 UL
CHRYSENE	6.0 U	6.0 U			1.2 U		1.3 UL
DI-N-BUTYL PHTHALATE	5.9 U	5.9 U			1.2 U		1.2 UL
DI-N-OCTYL PHTHALATE	8.8 U	8.8 U			1.8 U		1.9 UL
DIALLATE	50.0 UR	50.0 UR			10.2 UR		10.5 UR
DIBENZO(A,H)ANTHRACENE	6.4 U	6.4 U			1.3 U		1.3 UL
DIBENZOFURAN	7.1 U	7.1 U			1.4 U		1.5 UL
DIETHYL PHTHALATE	2.0 U	2.0 U			0.40 U		0.41 UL
DIMETHOATE	100 U	100 U			20.4 U		21.0 UL
DIMETHYL PHTHALATE	0.35 U	0.35 U			0.07 U		0.07 UL
DIPHENYLAMINE	50.0 U	50.0 U			10.2 U		10.5 UL
ETHYL METHACRYLATE	50.0 UJ	50.0 U			10.2 U		10.5 UL
FAMPHUR	100 U	100 UJ			20.4 UJ		21.0 UJ
FLUORANTHENE	7.4 U	7.4 U			1.5 U		1.5 UL
FLUORENE	7.8 U	7.8 U			1.6 U		1.6 UL
HEXACHLOROBENZENE	3.9 U	3.9 U			0.79 U		0.81 UL
HEXACHLOROBUTADIENE	11.8 U	11.8 U			2.4 U		2.5 UL
HEXACHLOROCYCLOPENTADIENE	4.7 U	4.7 U			0.96 U		0.99 UL

Summary of Surface Water Analytical Results - SWMU 25
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER:	S25-SW001	FD06	S25-SW001-F	FD06-F	S25-SW002	S25-SW002-F	S25-SW003
FILTERING:	Unfiltered	Unfiltered	Filtered	Filtered	Unfiltered	Filtered	Unfiltered
LOCATION:	SW001	SW001	SW001	SW001	SW002	SW002	SW003
SAMPLE DATE:	09/22/95	09/22/95	09/22/95	09/22/95	09/21/95	09/21/95	09/22/95
SEMIVOLATILES (UG/L)							
HEXACHLOROETHANE	9.3 U	9.3 U			1.9 U		2.0 UL
HEXACHLOROPHENE	250 UR	250 UR			51.0 UR		52.5 UR
HEXACHLOROPROPENE	50.0 U	50.0 U			10.2 U		10.5 UL
INDENO(1,2,3-CD)PYRENE	6.6 U	6.6 U			1.4 U		1.4 UL
ISODRIN	100 U	100 U			20.4 U		21.0 UL
ISOPHORONE	5.6 U	5.6 U			1.1 U		1.2 UL
ISOSAFROLE	50.0 U	50.0 U			10.2 U		10.5 UL
KEPONE	100 UR	100 UR			20.4 UR		21.0 UR
METHAPYRILENE	500 UJ	500 UJ			102 UJ		105 UJ
METHYL METHANESULFONATE	75.0 U	75.0 U			15.3 U		15.8 UL
N-NITROSO-DI-N-PROPYLAMINE	8.7 U	8.7 U			1.8 U		1.8 UL
N-NITROSODI-N-BUTYLAMINE	50.0 U	50.0 U			10.2 U		10.5 UL
N-NITROSODIETHYLAMINE	100 U	100 U			20.4 U		21.0 UL
N-NITROSODIMETHYLAMINE	16.0 U	16.0 U			3.3 U		3.4 UL
N-NITROSODIPHENYLAMINE	7.3 U	7.3 U			1.5 U		1.5 UL
N-NITROSOMETHYLETHYLAMINE	50.0 U	50.0 U			10.2 U		10.5 UL
N-NITROSOMORPHOLINE	50.0 U	50.0 U			10.2 U		10.5 UL
N-NITROSOPIPERIDINE	100 U	100 U			20.4 U		21.0 UL
N-NITROSOPYRROLIDINE	50.0 U	50.0 U			10.2 U		10.5 UL
NAPHTHALENE	7.7 U	7.7 U			1.6 U		1.6 UL
NITROBENZENE	0.42 U	0.46 U			1.0 U		1.2 U
O,O,O-TRIETHYLPHOSPHOROTHIOATE	50.0 U	50.0 U			10.2 U		10.5 UL
O,O-DIETHYL-O-2-PYRAZINYLPHOSPHOROT	50.0 U	50.0 U			10.2 U		10.5 UL
O-TOLUIDINE	50.0 U	50.0 U			10.2 U		10.5 UL
P-DIMETHYLAMINOAZOBENZENE	50.0 U	50.0 U			10.2 U		10.5 UL
P-PHENYLENEDIAMINE	50.0 U	50.0 U			10.2 U		10.5 UL
PENTACHLOROBENZENE	50.0 U	50.0 U			10.2 U		10.5 UL
PENTACHLORONITROBENZENE	100 U	100 U			20.4 U		21.0 UL
PENTACHLOROPHENOL	10.9 U	10.9 U			2.2 U		2.3 U
PHENACETIN	100 U	100 U			20.4 U		21.0 UL
PHENANTHRENE	7.8 U	7.8 U			1.6 U		1.6 UL
PHENOL	10.4 U	10.4 U			2.1 U		2.2 U
PHORATE	50.0 U	50.0 U			10.2 U		10.5 UL

Summary of Surface Water Analytical Results - SWMU 25
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER:	S25-SW001	FD06	S25-SW001-F	FD06-F	S25-SW002	S25-SW002-F	S25-SW003
FILTERING:	Unfiltered	Unfiltered	Filtered	Filtered	Unfiltered	Filtered	Unfiltered
LOCATION:	SW001	SW001	SW001	SW001	SW002	SW002	SW003
SAMPLE DATE:	09/22/95	09/22/95	09/22/95	09/22/95	09/21/95	09/21/95	09/22/95
SEMIVOLATILES (UG/L)							
PRONAMIDE	50.0 U	50.0 U			10.2 U		10.5 UL
PYRENE	7.9 U	7.9 U			1.6 U		1.7 UL
PYRIDINE	50.0 U	50.0 U			10.2 U		10.5 UL
SAFROLE	50.0 U	50.0 U			10.2 U		10.5 UL
EXPLOSIVES (UG/L)							
2,4,6-TRINITROTOLUENE	0.42 U	0.46 U			1.0 U		1.2 U
2-AMINO-4,6-DINITROTOLUENE	0.42 U	0.46 U			1.0 U		1.2 U
2-NITROTOLUENE	0.85 U	0.91 U			2.0 U		2.3 U
3-NITROTOLUENE	0.85 U	0.91 U			2.0 U		2.3 U
4-AMINO-2,6-DINITROTOLUENE	1.9	1.9			17.6		1.2 U
4-NITROTOLUENE	0.85 U	0.91 U			2.0 U		2.3 U
HMX	0.85 U	0.91 U			2.0 U		2.3 U
NITROCELLULOSE	0.18 U	0.18 U			0.16 U		0.18 U
NITROGLYCERIN	16.9 U	18.2 U			15.8 U		18.2 U
NITROGUANIDINE	5.0 U	5.0 U			5.0 U		5.0 U
PENTAERYTHRITOL TETRANITRATE	0.42 U	0.45 U			1.0 U		1.2 U
RDX	0.85 U	0.91 U			2.0 U		2.3 U
TETRYL	0.85 U	0.91 U			2.0 U		2.3 U
INORGANICS (UG/L)							
ALUMINUM	19800 J	23000 J	577 J	310 J	1200 J	202 J	2090 J
ANTIMONY	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U	2.3 L
ARSENIC	1.9 UL	1.9 UL	1.9 UL	1.9 UL	1.9 UL	1.9 UL	1.9 UL
BARIUM	99.0	111	14.0 U	14.0 U	19.8	14.0 U	57.8
BERYLLIUM	0.90 U	1.1	0.90 U	0.90 U	0.90 U	0.90 U	0.90 U
CADMIUM	5.0 UL	5.0 UL	5.0 UL	5.0 UL	5.0 UL	5.0 UL	5.0 UL
CALCIUM	2000 K	2070 K	1100 K	1070 K	2150 K	2460 K	5980 K
CHROMIUM	10.0 UJ	10.0 UJ	10.0 UJ	10.0 UJ	10.0 UJ	10.0 UJ	10.0 UJ
COBALT	26.6	26.9	14.0 U	14.0 U	14.0 U	14.0 U	14.0 U
COPPER	55.5	55.8	18.0	15.0 U	15.0 UL	15.0 UL	20.8
CYANIDE	470	442			56.0		8.0
IRON	42000 K	52000 K	564 K	987 K	3010 K	395 K	8520 K
LEAD	57.3 K	57.6 K	0.72 K	4.2 K	3.5 J	0.60 UJ	17.6 K
MAGNESIUM	2040 K	2100 K	744 K	770 K	1130 K	1170 K	4620 K

Summary of Surface Water Analytical Results - SWMU 25
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Indian Head, Maryland

SAMPLE NUMBER:	S25-SW001	FD06	S25-SW001-F	FD06-F	S25-SW002	S25-SW002-F	S25-SW003
FILTERING:	Unfiltered	Unfiltered	Filtered	Filtered	Unfiltered	Filtered	Unfiltered
LOCATION:	SW001	SW001	SW001	SW001	SW002	SW002	SW003
SAMPLE DATE:	09/22/95	09/22/95	09/22/95	09/22/95	09/21/95	09/21/95	09/22/95
INORGANICS (UG/L)							
MANGANESE	1200	1230	612	640	183	199	61.6
MERCURY	0.29	0.23	0.16	0.10 U	0.10 U	0.10 U	0.12
NICKEL	18.0 J	17.0 UJ	17.0 UJ	17.0 UJ	17.0 UJ	17.0 UJ	17.0 UJ
POTASSIUM	5500	6010	4530	4980	1560	1590	2450
SELENIUM	1.5 U	1.5 U	2.3 B	1.5 U	1.5 U	1.5 U	1.5 U
SILVER	0.98 U	0.98 U	0.96 U	0.98 U	0.98 U	0.98 U	0.98 U
SODIUM	1040	1150	1250	1300	3520	4160	32200
THALLIUM	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 UL
TIN	40.0 UJ	40.0 UJ	40.0 UJ	40.0 UJ	40.0 UJ	40.0 UJ	40.0 UJ
VANADIUM	46.1 B	63.8 B	22.0 UL	22.0 UL	22.0 UL	22.0 UL	22.0 UL
ZINC	16.0 B	14.0 B	8.0 UL	8.0 UL	9.8 B	8.0 UL	13.0 B
INDICATOR PARAMETERS (MG/L)							
AMMONIA	9.3	9.3			0.60 L		0.26
NITRATE/NITRITE	0.05 L	0.07 L			0.05 U		0.05 UL
PHOSPHORUS	0.78	0.81			0.08		0.21
SULFATE	25.0 U	25.0 U			1.0 UL		6.8
TOTAL KJELDAHL NITROGEN	10.4	11.1			1.5 J		2.6
TOTAL ORGANIC CARBON	29.5 L	30.1 L			4.0		16.0 L
TOTAL ORGANIC HALIDES (UG/L)	39.8 L	42.4 L			10.0 UR		29.3 L

Summary of Surface Water Analytical Results - SWMU 25
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Indian Head, Maryland

SAMPLE NUMBER: FILTERING: LOCATION: SAMPLE DATE:	S25-SW003-F Filtered SW003 09/22/95	S25-SW004 Unfiltered SW004 09/25/95	S25-SW004-F Filtered SW004 09/25/95				
VOLATILES (UG/L)							
1,1,1,2-TETRACHLOROETHANE		5.0 U					
1,1,1-TRICHLOROETHANE		0.28 U					
1,1,2,2-TETRACHLOROETHANE		0.49 U					
1,1,2-TRICHLOROETHANE		0.28 U					
1,1-DICHLOROETHANE		0.29 U					
1,1-DICHLOROETHENE		0.37 U					
1,2,3-TRICHLOROPROPANE		5.0 U					
1,2-DIBROMO-3-CHLOROPROPANE		100 U					
1,2-DIBROMOETHANE		5.0 U					
1,2-DICHLOROETHANE		0.13 U					
1,2-DICHLOROPROPANE		0.23 U					
1,4-DICHLORO-2-BUTENE		100 U					
1,4-DIOXANE		150 UR					
2-BUTANONE		1.5 U					
2-HEXANONE		0.67 U					
4-METHYL-2-PENTANONE		0.52 U					
ACETONE		4.7 B					
ACETONITRILE		100 U					
ACROLEIN		2.6 UR					
ACRYLONITRILE		2.0 U					
ALLYL CHLORIDE		5.0 U					
BENZENE		0.14 U					
BROMODICHLOROMETHANE		0.16 U					
BROMOFORM		0.16 U					
BROMOMETHANE		0.41 U					
CARBON DISULFIDE		0.48 U					
CARBON TETRACHLORIDE		0.27 U					
CHLOROBENZENE		0.30 U					
CHLOROETHANE		0.49 U					
CHLOROFORM		0.16 U					
CHLOROMETHANE		0.32 U					
CHLOROPRENE		5.0 UR					
CIS-1,3-DICHLOROPROPENE		0.21 U					

Summary of Surface Water Analytical Results - SWMU 25
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER: FILTERING: LOCATION: SAMPLE DATE:	S25-SW003-F Filtered SW003 09/22/95	S25-SW004 Unfiltered SW004 09/25/95	S25-SW004-F Filtered SW004 09/25/95				
VOLATILES (UG/L)							
DIBROMOCHLOROMETHANE		0.18 U					
DIBROMOMETHANE		5.0 U					
DICHLORODIFLUOROMETHANE		2.6 U					
ETHYLBENZENE		0.23 U					
IODOMETHANE		5.0 U					
ISOBUTYL ALCOHOL		50.0 U					
METHACRYLONITRILE		5.0 U					
METHYL METHACRYLATE		5.0 U					
METHYLENE CHLORIDE		2.2 B					
PENTACHLOROETHANE		5.0 U					
PROPIONITRILE		50.0 UJ					
STYRENE		0.29 U					
TETRACHLOROETHENE		0.23 U					
TOLUENE		0.17 U					
TRANS-1,2-DICHLOROETHENE		0.31 U					
TRANS-1,3-DICHLOROPROPENE		0.28 U					
TRICHLOROETHENE		0.15 U					
TRICHLOROFLUOROMETHANE		0.44 U					
VINYL ACETATE		0.28 U					
VINYL CHLORIDE		0.56 U					
XYLENES, TOTAL		0.24 U					
SEMIVOLATILES (UG/L)							
1,2,4,5-TETRACHLOROBENZENE		10.5 U					
1,2,4-TRICHLOROBENZENE		2.4 U					
1,3,5-TRINITROBENZENE		0.37 U					
1,3-DINITROBENZENE		0.37 U					
1,4-NAPHTHOQUINONE		10.5 U					
1-NAPHTHYLAMINE		10.5 U					
2,2'-OXYBIS(1-CHLOROPROPANE)		10.5 U					
2,3,4,6-TETRACHLOROPHENOL		10.5 U					
2,4,5-TRICHLOROPHENOL		0.87 U					
2,4,6-TRICHLOROPHENOL		2.3 U					
2,4-DICHLOROPHENOL		2.0 U					

Summary of Surface Water Analytical Results - SWMU 25
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER:	S25-SW003-F	S25-SW004	S25-SW004-F				
FILTERING:	Filtered	Unfiltered	Filtered				
LOCATION:	SW003	SW004	SW004				
SAMPLE DATE:	09/22/95	09/25/95	09/25/95				
SEMIVOLATILES (UG/L)							
2,4-DIMETHYLPHENOL		7.2 U					
2,4-DINITROPHENOL		2.4 U					
2,4-DINITROTOLUENE		0.37 U					
2,6-DICHLOROPHENOL		10.5 U					
2,6-DINITROTOLUENE		0.37 U					
2-ACETYLAMINOFLUORENE		21.0 U					
2-CHLORONAPHTHALENE		1.7 U					
2-CHLOROPHENOL		1.4 U					
2-METHYLNAPHTHALENE		2.3 U					
2-METHYLPHENOL		1.3 U					
2-NAPHTHYLAMINE		10.5 U					
2-NITROANILINE		1.5 U					
2-NITROPHENOL		1.5 U					
2-PICOLINE		10.5 U					
3,3'-DICHLOROBENZIDINE		10.4 U					
3,3'-DIMETHYLBENZIDINE		10.5 U					
3-METHYLCHOLANTHRENE		10.5 U					
3-METHYLPHENOL		10.5 U					
3-NITROANILINE		4.3 U					
4,6-DINITRO-2-METHYLPHENOL		5.3 U					
4-AMINOBIPHENYL		21.0 U					
4-BROMOPHENYL PHENYL ETHER		1.2 U					
4-CHLORO-3-METHYLPHENOL		2.4 U					
4-CHLOROANILINE		0.68 U					
4-CHLOROPHENYL PHENYL ETHER		1.3 U					
4-METHYLPHENOL		1.2 U					
4-NITROANILINE		3.9 U					
4-NITROPHENOL		2.7 U					
4-NITROQUINOLINE-1-OXIDE		42.0 UR					
5-NITRO-O-TOLUIDINE		10.5 U					
7,12-DIMETHYLBENZ(A)ANTHRACENE		10.5 U					
A,A-DIMETHYLPHENETHYLAMINE		10.5 U					
ACENAPHTHENE		1.4 U					

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SAMPLE NUMBER: FILTERING: LOCATION: SAMPLE DATE:	S25-SW003-F Filtered SW003 09/22/95	S25-SW004 Unfiltered SW004 09/25/95	S25-SW004-F Filtered SW004 09/25/95				
SEMIVOLATILES (UG/L)							
ACENAPHTHYLENE		1.5 U					
ACETOPHENONE		10.5 U					
ANILINE		10.5 U					
ANTHRACENE		1.3 U					
ARAMITE		21.0 U					
BENZO(A)ANTHRACENE		1.3 U					
BENZO(A)PYRENE		1.0 U					
BENZO(B)FLUORANTHENE		0.88 U					
BENZO(G,H,I)PERYLENE		3.8 U					
BENZO(K)FLUORANTHENE		1.8 U					
BENZYL ALCOHOL		2.3 U					
BIS(2-CHLOROETHOXY)METHANE		1.3 U					
BIS(2-CHLOROETHYL)ETHER		0.85 U					
BIS(2-ETHYLHEXYL)PHTHALATE		1.1 J					
BUTYL BENZYL PHTHALATE		4.8 U					
CHLOROBENZILATE		10.5 U					
CHRYSENE		1.3 U					
DI-N-BUTYL PHTHALATE		1.2 U					
DI-N-OCTYL PHTHALATE		1.9 U					
DIALLATE		10.5 UR					
DIBENZO(A,H)ANTHRACENE		1.3 U					
DIBENZOFURAN		1.5 U					
DIETHYL PHTHALATE		0.41 U					
DIMETHOATE		21.0 U					
DIMETHYL PHTHALATE		0.07 U					
DIPHENYLAMINE		10.5 U					
ETHYL METHACRYLATE		10.5 U					
FAMPHUR		21.0 UJ					
FLUORANTHENE		1.5 U					
FLUORENE		1.6 U					
HEXACHLOROBENZENE		0.81 U					
HEXACHLOROBUTADIENE		2.5 U					
HEXACHLOROCYCLOPENTADIENE		0.99 U					

Summary of Surface Water Analytical Results - SWMU 25
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER: FILTERING: LOCATION: SAMPLE DATE:	S25-SW003-F Filtered SW003 09/22/95	S25-SW004 Unfiltered SW004 09/25/95	S25-SW004-F Filtered SW004 09/25/95				
SEMIVOLATILES (UG/L)							
HEXACHLOROETHANE		2.0 U					
HEXACHLOROPHENE		52.5 UR					
HEXACHLOROPROPENE		10.5 U					
INDENO(1,2,3-CD)PYRENE		1.4 U					
ISODRIN		21.0 U					
ISOPHORONE		1.2 U					
ISOSAFROLE		10.5 U					
KEPONE		21.0 UR					
METHAPYRILENE		105 UJ					
METHYL METHANESULFONATE		15.8 U					
N-NITROSO-DI-N-PROPYLAMINE		1.8 U					
N-NITROSODI-N-BUTYLAMINE		10.5 U					
N-NITROSODIETHYLAMINE		21.0 U					
N-NITROSODIMETHYLAMINE		3.4 U					
N-NITROSODIPHENYLAMINE		1.5 U					
N-NITROSOMETHYLETHYLAMINE		10.5 U					
N-NITROSOMORPHOLINE		10.5 U					
N-NITROSOPIPERIDINE		21.0 U					
N-NITROSOPYRROLIDINE		10.5 U					
NAPHTHALENE		1.6 U					
NITROBENZENE		0.37 U					
O,O,O-TRIETHYLPHOSPHOROTHIOATE		10.5 U					
O,O-DIETHYL-O-2-PYRAZINYLPHOSPHOROT		10.5 U					
O-TOLUIDINE		10.5 U					
P-DIMETHYLAMINOAZOBENZENE		10.5 U					
P-PHENYLENEDIAMINE		10.5 U					
PENTACHLOROBENZENE		10.5 U					
PENTACHLORONITROBENZENE		21.0 U					
PENTACHLOROPHENOL		2.3 U					
PHENACETIN		21.0 U					
PHENANTHRENE		1.6 U					
PHENOL		2.2 U					
PHORATE		10.5 U					

Summary of Surface Water Analytical Results - SWMU 25
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER: FILTERING: LOCATION: SAMPLE DATE:	S25-SW003-F Filtered SW003 09/22/95	S25-SW004 Unfiltered SW004 09/25/95	S25-SW004-F Filtered SW004 09/25/95				
SEMIVOLATILES (UG/L)							
PRONAMIDE		10.5 U					
PYRENE		1.7 U					
PYRIDINE		10.5 U					
SAFROLE		10.5 U					
EXPLOSIVES (UG/L)							
2,4,6-TRINITROTOLUENE		0.37 U					
2-AMINO-4,6-DINITROTOLUENE		0.37 U					
2-NITROTOLUENE		0.74 U					
3-NITROTOLUENE		0.74 U					
4-AMINO-2,6-DINITROTOLUENE		0.37 U					
4-NITROTOLUENE		0.74 U					
HMX		0.74 U					
NITROCELLULOSE		0.18 UL					
NITROGLYCERIN		14.8 U					
NITROGUANIDINE		5.0 U					
PENTAERYTHRITOL TETRANITRATE		0.37 U					
RDX		0.74 U					
TETRYL		0.74 U					
INORGANICS (UG/L)							
ALUMINUM	110 UJ	110 UJ	110 UJ				
ANTIMONY	1.7 U	1.7 U	1.7 U				
ARSENIC	1.9 UL	0.80 UL	1.9 UL				
BARIUM	38.3	69.9	85.3				
BERYLLIUM	0.90 U	0.90 U	0.90 U				
CADMIUM	5.0 UL	5.0 UL	5.0 UL				
CALCIUM	5870 K	39500	48000				
CHROMIUM	10.0 UJ	10.0 UJ	10.0 UJ				
COBALT	14.0 U	14.0 U	14.0 U				
COPPER	15.0 U	15.0 UL	15.0 UL				
CYANIDE		5.0 U					
IRON	2970 K	619 K	47.0 U				
LEAD	0.60 U	0.94 K	0.60 U				
MAGNESIUM	4890 K	43900	51100				

Summary of Surface Water Analytical Results - SWMU 25
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER: FILTERING: LOCATION: SAMPLE DATE:	S25-SW003-F Filtered SW003 09/22/95	S25-SW004 Unfiltered SW004 09/25/95	S25-SW004-F Filtered SW004 09/25/95				
INORGANICS (UG/L)							
MANGANESE	62.9	37.7	24.7				
MERCURY	0.10 U	0.10 U	0.10 U				
NICKEL	17.0 UJ	17.0 UJ	17.0 UJ				
POTASSIUM	2380	16200	16300				
SELENIUM	1.5 U	1.5 U	1.5 U				
SILVER	0.98 U	0.98 U	0.98 U				
SODIUM	36100	353000	368000				
THALLIUM	2.5 UL	2.5 U	2.5 UL				
TIN	40.0 UJ	40.0 UJ	40.0 UJ				
VANADIUM	22.0 UL	22.0 UL	22.0 UL				
ZINC	8.0 UL	8.0 UL	8.0 UL				
INDICATOR PARAMETERS (MG/L)							
AMMONIA		0.67					
NITRATE/NITRITE		0.05 U					
PHOSPHORUS		0.09					
SULFATE		98.7					
TOTAL KJELDAHL NITROGEN		0.74					
TOTAL ORGANIC CARBON		2.3 L					
TOTAL ORGANIC HALIDES (UG/L)		42.2 L					

Summary of Soil Analytical Results - SWMU 26
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER:	S26-MW01-01	S26-MW01-02	S26-MW02-001	S26-MW02-002	S26-MW03-001	S26-MW03-002	S26-SB01-01
DEPTH (feet):	0 - 2	4 - 6	0 - 2	10 - 12	0 - 2	6 - 9	0 - 2
LOCATION:	MW01	MW01	MW02	MW02	MW03	MW03	SB01
SAMPLE DATE:	9/19/95	9/19/95	9/23/95	9/23/95	9/24/95	9/24/95	9/18/95
VOLATILES (UG/KG)							
1,1,1,2-TETRACHLOROETHANE	5.7 U	6.0 U	6.0 U	6.1 U	5.7 U	5.9 U	5.8 UJ
1,1,1-TRICHLOROETHANE	0.20 U	0.20 U	0.20 U	0.21 U	0.19 U	0.20 U	0.20 UJ
1,1,2,2-TETRACHLOROETHANE	0.61 U	0.63 U	0.64 U	0.65 U	0.60 U	0.63 U	0.62 UJ
1,1,2-TRICHLOROETHANE	0.52 U	0.54 U	0.54 U	0.55 U	0.51 U	0.54 U	0.52 UJ
1,1-DICHLOROETHANE	0.38 U	0.39 U	0.40 U	0.40 U	0.37 U	0.39 U	0.38 UJ
1,1-DICHLOROETHENE	0.32 U	0.34 U	0.34 U	0.34 U	0.32 U	0.33 U	0.33 UJ
1,2,3-TRICHLOROPROPANE	5.7 U	6.0 U	6.0 U	6.1 U	5.7 U	5.9 U	5.8 UJ
1,2-DIBROMO-3-CHLOROPROPANE	114 U	120 U	120 U	122 U	113 U	119 U	116 UJ
1,2-DIBROMOETHANE	5.7 U	6.0 U	6.0 U	6.1 U	5.7 U	5.9 U	5.8 UJ
1,2-DICHLOROETHANE	5.7 U	6.0 U	6.0 U	6.1 U	5.7 U	5.9 U	5.8 UJ
1,2-DICHLOROPROPANE	5.7 U	6.0 U	6.0 U	6.1 U	5.7 U	5.9 U	5.8 UJ
1,4-DICHLORO-2-BUTENE	114 UJ	120 UJ	120 U	122 U	113 U	119 U	116 UJ
1,4-DIOXANE	172 UR	179 UR	180 UR	183 UR	170 UR	178 UR	174 UR
2-BUTANONE	4.3 UR	4.5 UR	4.6 UR	4.6 UR	4.3 UR	4.5 UR	4.4 UJ
2-HEXANONE	2.6 U	2.7 U	2.7 U	2.7 U	2.5 U	2.7 U	2.6 UJ
4-METHYL-2-PENTANONE	1.7 U	1.8 U	1.8 U	1.8 U	1.7 U	1.8 U	1.8 UJ
ACETONE	4.5 U	4.6 U	7.8 B	4.2 B	3.9 B	1.4 B	4.4 UJ
ACETONITRILE	114 U	120 U	120 U	122 U	113 U	119 U	116 UJ
ACROLEIN	13.2 U	13.8 U	13.9 U	14.1 U	13.0 U	13.7 U	13.4 UJ
ACRYLONITRILE	5.7 U	6.0 U	6.0 U	6.1 U	5.7 U	5.9 U	5.8 UJ
ALLYL CHLORIDE	5.7 U	6.0 U	6.0 U	6.1 U	5.7 U	5.9 U	5.8 UJ
BENZENE	0.29 U	0.30 U	0.30 U	0.31 U	0.28 U	0.30 U	0.29 UJ
BROMODICHLOROMETHANE	0.22 U	0.23 U	0.23 U	0.23 U	0.22 U	0.23 U	0.22 UJ
BROMOFORM	3.1 U	3.2 U	3.2 U	3.3 U	3.0 U	3.2 U	3.1 UJ
BROMOMETHANE	0.22 U	0.23 U	0.23 U	0.23 U	0.22 U	0.23 U	0.22 UJ
CARBON DISULFIDE	1.2 J	1.4 U	1.4 U	1.4 U	1.3 U	1.4 U	1.4 UJ
CARBON TETRACHLORIDE	0.14 U	0.14 U	0.14 U	0.15 U	0.14 U	0.14 U	0.14 UJ
CHLOROBENZENE	0.41 U	0.43 U	0.43 U	0.44 U	0.41 U	0.43 U	0.42 UJ
CHLOROETHANE	0.47 U	0.49 U	0.49 U	0.50 U	0.46 U	0.49 U	0.48 UJ
CHLOROFORM	5.0 J	3.0 J	0.45 U	0.45 U	0.42 U	0.44 U	0.43 UJ
CHLOROMETHANE	0.56 U	0.59 U	0.59 U	0.60 U	0.55 U	0.58 U	0.57 UJ
CHLOROPRENE	5.7 UR	6.0 UR	6.0 UR	6.1 UR	5.7 UR	5.9 UR	5.8 UR
CIS-1,3-DICHLOROPROPENE	0.31 U	0.32 U	0.33 U	0.33 U	0.31 U	0.32 U	0.31 UJ

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Indian Head, Maryland

SAMPLE NUMBER:	S26-MW01-01	S26-MW01-02	S26-MW02-001	S26-MW02-002	S26-MW03-001	S26-MW03-002	S26-SB01-01
DEPTH (feet):	0 - 2	4 - 6	0 - 2	10 - 12	0 - 2	6 - 9	0 - 2
LOCATION:	MW01	MW01	MW02	MW02	MW03	MW03	SB01
SAMPLE DATE:	9/19/95	9/19/95	9/23/95	9/23/95	9/24/95	9/24/95	9/18/95
VOLATILES (UG/KG)							
DIBROMOCHLOROMETHANE	0.25 U	0.26 U	0.27 U	0.27 U	0.25 U	0.26 U	0.26 UJ
DIBROMOMETHANE	5.7 U	6.0 U	6.0 U	6.1 U	5.7 U	5.9 U	5.8 UJ
DICHLORODIFLUOROMETHANE	0.24 U	0.25 U	0.25 U	0.26 U	0.24 U	0.25 U	0.24 UJ
ETHYLBENZENE	1.6 U	1.6 U	1.6 U	1.7 U	1.5 U	1.6 U	1.6 UJ
IODOMETHANE	5.7 U	6.0 U	6.0 U	6.1 U	5.7 U	5.9 U	5.8 UJ
ISOBUTYL ALCOHOL	57.2 U	59.8 U	60.2 U	61.0 U	56.5 U	59.4 U	58.2 UJ
METHACRYLONITRILE	5.7 U	6.0 U	6.0 U	6.1 U	5.7 U	5.9 U	5.8 UJ
METHYL METHACRYLATE	5.7 U	6.0 U	6.0 U	6.1 U	5.7 U	5.9 U	5.8 UJ
METHYLENE CHLORIDE	122 B	73.5 B	13.4 B	18.0 B	14.3 B	8.3 B	171 J
PENTACHLOROETHANE	5.7 U	6.0 U	6.0 U	6.1 U	5.7 U	5.9 U	5.8 UJ
PROPIONITRILE	57.2 U	59.8 U	60.2 U	61.0 U	56.5 U	59.4 U	58.2 UJ
STYRENE	0.34 U	0.36 U	0.36 U	0.37 U	0.34 U	0.36 U	0.35 UJ
TETRACHLOROETHENE	1.0 U	1.0 U	1.1 U	1.1 U	0.96 U	1.0 U	1.0 UJ
TOLUENE	2.1 J	0.33 U	0.33 U	0.33 U	1.9 B	0.32 U	33.7 J
TRANS-1,2-DICHLOROETHENE	0.32 U	0.34 U	0.34 U	0.34 U	0.32 U	0.33 U	0.33 UJ
TRANS-1,3-DICHLOROPROPENE	0.56 U	0.59 U	0.59 U	0.60 U	0.55 U	0.58 U	0.57 UJ
TRICHLOROETHENE	0.30 U	0.31 U	0.31 U	0.32 U	0.29 U	0.31 U	0.30 UJ
TRICHLOROFLUOROMETHANE	0.33 U	0.35 U	0.35 U	0.35 U	0.33 U	0.35 U	0.34 UJ
VINYL ACETATE	0.32 UJ	0.34 UJ	0.34 U	0.34 U	0.32 U	0.33 U	0.33 UJ
VINYL CHLORIDE	0.38 U	0.39 U	0.40 U	0.40 U	0.37 U	0.39 U	0.38 UJ
XYLENES, TOTAL	0.79 U	0.82 U	0.83 U	0.84 U	0.78 U	0.82 U	0.80 UJ
SEMIVOLATILES (UG/KG)							
1,2,4,5-TETRACHLOROBENZENE	380 U	396 U	396 UJ	403 UJ	373 UJ	393 UJ	383 U
1,2,4-TRICHLOROBENZENE	36.3 U	37.9 U	37.9 UJ	38.5 UJ	35.7 UJ	37.6 UJ	36.6 U
1,3,5-TRINITROBENZENE	380 U	396 U	396 UJ	403 UJ	373 UJ	393 UJ	383 U
1,3-DINITROBENZENE	380 U	396 U	396 UJ	403 UJ	373 UJ	393 UJ	383 U
1,4-NAPHTHOQUINONE	380 U	396 U	396 UJ	403 UJ	373 UJ	393 UJ	383 U
1-NAPHTHYLAMINE	380 U	396 U	396 UJ	403 UJ	373 UJ	393 UJ	383 U
2,2'-OXYBIS(1-CHLOROPROPANE)	380 U	396 U	396 UJ	403 UJ	373 UJ	393 UJ	383 U
2,3,4,6-TETRACHLOROPHENOL	380 U	396 U	396 UJ	403 UJ	373 UJ	393 UJ	383 U
2,4,5-TRICHLOROPHENOL	53.3 U	55.6 U	55.6 UJ	56.6 UJ	52.4 UJ	55.2 UJ	53.8 U
2,4,6-TRICHLOROPHENOL	73.6 U	76.8 U	76.8 UJ	78.0 UJ	72.3 UJ	76.1 UJ	74.2 U
2,4-DICHLOROPHENOL	52.8 U	55.1 U	55.1 UJ	56.0 UJ	51.9 UJ	54.6 UJ	53.3 U

Summary of Soil Analytical Results - SWMU 26
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SAMPLE NUMBER:	S26-MW01-01	S26-MW01-02	S26-MW02-001	S26-MW02-002	S26-MW03-001	S26-MW03-002	S26-SB01-01
DEPTH (feet):	0 - 2	4 - 6	0 - 2	10 - 12	0 - 2	6 - 9	0 - 2
LOCATION:	MW01	MW01	MW02	MW02	MW03	MW03	SB01
SAMPLE DATE:	9/19/95	9/19/95	9/23/95	9/23/95	9/24/95	9/24/95	9/18/95
SEMIVOLATILES (UG/KG)							
2,4-DIMETHYLPHENOL	119 U	124 U	124 UJ	126 UJ	116 UJ	123 UJ	120 U
2,4-DINITROPHENOL	187 U	195 U	195 UJ	198 UJ	183 UJ	193 UJ	188 U
2,4-DINITROTOLUENE	25.9 U	27.0 U	27.0 UJ	27.5 UJ	25.4 UJ	26.8 UJ	26.1 U
2,6-DICHLOROPHENOL	380 U	396 U	396 UJ	403 UJ	373 UJ	393 UJ	383 U
2,6-DINITROTOLUENE	16.3 U	17.0 U	17.0 UJ	17.3 UJ	16.0 UJ	16.9 UJ	16.4 U
2-ACETYLAMINOFLUORENE	380 U	396 U	396 UJ	403 UJ	373 UJ	393 UJ	383 U
2-CHLORONAPHTHALENE	28.3 U	29.6 U	29.6 UJ	30.0 UJ	27.8 UJ	29.3 UJ	28.6 U
2-CHLOROPHENOL	67.6 U	70.6 U	70.6 UJ	71.7 UJ	66.4 UJ	70.0 UJ	68.2 U
2-METHYLNAPHTHALENE	45.8 U	47.8 U	47.8 UJ	48.6 UJ	45.0 UJ	47.4 UJ	46.2 U
2-METHYLPHENOL	55.7 U	58.2 U	58.2 UJ	59.1 UJ	54.8 UJ	57.7 UJ	56.2 U
2-NAPHTHYLAMINE	380 U	396 U	396 UJ	403 UJ	373 UJ	393 UJ	383 U
2-NITROANILINE	58.8 U	61.4 U	61.4 UJ	62.4 UJ	57.6 UJ	60.8 UJ	59.3 U
2-NITROPHENOL	67.6 U	70.6 U	70.6 UJ	71.7 UJ	66.4 UJ	70.0 UJ	68.2 U
2-PICOLINE	380 U	396 U	396 UJ	403 UJ	373 UJ	393 UJ	383 U
3,3'-DICHLOROBENZIDINE	372 U	388 U	388 UJ	394 UJ	365 UJ	385 UJ	375 U
3,3'-DIMETHYLBENZIDINE	380 U	396 U	396 UJ	403 UJ	373 UJ	393 UJ	383 U
3-METHYLCHOLANTHRENE	380 U	396 U	396 UJ	403 UJ	373 UJ	393 UJ	383 U
3-METHYLPHENOL	380 U	396 U	396 UJ	403 UJ	373 UJ	393 UJ	383 U
3-NITROANILINE	142 U	148 U	148 UJ	151 UJ	140 UJ	147 UJ	144 UR
4,6-DINITRO-2-METHYLPHENOL	65.4 U	68.2 U	68.2 UJ	69.4 UJ	64.3 UJ	67.7 UJ	66.0 U
4-AMINOBIPHENYL	759 U	792 U	792 UJ	805 UJ	746 UJ	785 UJ	766 U
4-BROMOPHENYL PHENYL ETHER	30.2 U	31.5 U	31.5 UJ	32.0 UJ	29.7 UJ	31.2 UJ	30.4 U
4-CHLORO-3-METHYLPHENOL	60.3 U	62.9 U	62.9 UJ	64.0 UJ	59.2 UJ	62.4 UJ	60.8 U
4-CHLOROANILINE	85.8 U	89.5 U	89.5 UJ	91.0 UJ	84.3 UJ	88.8 UJ	86.5 U
4-CHLOROPHENYL PHENYL ETHER	22.8 U	23.8 U	23.8 UJ	24.2 UJ	22.4 UJ	23.6 UJ	23.0 U
4-METHYLPHENOL	43.7 U	45.6 U	45.6 UJ	46.4 UJ	43.0 UJ	45.3 UJ	44.1 U
4-NITROANILINE	67.0 U	70.0 U	70.0 UJ	71.1 UJ	65.9 UJ	69.4 UJ	67.6 U
4-NITROPHENOL	134 U	139 U	139 UJ	142 UJ	131 UJ	138 UJ	135 U
4-NITROQUINOLINE-1-OXIDE	1520 UR	1580 UR	1580 UR	1610 UR	1490 UR	1570 UR	1530 UR
5-NITRO-O-TOLUIDINE	380 U	396 U	396 UJ	403 UJ	373 UJ	393 UJ	383 U
7,12-DIMETHYLBENZ(A)ANTHRACENE	380 U	396 U	396 UJ	403 UJ	373 UJ	393 UJ	383 U
A,A-DIMETHYLPHENETHYLAMINE	380 U	396 U	396 UJ	403 UJ	373 UJ	393 UJ	383 U
ACENAPHTHENE	39.4 U	41.1 U	41.1 UJ	41.8 UJ	38.7 UJ	40.8 UJ	39.7 U

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SAMPLE NUMBER:	S26-MW01-01	S26-MW01-02	S26-MW02-001	S26-MW02-002	S26-MW03-001	S26-MW03-002	S26-SB01-01
DEPTH (feet):	0 - 2	4 - 6	0 - 2	10 - 12	0 - 2	6 - 9	0 - 2
LOCATION:	MW01	MW01	MW02	MW02	MW03	MW03	SB01
SAMPLE DATE:	9/19/95	9/19/95	9/23/95	9/23/95	9/24/95	9/24/95	9/18/95
SEMIVOLATILES (UG/KG)							
ACENAPHTHYLENE	39.0 U	40.6 U	40.6 UJ	41.3 UJ	38.3 UJ	40.3 UJ	39.3 U
ACETOPHENONE	380 U	396 U	396 UJ	403 UJ	373 UJ	393 UJ	383 U
ANILINE	380 U	396 U	396 UJ	403 UJ	373 UJ	393 UJ	383 U
ANTHRACENE	26.7 U	27.8 U	27.8 UJ	28.3 UJ	26.2 UJ	27.6 UJ	26.9 U
ARAMITE	759 U	792 U	792 UJ	805 UJ	746 UJ	785 UJ	766 U
BENZO(A)ANTHRACENE	13.8 U	14.5 U	14.5 UJ	14.7 UJ	13.6 UJ	14.3 UJ	14.0 U
BENZO(A)PYRENE	17.2 U	18.0 U	18.0 UJ	18.3 UJ	16.9 UJ	17.8 UJ	17.4 U
BENZO(B)FLUORANTHENE	51.2 U	53.5 U	53.5 UJ	54.4 UJ	50.3 UJ	53.0 UJ	51.7 U
BENZO(G,H,I)PERYLENE	52.7 U	55.0 U	55.0 UJ	55.9 UJ	51.8 UJ	54.5 UJ	53.2 U
BENZO(K)FLUORANTHENE	42.3 U	44.1 U	44.1 UJ	44.9 UJ	41.6 UJ	43.8 UJ	42.7 U
BENZYL ALCOHOL	51.7 U	53.9 U	53.9 UJ	54.8 UJ	50.8 UJ	53.5 UJ	52.1 U
BIS(2-CHLOROETHOXY)METHANE	53.9 U	56.2 U	56.2 UJ	57.1 UJ	52.9 UJ	55.7 UJ	54.3 U
BIS(2-CHLOROETHYL)ETHER	81.4 U	85.0 U	85.0 UJ	86.4 UJ	80.0 UJ	84.3 UJ	82.1 U
BIS(2-ETHYLHEXYL)PHTHALATE	74.2 U	77.4 U	46.8 J	78.7 UJ	72.9 UJ	76.8 UJ	74.8 U
BUTYL BENZYL PHTHALATE	107 U	112 U	112 UJ	114 UJ	105 UJ	111 UJ	108 U
CHLOROBENZILATE	380 U	396 U	396 UJ	403 UJ	373 UJ	393 UJ	383 U
CHRYSENE	21.4 U	22.4 U	22.4 UJ	22.7 UJ	21.0 UJ	22.2 UJ	21.6 U
DI-N-BUTYL PHTHALATE	62.9 U	65.6 U	65.6 UJ	66.7 UJ	61.8 UJ	65.1 UJ	63.4 U
DI-N-OCTYL PHTHALATE	54.4 U	56.8 U	56.8 UJ	57.7 UJ	53.5 UJ	56.3 UJ	54.9 U
DIALLATE	380 UR	396 UR	396 UR	403 UR	373 UR	393 UR	383 UR
DIBENZO(A,H)ANTHRACENE	43.6 U	45.5 U	45.5 UJ	46.3 UJ	42.8 UJ	45.1 UJ	44.0 U
DIBENZOFURAN	29.2 U	30.5 U	30.5 UJ	31.0 UJ	28.7 UJ	30.3 UJ	29.5 U
DIETHYL PHTHALATE	41.4 U	43.2 U	43.2 UJ	43.9 UJ	40.8 UJ	42.8 UJ	41.7 U
DIMETHOATE	759 U	792 U	792 UJ	805 UJ	746 UJ	785 UJ	766 U
DIMETHYL PHTHALATE	19.2 U	20.0 U	20.0 UJ	20.3 UJ	18.8 UJ	19.8 UJ	19.3 U
DIPHENYLAMINE	380 U	396 U	396 UJ	403 UJ	373 UJ	393 UJ	383 U
ETHYL METHACRYLATE	380 U	396 U	396 UJ	403 UJ	373 UJ	393 UJ	383 U
FAMPHUR	759 UJ	792 UJ	792 UJ	805 UJ	746 UJ	785 UJ	766 UR
FLUORANTHENE	51.6 U	53.8 U	53.8 UJ	54.7 UJ	50.7 UJ	53.4 UJ	52.0 U
FLUORENE	27.6 U	28.8 U	28.8 UJ	29.2 UJ	27.1 UJ	28.5 UJ	27.8 U
HEXACHLOROBENZENE	22.6 U	23.6 U	23.6 UJ	24.0 UJ	22.2 UJ	23.4 UJ	22.8 U
HEXACHLOROBUTADIENE	41.7 U	43.5 U	43.5 UJ	44.3 UJ	41.0 UJ	43.2 UJ	42.1 U
HEXACHLOROCYCLOPENTADIENE	69.7 U	72.8 U	72.8 UJ	74.0 UJ	68.5 UJ	72.1 UJ	70.3 U

Summary of Soil Analytical Results - SWMU 26
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER:	S26-MW01-01	S26-MW01-02	S26-MW02-001	S26-MW02-002	S26-MW03-001	S26-MW03-002	S26-SB01-01
DEPTH (feet):	0 - 2	4 - 6	0 - 2	10 - 12	0 - 2	6 - 9	0 - 2
LOCATION:	MW01	MW01	MW02	MW02	MW03	MW03	SB01
SAMPLE DATE:	9/19/95	9/19/95	9/23/95	9/23/95	9/24/95	9/24/95	9/18/95
SEMIVOLATILES (UG/KG)							
HEXACHLOROETHANE	24.7 U	25.8 U	25.8 UJ	26.2 UJ	24.3 UJ	25.6 UJ	24.9 U
HEXACHLOROPHENE	1900 UR	1980 UR	1980 UR	2010 UR	1860 UR	1960 UR	1910 UR
HEXACHLOROPROPENE	380 U	396 U	396 UJ	403 UJ	373 UJ	393 UJ	383 U
INDENO(1,2,3-CD)PYRENE	47.2 U	49.2 U	49.2 UJ	50.1 UJ	46.4 UJ	48.8 UJ	47.6 U
ISODRIN	759 U	792 U	792 UJ	805 UJ	746 UJ	785 UJ	766 U
ISOPHORONE	55.3 U	57.7 U	57.7 UJ	58.7 UJ	54.4 UJ	57.2 UJ	55.8 U
ISOSAFROLE	380 U	396 U	396 UJ	403 UJ	373 UJ	393 UJ	383 U
KEPONE	759 UR	792 UR	792 UR	805 UR	746 UR	785 UR	766 UR
METHAPYRILENE	3800 U	3960 U	3960 UJ	4030 UJ	3730 UJ	3930 UJ	3830 U
METHYL METHANESULFONATE	569 U	594 U	594 UJ	604 UJ	559 UJ	589 UJ	574 U
N-NITROSO-DI-N-PROPYLAMINE	65.3 U	68.2 U	68.2 UJ	69.3 UJ	64.2 UJ	67.6 UJ	65.9 U
N-NITROSODI-N-BUTYLAMINE	380 U	396 U	396 UJ	403 UJ	373 UJ	393 UJ	383 U
N-NITROSODIETHYLAMINE	759 U	792 U	792 UJ	805 UJ	746 UJ	785 UJ	766 U
N-NITROSODIMETHYLAMINE	57.2 U	59.7 U	59.7 UJ	60.6 UJ	56.2 UJ	59.2 UJ	57.7 U
N-NITROSODIPHENYLAMINE	38.3 U	40.0 U	40.0 UJ	40.6 UJ	37.6 UJ	39.6 UJ	38.6 U
N-NITROSOMETHYLETHYLAMINE	380 U	396 U	396 UJ	403 UJ	373 UJ	393 UJ	383 U
N-NITROSOMORPHOLINE	380 U	396 U	396 UJ	403 UJ	373 UJ	393 UJ	383 U
N-NITROSOPIPERIDINE	759 U	792 U	792 UJ	805 UJ	746 UJ	785 UJ	766 U
N-NITROSOPYRROLIDINE	380 U	396 U	396 UJ	403 UJ	373 UJ	393 UJ	383 U
NAPHTHALENE	35.1 U	36.6 U	36.6 UJ	37.2 UJ	34.5 UJ	36.3 UJ	35.4 U
NITROBENZENE	51.7 U	54.0 U	54.0 UJ	54.9 UJ	50.8 UJ	53.5 UJ	52.2 U
O,O,O-TRIETHYLPHOSPHOROTHIOATE	380 U	396 U	396 UJ	403 UJ	373 UJ	393 UJ	383 U
O,O-DIETHYL-O-2-PYRAZINYLPHOSPHOROT	380 U	396 U	396 UJ	403 UJ	373 UJ	393 UJ	383 U
O-TOLUIDINE	380 U	396 U	396 UJ	403 UJ	373 UJ	393 UJ	383 U
P-DIMETHYLAMINOAZOBENZENE	380 U	396 U	396 UJ	403 UJ	373 UJ	393 UJ	383 U
P-PHENYLENEDIAMINE	380 U	396 U	396 UJ	403 UJ	373 UJ	393 UJ	383 U
PENTACHLOROBENZENE	380 U	396 U	396 UJ	403 UJ	373 UJ	393 UJ	383 U
PENTACHLORONITROBENZENE	380 U	396 U	396 UJ	403 UJ	373 UJ	393 UJ	383 U
PENTACHLOROPHENOL	121 U	126 U	126 UJ	128 UJ	119 UJ	125 UJ	122 U
PHENACETIN	759 U	792 U	792 UJ	805 UJ	746 UJ	785 UJ	766 U
PHENANTHRENE	42.9 U	44.8 U	44.8 UJ	45.5 UJ	42.1 UJ	44.4 UJ	43.3 U
PHENOL	157 U	164 U	164 UJ	167 UJ	155 UJ	163 UJ	159 U
PHORATE	380 U	396 U	396 UR	403 UR	373 UR	393 UR	383 U

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Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER:	S26-MW01-01	S26-MW01-02	S26-MW02-001	S26-MW02-002	S26-MW03-001	S26-MW03-002	S26-SB01-01
DEPTH (feet):	0 - 2	4 - 6	0 - 2	10 - 12	0 - 2	6 - 9	0 - 2
LOCATION:	MW01	MW01	MW02	MW02	MW03	MW03	SB01
SAMPLE DATE:	9/19/95	9/19/95	9/23/95	9/23/95	9/24/95	9/24/95	9/18/95
SEMIVOLATILES (UG/KG)							
PRONAMIDE	380 U	396 U	396 UJ	403 UJ	373 UJ	393 UJ	383 U
PYRENE	94.7 U	98.8 U	98.8 UJ	100 UJ	93.0 UJ	98.0 UJ	95.5 U
PYRIDINE	380 U	396 U	396 UJ	403 UJ	373 UJ	393 UJ	383 U
SAFROLE	380 U	396 U	396 UJ	403 UJ	373 UJ	393 UJ	383 U
PESTICIDES/PCBs (UG/KG)							
AROCLOR-1016	19.3 U	19.9 U	20.1 U	20.4 U	18.9 U	19.9 U	19.4 U
AROCLOR-1221	19.3 U	19.9 U	20.1 U	20.4 U	18.9 U	19.9 U	19.4 U
AROCLOR-1232	19.3 U	19.9 U	20.1 U	20.4 U	18.9 U	19.9 U	19.4 U
AROCLOR-1242	25.0 U	25.9 U	26.1 U	26.6 U	24.6 U	25.9 U	25.3 U
AROCLOR-1248	38.5 U	39.9 U	40.2 U	40.9 U	37.8 U	39.9 U	38.9 U
AROCLOR-1254	38.5 U	39.9 U	40.2 U	40.9 U	37.8 U	39.9 U	38.9 U
AROCLOR-1260	38.5 U	39.9 U	40.2 U	40.9 U	37.8 U	39.9 U	38.9 U
EXPLOSIVES (UG/KG)							
1,3 DINITROBENZENE							37.2 U
1,3,5 TRINITROBENZENE							40.2 U
2,4 DINITROTOLUENE							51.6 U
2,4,6-TRINITROTOLUENE							35.6 U
2,6 DINITROTOLUENE							47.6 U
2-AMINO-4,6-DINITROTOLUENE							46.7 U
2-NITROTOLUENE							61.4 U
3-NITROTOLUENE							61.7 U
4-AMINO-2,6-DINITROTOLUENE							40.8 U
4-NITROTOLUENE							87.2 U
HMX							70.5 U
NITRO-BENZENE							35.2 U
NITROCELLULOSE							8.6 U
NITROGLYCERIN							10000 U
NITROGUANIDINE							63.0 U
PENTAERYTHRITOL TETRANITRATE							250 U
RDX							50.9 U
TETRYL							163 U
INORGANICS (MG/KG)							
ALUMINUM	10600	7520	10200 J	8330 J	12700 J	8250 J	6640

Summary of Soil Analytical Results - SWMU 26
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Indian Head, Maryland

SAMPLE NUMBER:	S26-MW01-01	S26 MW01-02	S26-MW02-001	S26-MW02-002	S26-MW03-001	S26-MW03-002	S26-SB01-01
DEPTH (feet):	0 - 2	4 - 6	0 - 2	10 - 12	0 - 2	6 - 9	0 - 2
LOCATION:	MW01	MW01	MW02	MW02	MW03	MW03	SB01
SAMPLE DATE:	9/19/95	9/19/95	9/23/95	9/23/95	9/24/95	9/24/95	9/18/95
INORGANICS (MG/KG)							
ANTIMONY	0.20 UL	0.20 UL	0.20 UL	0.21 UL	0.19 UL	0.21 UL	0.20 UL
ARSENIC	4.5	2.5 K	5.3 L	15.9 L	3.3 L	1.9 J	4.3
BARIUM	52.0	37.3	63.9	40.6	64.8	39.6	30.3
BERYLLIUM	0.40 L	0.33 L	0.51 L	0.55 L	0.61 L	0.43 L	0.34
CADMIUM	0.57 U	0.60 U	1.2	0.61 U	0.57 U	0.59 U	0.58 UL
CALCIUM	53.1 K	56.2 K	382	64.0	409	50.7	9350
CHROMIUM	14.4	10.2	47.2	33.9	20.8	13.4	11.8 J
COBALT	5.7	4.5	20.5	3.5	15.0	8.4	9.2
COPPER	7.7 L	4.8 L	12.7 L	8.6 L	4.4 L	5.2 L	56.6
CYANIDE	1.1 U	1.2 U	1.2 U	1.2 U	1.1 U	1.2 U	1.2 U
IRON	17800 J	15800 J	83900 J	13400 J	25300 J	20300 J	15500 J
LEAD	9.8 L	6.6 L	33.8 J	10.3 J	9.9 J	5.4 J	9.3 L
MAGNESIUM	1600	926	665 J	1210 J	1090 J	746 J	1210
MANGANESE	83.4	45.6	1130 J	27.7 J	882 J	98.8 J	100 J
MERCURY	0.05 UL	0.06 UL	0.20	0.09	0.07	0.06 U	0.16 L
NICKEL	4.4 K	4.9 K	49.7	10.8	10.5	8.0	55.0
POTASSIUM	636	578	696	845	783	385	535
SELENIUM	0.20	0.18 U	0.43 B	0.49 B	0.17 U	0.18 U	0.17 U
SILVER	0.11 U	0.12 U	0.12 U	0.12 U	0.11 U	0.12 U	0.23
SODIUM	116 B	155 B	21.7 U	34.8	20.3 U	21.4 U	84.3 B
THALLIUM	0.29 U	0.30 U	0.30 U	0.31 U	0.28 U	0.30 U	0.29 U
TIN	3.9 UL	4.0 UL	15.3 J	4.9 UJ	4.5 UJ	4.8 UJ	4.7 UL
VANADIUM	22.5	14.6	23.7	18.1	36.7	23.9	15.8
ZINC	23.9	18.9	137 J	36.2 J	30.8 J	24.2 J	28.0
TOTAL PETROLEUM HYDROCARBONS (MG/KG)							
TPH	28.6 U	29.9 U	30.1 UL	30.5 UL	33.7 L	39.1 L	30.9
INDICATOR PARAMETERS (MG/KG)							
AMMONIA	10.0 UL	9.6 UL	141	32.8	49.9	9.5	16.2 L
NITRATE/NITRITE	0.66 U	0.68 U	5.3	2.0 U	1.5 U	2.6 U	0.743 U
TOTAL ORGANIC CARBON	554	373	6970	1940	5020	1290	848

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SAMPLE NUMBER:	S26-SB01-02	S26-SB02-001	FD07	S26-SB02-002	S26-SB03-001	S26-SB03-002	S26-SB04-001
DEPTH (feet):	6 - 10	0 - 2	0 - 2	6 - 10	0 - 2	6 - 10	0 - 2
LOCATION:	SB01	SB02	SB02	SB02	SB03	SB03	SB04
SAMPLE DATE:	9/18/95	9/21/95	9/21/95	9/21/95	9/23/95	9/23/95	9/24/95
VOLATILES (UG/KG)							
1,1,1,2-TETRACHLOROETHANE	5.6 U	6.1 UJ		6.1 UJ	5.6 U	6.1 U	5.7 U
1,1,1-TRICHLOROETHANE	0.19 U	0.21 UJ		0.21 UJ	0.19 U	0.21 U	1.2 B
1,1,2,2-TETRACHLOROETHANE	0.60 U	0.65 UJ		0.64 UJ	0.59 U	0.65 U	0.61 U
1,1,2-TRICHLOROETHANE	0.51 U	0.55 UJ		0.54 UJ	0.50 U	0.55 U	0.52 U
1,1-DICHLOROETHANE	0.37 UJ	0.40 UJ		0.40 UJ	0.37 U	0.40 U	0.38 U
1,1-DICHLOROETHENE	0.32 UJ	0.34 UJ		0.34 UJ	0.31 U	0.34 U	0.32 U
1,2,3-TRICHLOROPROPANE	5.6 UJ	6.1 UJ		6.1 UJ	5.6 U	6.1 U	5.7 U
1,2-DIBROMO-3-CHLOROPROPANE	112 U	122 UJ		121 UJ	112 U	122 U	115 U
1,2-DIBROMOETHANE	5.6 U	6.1 UJ		6.1 UJ	5.6 U	6.1 U	5.7 U
1,2-DICHLOROETHANE	5.6 UJ	6.1 UJ		6.1 UJ	5.6 U	6.1 U	5.7 U
1,2-DICHLOROPROPANE	5.6 U	6.1 UJ		6.1 UJ	5.6 U	6.1 U	5.7 U
1,4-DICHLORO-2-BUTENE	112 U	122 UJ		121 UJ	112 U	122 U	115 U
1,4-DIOXANE	169 UR	183 UR		182 UR	168 UR	183 UR	172 UR
2-BUTANONE	4.3 UJ	4.6 UJ		4.6 UJ	4.2 UR	4.6 UR	4.3 UR
2-HEXANONE	2.5 U	2.7 UJ		2.7 UJ	2.5 U	2.7 U	2.6 U
4-METHYL-2-PENTANONE	1.7 U	1.8 UJ		1.8 UJ	1.7 U	1.8 U	1.7 U
ACETONE	24.5 B	2.3 B		4.6 UJ	4.3 U	1.7 B	4.4 UJ
ACETONITRILE	112 UJ	122 UJ		121 UJ	112 U	122 U	115 U
ACROLEIN	13.0 UJ	14.0 UJ		14.0 UJ	12.9 U	14.1 U	13.2 U
ACRYLONITRILE	5.6 UJ	6.1 UJ		6.1 UJ	5.6 U	6.1 U	5.7 U
ALLYL CHLORIDE	5.6 U	6.1 UJ		6.1 UJ	5.6 U	6.1 U	5.7 U
BENZENE	0.28 U	0.30 UJ		0.30 UJ	0.28 U	0.31 U	0.29 U
BROMODICHLOROMETHANE	0.21 U	0.23 UJ		0.23 UJ	0.21 U	0.23 U	0.22 U
BROMOFORM	3.0 U	3.3 UJ		3.2 UJ	3.0 U	3.3 U	3.1 U
BROMOMETHANE	0.21 UJ	0.23 UJ		0.23 UJ	0.21 U	0.23 U	0.22 U
CARBON DISULFIDE	1.3 UJ	1.4 UJ		1.4 UJ	1.3 U	1.4 U	1.4 U
CARBON TETRACHLORIDE	0.14 U	0.15 UJ		0.15 UJ	0.13 U	0.15 U	0.14 U
CHLOROBENZENE	0.41 U	0.44 UJ		0.44 UJ	0.40 U	0.44 U	0.41 U
CHLOROETHANE	0.46 UJ	0.50 UJ		0.50 UJ	0.46 U	0.50 U	0.47 U
CHLOROFORM	0.42 UJ	0.45 UJ		0.45 UJ	0.41 U	0.45 U	4.1
CHLOROMETHANE	0.55 UJ	0.60 UJ		0.59 UJ	0.55 U	0.60 U	0.56 U
CHLOROPRENE	5.6 UR	6.1 UR		6.1 UR	5.6 UR	6.1 UR	5.7 UR
CIS-1,3-DICHLOROPROPENE	0.30 U	0.33 UJ		0.33 UJ	0.30 U	0.33 U	0.31 U

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Indian Head, Maryland

SAMPLE NUMBER:	S26-SB01-02	S26-SB02-001	FD07	S26-SB02-002	S26-SB03-001	S26-SB03-002	S26-SB04-001
DEPTH (feet):	6 - 10	0 - 2	0 - 2	6 - 10	0 - 2	8 - 10	0 - 2
LOCATION:	SB01	SB02	SB02	SB02	SB03	SB03	SB04
SAMPLE DATE:	9/18/95	9/21/95	9/21/95	9/21/95	9/23/95	9/23/95	9/24/95
VOLATILES (UG/KG)							
DIBROMOCHLOROMETHANE	0.25 UJ	0.27 UJ		0.27 UJ	0.25 U	0.27 U	0.25 U
DIBROMOMETHANE	5.6 U	6.1 UJ		6.1 UJ	5.6 U	6.1 U	5.7 U
DICHLORODIFLUOROMETHANE	0.24 UJ	0.26 UJ		0.25 UJ	0.23 U	0.26 U	0.24 U
ETHYLBENZENE	1.5 U	1.7 UJ		1.6 UJ	1.5 U	1.7 U	1.6 U
IODOMETHANE	5.6 UJ	6.1 UJ		6.1 UJ	5.6 U	6.1 U	5.7 U
ISOBUTYL ALCOHOL	56.2 U	60.9 UJ		60.5 UJ	55.8 U	61.1 U	57.4 U
METHACRYLONITRILE	5.6 U	6.1 UJ		6.1 UJ	5.6 U	6.1 U	5.7 U
METHYL METHACRYLATE	5.6 U	6.1 UJ		6.1 UJ	5.6 U	6.1 U	5.7 U
METHYLENE CHLORIDE	172 J	15.7 J		3.6 J	13.8 B	20.6 B	174 B
PENTACHLOROETHANE	5.6 U	6.1 UJ		6.1 UJ	5.6 U	6.1 U	5.7 U
PROPIONITRILE	56.2 UJ	60.9 UJ		60.5 UJ	55.8 U	61.1 U	57.4 U
STYRENE	0.34 U	0.37 UJ		0.36 UJ	0.34 U	0.37 U	0.34 U
TETRACHLOROETHENE	0.98 U	1.1 UJ		1.1 UJ	0.97 U	1.1 U	1.00 U
TOLUENE	27.0 J	0.33 UJ		0.33 UJ	0.30 U	0.33 U	1.3 B
TRANS-1,2-DICHLOROETHENE	0.32 UJ	0.34 UJ		0.34 UJ	0.31 U	0.34 U	0.32 U
TRANS-1,3-DICHLOROPROPENE	0.55 U	0.60 UJ		0.59 UJ	0.55 U	0.60 U	0.56 U
TRICHLOROETHENE	0.29 U	0.32 UJ		0.32 UJ	0.29 U	0.32 U	0.30 U
TRICHLOROFLUOROMETHANE	0.33 UJ	0.35 UJ		0.35 UJ	0.32 U	0.35 U	0.33 U
VINYL ACETATE	0.32 U	0.34 UJ		0.34 UJ	0.31 U	0.34 U	0.32 U
VINYL CHLORIDE	0.37 UJ	0.40 UJ		0.40 UJ	0.37 U	0.40 U	0.38 U
XYLENES, TOTAL	0.78 U	0.84 UJ		0.84 UJ	0.77 U	0.84 U	0.79 U
SEMIVOLATILES (UG/KG)							
1,2,4,5-TETRACHLOROBENZENE	370 U	403 UJ		399 UJ	370 UJ	403 UJ	380 UJ
1,2,4-TRICHLOROBENZENE	35.4 U	38.5 UJ		38.2 UJ	35.4 UJ	38.5 UJ	36.3 UJ
1,3,5-TRINITROBENZENE	370 U	403 UJ		399 UJ	370 UJ	403 UJ	380 UJ
1,3-DINITROBENZENE	370 U	403 UJ		399 UJ	370 UJ	403 UJ	380 UJ
1,4-NAPHTHOQUINONE	370 U	403 UJ		399 UJ	370 UJ	403 UJ	380 UJ
1-NAPHTHYLAMINE	370 U	403 UJ		399 UJ	370 UJ	403 UJ	380 UJ
2,2'-OXYBIS(1-CHLOROPROPANE)	370 U	403 UJ		399 UJ	370 UJ	403 UJ	380 UJ
2,3,4,6-TETRACHLOROPHENOL	370 U	403 UJ		399 UJ	370 UJ	403 UJ	380 UJ
2,4,5-TRICHLOROPHENOL	51.9 U	56.6 UJ		56.1 UJ	51.9 UJ	56.6 UJ	53.3 UJ
2,4,6-TRICHLOROPHENOL	71.6 U	78.0 UJ		77.4 UJ	71.6 UJ	78.0 UJ	73.6 UJ
2,4-DICHLOROPHENOL	51.4 U	56.0 UJ		55.6 UJ	51.4 UJ	56.0 UJ	52.8 UJ

Summary of Soil Analytical Results - SWMU 26
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER:	S26-SB01-02	S26-SB02-001	FD07	S26-SB02-002	S26-SB03-001	S26-SB03-002	S26-SB04-001
DEPTH (feet):	6 - 10	0 - 2	0 - 2	6 - 10	0 - 2	8 - 10	0 - 2
LOCATION:	SB01	SB02	SB02	SB02	SB03	SB03	SB04
SAMPLE DATE:	9/18/95	9/21/95	9/21/95	9/21/95	9/23/95	9/23/95	9/24/95
SEMIVOLATILES (UG/KG)							
2,4-DIMETHYLPHENOL	116 U	126 UJ		125 UJ	116 UJ	126 UJ	119 UJ
2,4-DINITROPHENOL	182 U	198 UJ		196 UJ	182 UJ	198 UJ	187 UJ
2,4-DINITROTOLUENE	25.2 U	27.5 UJ		27.2 UJ	25.2 UJ	27.5 UJ	25.9 UJ
2,6-DICHLOROPHENOL	370 U	403 UJ		399 UJ	370 UJ	403 UJ	380 UJ
2,6-DINITROTOLUENE	15.9 U	17.3 UJ		17.2 UJ	15.9 UJ	17.3 UJ	16.3 UJ
2-ACETYLAMINOFLUORENE	370 U	403 UJ		399 UJ	370 UJ	403 UJ	380 UJ
2-CHLORONAPHTHALENE	27.6 U	30.0 UJ		29.8 UJ	27.6 UJ	30.0 UJ	28.3 UJ
2-CHLOROPHENOL	65.9 U	71.7 UJ		71.2 UJ	65.9 UJ	71.7 UJ	67.6 UJ
2-METHYLNAPHTHALENE	44.6 U	48.6 UJ		48.2 UJ	44.6 UJ	48.6 UJ	45.8 UJ
2-METHYLPHENOL	54.3 U	59.1 UJ		58.6 UJ	54.3 UJ	59.1 UJ	55.7 UJ
2-NAPHTHYLAMINE	370 U	403 UJ		399 UJ	370 UJ	403 UJ	380 UJ
2-NITROANILINE	57.3 U	62.4 UJ		61.9 UJ	57.3 UJ	62.4 UJ	58.8 UJ
2-NITROPHENOL	65.8 U	71.7 UJ		71.1 UJ	65.8 UJ	71.7 UJ	67.6 UJ
2-PICOLINE	370 U	403 UJ		399 UJ	370 UJ	403 UJ	380 UJ
3,3'-DICHLOROBENZIDINE	362 U	394 UJ		391 UJ	362 UJ	394 UJ	372 UJ
3,3'-DIMETHYLBENZIDINE	370 U	403 UJ		399 UJ	370 UJ	403 UJ	380 UJ
3-METHYLCHOLANTHRENE	370 U	403 UJ		399 UJ	370 UJ	403 UJ	380 UJ
3-METHYLPHENOL	370 U	403 UJ		399 UJ	370 UJ	403 UJ	380 UJ
3-NITROANILINE	138 UR	151 UJ		150 UJ	138 UJ	151 UJ	142 UJ
4,6-DINITRO-2-METHYLPHENOL	63.7 U	69.4 UJ		68.8 UJ	63.7 UJ	69.4 UJ	65.4 UJ
4-AMINOBIPHENYL	739 U	805 UJ		799 UJ	739 UJ	805 UJ	759 UJ
4-BROMOPHENYL PHENYL ETHER	29.4 U	32.0 UJ		31.8 UJ	29.4 UJ	32.0 UJ	30.2 UJ
4-CHLORO-3-METHYLPHENOL	58.7 U	64.0 UJ		63.4 UJ	58.7 UJ	64.0 UJ	60.3 UJ
4-CHLOROANILINE	83.5 U	91.0 UJ		90.2 UJ	83.5 UJ	91.0 UJ	85.8 UJ
4-CHLOROPHENYL PHENYL ETHER	22.2 U	24.2 UJ		24.0 UJ	22.2 UJ	24.2 UJ	22.8 UJ
4-METHYLPHENOL	42.6 U	46.4 UJ		46.0 UJ	42.6 UJ	46.4 UJ	43.7 UJ
4-NITROANILINE	65.3 U	71.1 UJ		70.6 UJ	65.3 UJ	71.1 UJ	67.0 UJ
4-NITROPHENOL	130 U	142 UJ		140 UJ	130 UJ	142 UJ	134 UJ
4-NITROQUINOLINE-1-OXIDE	1480 UR	1610 UR		1600 UR	1480 UR	1610 UR	1520 UR
5-NITRO-O-TOLUIDINE	370 U	403 UJ		399 UJ	370 UJ	403 UJ	380 UJ
7,12-DIMETHYLBENZ(A)ANTHRACENE	370 U	403 UJ		399 UJ	370 UJ	403 UJ	380 UJ
A,A-DIMETHYLPHENETHYLAMINE	370 U	403 UJ		399 UJ	370 UJ	403 UJ	380 UJ
ACENAPHTHENE	38.4 U	41.8 UJ		41.4 UJ	38.4 UJ	41.8 UJ	39.4 UJ

Summary of Soil Analytical Results - SWMU 26
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER:	S26-SB01-02	S26-SB02-001	FD07	S26-SB02-002	S26-SB03-001	S26-SB03-002	S26-SB04-001
DEPTH (feet):	6 - 10	0 - 2	~~0-2~~ 6-10	6 - 10	0 - 2	8 - 10	0 - 2
LOCATION:	SB01	SB02	SB02	SB02	SB03	SB03	SB04
SAMPLE DATE:	9/18/95	9/21/95	9/21/95	9/21/95	9/23/95	9/23/95	9/24/95
SEMIVOLATILES (UG/KG)							
ACENAPHTHYLENE	37.9 U	41.3 UJ		41.0 UJ	37.9 UJ	41.3 UJ	39.0 UJ
ACETOPHENONE	370 U	403 UJ		399 UJ	370 UJ	403 UJ	380 UJ
ANILINE	370 U	403 UJ		399 UJ	370 UJ	403 UJ	380 UJ
ANTHRACENE	26.0 U	28.3 UJ		28.1 UJ	26.0 UJ	28.3 UJ	26.7 UJ
ARAMITE	739 U	806 UJ		799 UJ	739 UJ	805 UJ	759 UJ
BENZO(A)ANTHRACENE	13.5 U	14.7 UJ		14.6 UJ	13.5 UJ	14.7 UJ	13.8 UJ
BENZO(A)PYRENE	16.8 U	18.3 UJ		18.1 UJ	16.8 UJ	18.3 UJ	17.2 UJ
BENZO(B)FLUORANTHENE	49.9 U	54.4 UJ		53.9 UJ	49.9 UJ	54.4 UJ	51.2 UJ
BENZO(G,H,I)PERYLENE	51.3 U	55.9 UJ		55.5 UJ	51.3 UJ	55.9 UJ	52.7 UJ
BENZO(K)FLUORANTHENE	41.2 U	44.9 UJ		44.5 UJ	41.2 UJ	44.9 UJ	42.3 UJ
BENZYL ALCOHOL	50.3 U	54.8 UJ		54.4 UJ	50.3 UJ	54.8 UJ	51.7 UJ
BIS(2-CHLOROETHOXY)METHANE	52.5 U	57.1 UJ		56.7 UJ	52.5 UJ	57.1 UJ	53.9 UJ
BIS(2-CHLOROETHYL)ETHER	79.3 U	86.4 UJ		85.7 UJ	79.3 UJ	86.4 UJ	81.4 UJ
BIS(2-ETHYLHEXYL)PHTHALATE	72.3 U	78.7 UJ		78.1 UJ	72.3 UJ	78.7 UJ	74.2 UJ
BUTYL BENZYL PHTHALATE	104 U	114 UJ		113 UJ	104 UJ	114 UJ	107 UJ
CHLOROBENZILATE	370 U	403 UJ		399 UJ	370 UJ	403 UJ	380 UJ
CHRYSENE	20.9 U	22.7 UJ		22.5 UJ	20.9 UJ	22.7 UJ	21.4 UJ
DI-N-BUTYL PHTHALATE	61.2 U	66.7 UJ		66.2 UJ	61.2 UJ	66.7 UJ	62.9 UJ
DI-N-OCTYL PHTHALATE	53.0 U	57.7 UJ		57.3 UJ	53.0 UJ	57.7 UJ	54.4 UJ
DIALLATE	370 UR	403 UR		399 UR	370 UR	403 UR	380 UR
DIBENZO(A,H)ANTHRACENE	42.5 U	46.3 UJ		45.9 UJ	42.5 UJ	46.3 UJ	43.6 UJ
DIBENZOFURAN	28.5 U	31.0 UJ		30.8 UJ	28.5 UJ	31.0 UJ	29.2 UJ
DIETHYL PHTHALATE	40.3 U	43.9 UJ		43.5 UJ	40.3 UJ	43.9 UJ	41.4 UJ
DIMETHOATE	739 U	805 UJ		799 UJ	739 UJ	805 UJ	759 UJ
DIMETHYL PHTHALATE	18.7 U	20.3 UJ		20.2 UJ	18.7 UJ	20.3 UJ	19.2 UJ
DIPHENYLAMINE	370 U	403 UJ		399 UJ	370 UJ	403 UJ	380 UJ
ETHYL METHACRYLATE	370 U	403 UJ		399 UJ	370 UJ	403 UJ	380 UJ
FAMPHUR	739 UR	805 UJ		799 UJ	739 UJ	805 UJ	759 UJ
FLUORANTHENE	50.2 U	54.7 UJ		54.3 UJ	50.2 UJ	54.7 UJ	51.6 UJ
FLUORENE	26.8 U	29.2 UJ		29.0 UJ	26.8 UJ	29.2 UJ	27.6 UJ
HEXACHLOROBENZENE	22.0 U	24.0 UJ		23.8 UJ	22.0 UJ	24.0 UJ	22.6 UJ
HEXACHLOROBUTADIENE	40.6 U	44.3 UJ		43.9 UJ	40.6 UJ	44.3 UJ	41.7 UJ
HEXACHLOROCYCLOPENTADIENE	67.9 U	74.0 UJ		73.4 UJ	67.9 UJ	74.0 UJ	69.7 UJ

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SAMPLE NUMBER:	S26-SB01-02	S26-SB02-001	FD07	S26-SB02-002	S26-SB03-001	S26-SB03-002	S26-SB04-001
DEPTH (feet):	6 - 10	0 - 2	0 - 2	6 - 10	0 - 2	8 - 10	0 - 2
LOCATION:	SB01	SB02	SB02	SB02	SB03	SB03	SB04
SAMPLE DATE:	9/18/95	9/21/95	9/21/95	9/21/95	9/23/95	9/23/95	9/24/95
SEMIVOLATILES (UG/KG)							
HEXACHLOROETHANE	24.1 U	26.2 UJ		26.0 UJ	24.1 UJ	26.2 UJ	24.7 UJ
HEXACHLOROPHENE	1850 UR	2010 UR		2000 UR	1850 UR	2010 UR	1900 UR
HEXACHLOROPROPENE	370 U	403 UJ		399 UJ	370 UJ	403 UJ	380 UJ
INDENO(1,2,3-CD)PYRENE	46.0 U	50.1 UJ		49.6 UJ	46.0 UJ	50.1 UJ	47.2 UJ
ISODRIN	739 U	805 UJ		799 UJ	739 UJ	805 UJ	759 UJ
ISOPHORONE	53.9 U	58.7 UJ		58.2 UJ	53.9 UJ	58.7 UJ	55.3 UJ
ISOSAFROLE	370 U	403 UJ		399 UJ	370 UJ	403 UJ	380 UJ
KEPONE	739 UR	805 UR		799 UR	739 UR	805 UR	759 UR
METHAPYRILENE	3700 U	4030 UJ		3990 UJ	3700 UJ	4030 UJ	3800 UJ
METHYL METHANESULFONATE	554 U	604 UJ		599 UJ	554 UJ	604 UJ	569 UJ
N-NITROSO-DI-N-PROPYLAMINE	63.6 U	69.3 UJ		68.8 UJ	63.6 UJ	69.3 UJ	65.3 UJ
N-NITROSODI-N-BUTYLAMINE	370 U	403 UJ		399 UJ	370 UJ	403 UJ	380 UJ
N-NITROSODIETHYLAMINE	739 U	805 UJ		799 UJ	739 UJ	805 UJ	759 UJ
N-NITROSODIMETHYLAMINE	55.7 U	60.6 UJ		60.2 UJ	55.7 UJ	60.6 UJ	57.2 UJ
N-NITROSODIPHENYLAMINE	37.3 U	40.6 UJ		40.3 UJ	37.3 UJ	40.6 UJ	38.3 UJ
N-NITROSOMETHYLETHYLAMINE	370 U	403 UJ		399 UJ	370 UJ	403 UJ	380 UJ
N-NITROSOMORPHOLINE	370 U	403 UJ		399 UJ	370 UJ	403 UJ	380 UJ
N-NITROSOPIPERIDINE	739 U	805 UJ		799 UJ	739 UJ	805 UJ	759 UJ
N-NITROSOPYRROLIDINE	370 U	403 UJ		399 UJ	370 UJ	403 UJ	380 UJ
NAPHTHALENE	34.2 U	37.2 UJ		36.9 UJ	34.2 UJ	37.2 UJ	35.1 UJ
NITROBENZENE	50.4 U	54.9 UJ		54.4 UJ	50.4 UJ	54.9 UJ	51.7 UJ
O,O,O-TRIETHYLPHOSPHOROTHIOATE	370 U	403 UJ		399 UJ	370 UJ	403 UJ	380 UJ
O,O-DIETHYL-O-2-PYRAZINYLPHOSPHOROT	370 U	403 UJ		399 UJ	370 UJ	403 UJ	380 UJ
O-TOLUIDINE	370 U	403 UJ		399 UJ	370 UJ	403 UJ	380 UJ
P-DIMETHYLAMINOAZOBENZENE	370 U	403 UJ		399 UJ	370 UJ	403 UJ	380 UJ
P-PHENYLENEDIAMINE	370 U	403 UJ		399 UJ	370 UJ	403 UJ	380 UJ
PENTACHLOROBENZENE	370 U	403 UJ		399 UJ	370 UJ	403 UJ	380 UJ
PENTACHLORONITROBENZENE	370 U	403 UJ		399 UJ	370 UJ	403 UJ	380 UJ
PENTACHLOROPHENOL	118 U	128 UJ		127 UJ	118 UJ	128 UJ	121 UJ
PHENACETIN	739 U	805 UJ		799 UJ	739 UJ	805 UJ	759 UJ
PHENANTHRENE	41.8 U	45.5 UJ		45.1 UJ	41.8 UJ	45.5 UJ	42.9 UJ
PHENOL	153 U	167 UJ		166 UJ	153 UJ	167 UJ	157 UJ
PHORATE	370 U	403 UJ		399 UJ	370 UR	403 UR	380 UR

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SAMPLE NUMBER:	S26-SB01-02	S26-SB02-001	FD07	S26-SB02-002	S26-SB03-001	S26-SB03-002	S26-SB04-001
DEPTH (feet):	6 - 10	0 - 2	0 - 2	6 - 10	0 - 2	8 - 10	0 - 2
LOCATION:	SB01	SB02	SB02	SB02	SB03	SB03	SB04
SAMPLE DATE:	9/18/95	9/21/95	9/21/95	9/21/95	9/23/95	9/23/95	9/24/95
SEMIVOLATILES (UG/KG)							
PRONAMIDE	370 U	403 UJ		399 UJ	370 UJ	403 UJ	380 UJ
PYRENE	92.2 U	100 UJ		99.6 UJ	92.2 UJ	100 UJ	94.7 UJ
PYRIDINE	370 U	403 UJ		399 UJ	370 UJ	403 UJ	380 UJ
SAFROLE	370 U	403 UJ		399 UJ	370 UJ	403 UJ	380 UJ
PESTICIDES/PCBs (UG/KG)							
AROCLOR-1016	18.8 U	20.4 U	20.8 U	20.3 U	18.8 U	20.4 U	19.3 U
AROCLOR-1221	18.8 U	20.4 U	20.8 U	20.3 U	18.8 U	20.4 U	19.3 U
AROCLOR-1232	18.8 U	20.4 U	20.8 U	20.3 U	18.8 U	20.4 U	19.3 U
AROCLOR-1242	24.4 U	26.6 U	27.0 U	26.4 U	24.4 U	26.6 U	25.0 U
AROCLOR-1248	37.5 U	40.9 U	41.5 U	40.5 U	37.5 U	40.9 U	38.5 U
AROCLOR-1254	37.5 U	40.9 U	41.5 U	40.5 U	37.5 U	40.9 U	38.5 U
AROCLOR-1260	37.5 U	40.9 U	41.5 U	40.5 U	37.5 U	40.9 U	38.5 U
EXPLOSIVES (UG/KG)							
1,3 DINITROBENZENE	37.2 U	37.2 U			37.2 U		37.2 U
1,3,5 TRINITROBENZENE	40.2 U	40.2 U			40.2 U		40.2 U
2,4 DINITROTOLUENE	51.6 U	51.6 U			51.6 U		51.6 U
2,4,6-TRINITROTOLUENE	35.6 U	35.6 U			35.6 U		35.6 U
2,6 DINITROTOLUENE	47.6 U	47.6 U			47.6 U		47.6 U
2-AMINO-4,6-DINITROTOLUENE	46.7 U	46.7 U			46.7 U		46.7 U
2-NITROTOLUENE	81.4 U	81.4 U			81.4 U		81.4 U
3-NITROTOLUENE	81.7 U	81.7 U			81.7 U		81.7 U
4-AMINO-2,6-DINITROTOLUENE	40.8 U	40.8 U			40.8 U		40.8 U
4-NITROTOLUENE	87.2 U	87.2 U			87.2 U		87.2 U
HMX	70.5 U	70.5 U			70.5 U		70.5 U
NITRO-BENZENE	35.2 U	35.2 U			35.2 U		35.2 U
NITROCELLULOSE	6.0 U	8.5 U			16.2 UL		15.1 UL
NITROGLYCERIN	10000 U	10000 U			10000 U		10000 U
NITROGUANIDINE	63.0 U	63.0 U			63.0 U		63.0 U
PENTAERYTHRITOL TETRANITRATE	250 U	250 U			250 U		250 U
RDX	50.9 U	50.9 U			50.9 U		50.9 U
TETRYL	163 U	163 U			163 U		163 U
INORGANICS (MG/KG)							
ALUMINUM	2450	12500		11100	9970 J	3730 J	5540 J

Summary of Soil Analytical Results - SWMU 26
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SAMPLE NUMBER:	S26-SB01-02	S26-SB02-001	FD07	S26-SB02-002	S26-SB03-001	S26-SB03-002	S26-SB04-001
DEPTH (feet):	6 - 10	0 - 2	0 - 2	6 - 10	0 - 2	8 - 10	0 - 2
LOCATION:	SB01	SB02	SB02	SB02	SB03	SB03	SB04
SAMPLE DATE:	9/18/95	9/21/95	9/21/95	9/21/95	9/23/95	9/23/95	9/24/95
INORGANICS (MG/KG)							
ANTIMONY	0.19 UL	0.21 UL		0.45 L	0.19 UL	0.21 UL	0.20 UL
ARSENIC	1.3 K	3.1 L		2.2 L	4.7 L	3.5 L	4.3
BARIUM	14.7	42.9		75.5	61.5	15.3	46.2
BERYLLIUM	0.23	0.46		0.70	0.49 L	0.13	0.44
CADMIUM	0.56 UL	0.61 UL		0.60 UL	0.56 U	0.61 U	0.57 UL
CALCIUM	219 K	316 K		245 K	438	44.9	1110 J
CHROMIUM	12.2 J	15.7		13.9	16.1	6.1	14.6
COBALT	5.1	3.3		8.6	11.8	1.7 U	13.4
COPPER	5.5 L	7.5		8.4	5.5 L	3.3	4.5 L
CYANIDE	1.1 U	1.2 U		1.3	1.1 U	1.2 U	1.2 U
IRON	7650 J	33100		11200	17800 J	5840 J	12300
LEAD	4.6 L	11.0 J		10.5 J	95.7 J	5.5 J	10.0
MAGNESIUM	380 K	807 K		1920	1040 J	336 J	477 J
MANGANESE	76.1 J	30.7		70.9	265 J	14.0 J	1240 J
MERCURY	0.05 UL	0.09 L		0.06 UL	0.10	0.06 U	0.05 U
NICKEL	4.5 K	7.6 J		16.6	8.5	2.8	15.6
POTASSIUM	451	658		1130	1050	442	369
SELENIUM	0.17 U	0.30 B		0.18 U	0.19 B	0.18 U	0.17 U
SILVER	0.11 U	0.12 U		0.12 U	0.11 U	0.12 U	3.0
SODIUM	103 B	41.5		182	44.3	28.1	20.7 U
THALLIUM	0.28 U	0.30 U		0.30 U	0.28 U	0.31 U	0.29 U
TIN	4.5 UL	4.9 UJ		4.8 UJ	4.5 UJ	4.9 UJ	4.6 UJ
VANADIUM	11.5	26.9		17.4	26.7	12.4 B	15.6
ZINC	9.7	28.6		47.3	66.2 J	8.0 J	19.3
TOTAL PETROLEUM HYDROCARBONS (MG/KG)							
TPH	28.1 U	34.4	30.9 U	30.2 U	27.9 UL	30.6 UL	48.5
INDICATOR PARAMETERS (MG/KG)							
AMMONIA	10.6 UL	22.0 L		16.4 L	70.6	25.7	53.3
NITRATE/NITRITE	0.527 U	0.75 UJ		0.87 UJ	3.0	2.6 U	2.3
TOTAL ORGANIC CARBON	658	3170		929	2380	495	3850

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Indian Head, Maryland

SAMPLE NUMBER: DEPTH (feet): LOCATION: SAMPLE DATE:	F008 0 - 2 SB04 9/24/95	S26-SB04-002 8 - 10 SB04 9/24/95	-	-	-	-	-
VOLATILES (UG/KG)							
1,1,1,2-TETRACHLOROETHANE	5.7 U	6.0 U					
1,1,1-TRICHLOROETHANE	0.19 U	1.3 B					
1,1,2,2-TETRACHLOROETHANE	0.60 U	0.64 U					
1,1,2-TRICHLOROETHANE	0.51 U	0.54 U					
1,1-DICHLOROETHANE	0.37 U	0.40 U					
1,1-DICHLOROETHENE	0.32 U	0.34 U					
1,2,3-TRICHLOROPROPANE	5.7 U	6.0 U					
1,2-DIBROMO-3-CHLOROPROPANE	113 U	121 U					
1,2-DIBROMOETHANE	5.7 U	6.0 U					
1,2-DICHLOROETHANE	5.7 U	6.0 U					
1,2-DICHLOROPROPANE	5.7 U	6.0 U					
1,4-DICHLORO-2-BUTENE	113 U	121 U					
1,4-DIOXANE	170 UR	181 UR					
2-BUTANONE	4.3 UR	4.6 UR					
2-HEXANONE	2.5 U	2.7 U					
4-METHYL-2-PENTANONE	1.7 U	1.8 U					
ACETONE	4.3 UJ	4.6 UJ					
ACETONITRILE	113 U	121 U					
ACROLEIN	13.0 U	13.9 U					
ACRYLONITRILE	5.7 U	6.0 U					
ALLYL CHLORIDE	5.7 U	6.0 U					
BENZENE	0.28 U	0.30 U					
BROMODICHLOROMETHANE	0.22 U	0.23 U					
BROMOFORM	3.0 U	3.2 U					
BROMOMETHANE	0.22 U	0.23 U					
CARBON DISULFIDE	1.3 U	1.4 U					
CARBON TETRACHLORIDE	0.14 U	0.15 U					
CHLOROBENZENE	0.41 U	0.43 U					
CHLOROETHANE	0.46 U	0.49 U					
CHLOROFORM	3.9	3.4					
CHLOROMETHANE	0.55 U	0.59 U					
CHLOROPRENE	5.7 UR	6.0 UR					
CIS-1,3-DICHLOROPROPENE	0.31 U	0.33 U					

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SAMPLE NUMBER: DEPTH (feet): LOCATION: SAMPLE DATE:	FD08 0 - 2 SB04 9/24/95	S26-SB04-002 8 - 10 SB04 9/24/95	-	-	-	-	-
VOLATILES (UG/KG)							
DIBROMOCHLOROMETHANE	0.25 U	0.27 U					
DIBROMOMETHANE	5.7 U	6.0 U					
DICHLORODIFLUOROMETHANE	0.24 U	0.25 U					
ETHYLBENZENE	1.5 U	1.6 U					
IODOMETHANE	5.7 U	6.0 U					
ISOBUTYL ALCOHOL	56.6 U	60.3 U					
METHACRYLONITRILE	5.7 U	6.0 U					
METHYL METHACRYLATE	5.7 U	6.0 U					
METHYLENE CHLORIDE	165 B	208 B					
PENTACHLOROETHANE	5.7 U	6.0 U					
PROPIONITRILE	56.6 U	60.3 U					
STYRENE	0.34 U	0.36 U					
TETRACHLOROETHENE	0.98 U	1.1 U					
TOLUENE	1.2 B	0.33 U					
TRANS-1,2-DICHLOROETHENE	0.32 U	0.34 U					
TRANS-1,3-DICHLOROPROPENE	0.55 U	0.59 U					
TRICHLOROETHENE	0.29 U	0.31 U					
TRICHLOROFLUOROMETHANE	0.33 U	0.35 U					
VINYL ACETATE	0.32 U	0.34 U					
VINYL CHLORIDE	0.37 U	0.40 U					
XYLENES, TOTAL	0.78 U	0.83 U					
SEMIVOLATILES (UG/KG)							
1,2,4,5-TETRACHLOROBENZENE	373 UJ	399 UJ					
1,2,4-TRICHLOROBENZENE	35.7 UJ	38.2 UJ					
1,3,5-TRINITROBENZENE	373 UJ	399 UJ					
1,3-DINITROBENZENE	373 UJ	399 UJ					
1,4-NAPHTHOQUINONE	373 UJ	399 UJ					
1-NAPHTHYLAMINE	373 UJ	399 UJ					
2,2'-OXYBIS(1-CHLOROPROPANE)	373 UJ	399 UJ					
2,3,4,6-TETRACHLOROPHENOL	373 UJ	399 UJ					
2,4,5-TRICHLOROPHENOL	52.4 UJ	56.1 UJ					
2,4,6-TRICHLOROPHENOL	72.3 UJ	77.4 UJ					
2,4-DICHLOROPHENOL	51.9 UJ	55.6 UJ					

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SAMPLE NUMBER: DEPTH (feet): LOCATION: SAMPLE DATE:	FD08 0 - 2 SB04 9/24/95	S26-SB04-002 8 - 10 SB04 9/24/95	- -	- -	- -	- -	- -
SEMIVOLATILES (UG/KG)							
2,4-DIMETHYLPHENOL	116 UJ	125 UJ					
2,4-DINITROPHENOL	183 UJ	196 UJ					
2,4-DINITROTOLUENE	25.4 UJ	27.2 UJ					
2,6-DICHLOROPHENOL	373 UJ	399 UJ					
2,6-DINITROTOLUENE	18.0 UJ	17.2 UJ					
2-ACETYLAMINOFLUORENE	373 UJ	399 UJ					
2-CHLORONAPHTHALENE	27.8 UJ	29.8 UJ					
2-CHLOROPHENOL	66.4 UJ	71.2 UJ					
2-METHYLNAPHTHALENE	45.0 UJ	48.2 UJ					
2-METHYLPHENOL	54.8 UJ	58.6 UJ					
2-NAPHTHYLAMINE	373 UJ	399 UJ					
2-NITROANILINE	57.8 UJ	61.9 UJ					
2-NITROPHENOL	66.4 UJ	71.1 UJ					
2-PICOLINE	373 UJ	399 UJ					
3,3'-DICHLOROBENZIDINE	365 UJ	391 UJ					
3,3'-DIMETHYLBENZIDINE	373 UJ	399 UJ					
3-METHYLCHOLANTHRENE	373 UJ	399 UJ					
3-METHYLPHENOL	373 UJ	399 UJ					
3-NITROANILINE	140 UJ	150 UJ					
4,6-DINITRO-2-METHYLPHENOL	64.3 UJ	68.8 UJ					
4-AMINOBIPHENYL	746 UJ	799 UJ					
4-BROMOPHENYL PHENYL ETHER	29.7 UJ	31.8 UJ					
4-CHLORO-3-METHYLPHENOL	59.2 UJ	63.4 UJ					
4-CHLOROANILINE	84.3 UJ	90.2 UJ					
4-CHLOROPHENYL PHENYL ETHER	22.4 UJ	24.0 UJ					
4-METHYLPHENOL	43.0 UJ	46.0 UJ					
4-NITROANILINE	65.9 UJ	70.6 UJ					
4-NITROPHENOL	131 UJ	140 UJ					
4-NITROQUINOLINE-1-OXIDE	1490 UR	1600 UR					
5-NITRO-O-TOLUIDINE	373 UJ	399 UJ					
7,12-DIMETHYLBENZ(A)ANTHRACENE	373 UJ	399 UJ					
A,A-DIMETHYLPHENETHYLAMINE	373 UJ	399 UJ					
ACENAPHTHENE	38.7 UJ	41.4 UJ					

Summary of Soil Analytical Results - SWMU 26
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER: DEPTH (feet): LOCATION: SAMPLE DATE:	FD08 0 - 2 SB04 9/24/95	S26 SB04-002 8 - 10 SB04 9/24/95	-	-	-	-	-
SEMIVOLATILES (UG/KG)							
ACENAPHTHYLENE	38.3 UJ	41.0 UJ					
ACETOPHENONE	373 UJ	399 UJ					
ANILINE	373 UJ	399 UJ					
ANTHRACENE	26.2 UJ	28.1 UJ					
ARAMITE	746 UJ	799 UJ					
BENZO(A)ANTHRACENE	13.6 UJ	14.6 UJ					
BENZO(A)PYRENE	16.9 UJ	18.1 UJ					
BENZO(B)FLUORANTHENE	50.3 UJ	53.9 UJ					
BENZO(G,H,I)PERYLENE	51.8 UJ	55.5 UJ					
BENZO(K)FLUORANTHENE	41.6 UJ	44.5 UJ					
BENZYL ALCOHOL	50.8 UJ	54.4 UJ					
BIS(2-CHLOROETHOXY)METHANE	52.9 UJ	56.7 UJ					
BIS(2-CHLOROETHYL)ETHER	80.0 UJ	85.7 UJ					
BIS(2-ETHYLHEXYL)PHTHALATE	72.9 UJ	78.1 UJ					
BUTYL BENZYL PHTHALATE	105 UJ	113 UJ					
CHLOROBENZILATE	373 UJ	399 UJ					
CHRYSENE	21.0 UJ	22.5 UJ					
DI-N-BUTYL PHTHALATE	61.8 UJ	66.2 UJ					
DI-N-OCTYL PHTHALATE	53.5 UJ	57.3 UJ					
DIALLATE	373 UR	399 UR					
DIBENZO(A,H)ANTHRACENE	42.8 UJ	45.9 UJ					
DIBENZOFURAN	28.7 UJ	30.8 UJ					
DIETHYL PHTHALATE	40.6 UJ	43.5 UJ					
DIMETHOATE	746 UJ	799 UJ					
DIMETHYL PHTHALATE	18.8 UJ	20.2 UJ					
DIPHENYLAMINE	373 UJ	399 UJ					
ETHYL METHACRYLATE	373 UJ	399 UJ					
FAMPHUR	746 UJ	799 UJ					
FLUORANTHENE	50.7 UJ	54.3 UJ					
FLUORENE	27.1 UJ	29.0 UJ					
HEXACHLOROBENZENE	22.2 UJ	23.8 UJ					
HEXACHLOROBUTADIENE	41.0 UJ	43.9 UJ					
HEXACHLOROCYCLOPENTADIENE	68.5 UJ	73.4 UJ					

Summary of Soil Analytical Results - SWMU 26
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER:	FD08	S26-SB04-002				
DEPTH (feet):	0 - 2	8 - 10	-	-	-	-
LOCATION:	SB04	SB04				
SAMPLE DATE:	9/24/95	9/24/95				
SEMIVOLATILES (UG/KG)						
HEXACHLOROETHANE	24.3 UJ	26.0 UJ				
HEXACHLOROPHENE	1860 UR	2000 UR				
HEXACHLOROPROPENE	373 UJ	399 UJ				
INDENO(1,2,3-CD)PYRENE	46.4 UJ	49.6 UJ				
ISODRIN	746 UJ	799 UJ				
ISOPHORONE	54.4 UJ	58.2 UJ				
ISOSAFROLE	373 UJ	399 UJ				
KEPONE	746 UR	799 UR				
METHAPYRILENE	3730 UJ	3990 UJ				
METHYL METHANESULFONATE	559 UJ	599 UJ				
N-NITROSO-DI-N-PROPYLAMINE	64.2 UJ	68.8 UJ				
N-NITROSODI-N-BUTYLAMINE	373 UJ	399 UJ				
N-NITROSODIETHYLAMINE	746 UJ	799 UJ				
N-NITROSODIMETHYLAMINE	56.2 UJ	60.2 UJ				
N-NITROSODIPHENYLAMINE	37.6 UJ	40.3 UJ				
N-NITROSOMETHYLETHYLAMINE	373 UJ	399 UJ				
N-NITROSOMORPHOLINE	373 UJ	399 UJ				
N-NITROSOPIPERIDINE	746 UJ	799 UJ				
N-NITROSOPYRROLIDINE	373 UJ	399 UJ				
NAPHTHALENE	34.5 UJ	36.9 UJ				
NITROBENZENE	50.8 UJ	54.4 UJ				
O,O,O-TRIETHYLPHOSPHOROTHIOATE	373 UJ	399 UJ				
O,O-DIETHYL-O-2-PYRAZINYLPHOSPHOROT	373 UJ	399 UJ				
O-TOLUIDINE	373 UJ	399 UJ				
P-DIMETHYLAMINOAZOBENZENE	373 UJ	399 UJ				
P-PHENYLENEDIAMINE	373 UJ	399 UJ				
PENTACHLOROBENZENE	373 UJ	399 UJ				
PENTACHLORONITROBENZENE	373 UJ	399 UJ				
PENTACHLOROPHENOL	119 UJ	127 UJ				
PHENACETIN	746 UJ	799 UJ				
PHENANTHRENE	42.1 UJ	45.1 UJ				
PHENOL	155 UJ	166 UJ				
PHORATE	373 UR	399 UR				

Summary of Soil Analytical Results - SWMU 26
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER:	FD08	S26 SB04-002					
DEPTH (feet):	0 - 2	8 - 10	-	-	-	-	-
LOCATION:	SB04	SB04					
SAMPLE DATE:	9/24/95	9/24/95					
SEMIVOLATILES (UG/KG)							
PRONAMIDE	373 UJ	399 UJ					
PYRENE	93.0 UJ	99.6 UJ					
PYRIDINE	373 UJ	399 UJ					
SAFROLE	373 UJ	399 UJ					
PESTICIDES/PCBs (UG/KG)							
AROCLOR-1016	18.9 U	20.3 U					
AROCLOR-1221	18.9 U	20.3 U					
AROCLOR-1232	18.9 U	20.3 U					
AROCLOR-1242	24.6 U	26.4 U					
AROCLOR-1248	37.8 U	40.5 U					
AROCLOR-1254	37.8 U	40.5 U					
AROCLOR-1260	37.8 U	40.5 U					
EXPLOSIVES (UG/KG)							
1,3 DINITROBENZENE	37.2 U						
1,3,5 TRINITROBENZENE	40.2 U						
2,4 DINITROTOLUENE	51.6 U						
2,4,6-TRINITROTOLUENE	35.6 U						
2,6 DINITROTOLUENE	47.6 U						
2-AMINO-4,6-DINITROTOLUENE	46.7 U						
2-NITROTOLUENE	81.4 U						
3-NITROTOLUENE	81.7 U						
4-AMINO-2,6-DINITROTOLUENE	40.8 U						
4-NITROTOLUENE	87.2 U						
HMX	70.5 U						
NITRO-BENZENE	35.2 U						
NITROCELLULOSE	16.9 UL						
NITROGLYCERIN	10000 U						
NITROGUANIDINE	63.0 U						
PENTAERYTHRITOL TETRANITRATE	250 U						
RDX	50.9 U						
TETRYL	163 U						
INORGANICS (MG/KG)							
ALUMINUM	5180 J	10400 J					

Summary of Soil Analytical Results - SWMU 26
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER: DEPTH (feet): LOCATION: SAMPLE DATE:	FD08 0 - 2 SB04 9/24/95	26-SB04-002 8 - 10 SB04 9/24/95	- - - -	- - - -	- - - -	- - - -	- - - -
INORGANICS (MG/KG)							
ANTIMONY	0.19 UL	0.21 UL					
ARSENIC	4.0	1.3					
BARIUM	48.8	31.4					
BERYLLIUM	0.42	0.30					
CADMIUM	0.57 UL	0.60 UL					
CALCIUM	1010 J	90.3 B					
CHROMIUM	9.7	18.0					
COBALT	14.3	2.2					
COPPER	4.3 L	8.7					
CYANIDE	1.1 U	1.2 U					
IRON	9900	13700					
LEAD	10.2	7.4					
MAGNESIUM	461 J	881 J					
MANGANESE	985 J	20.3					
MERCURY	0.06 B	0.06 B					
NICKEL	14.1	5.9 J					
POTASSIUM	363	1020					
SELENIUM	0.21 L	0.19					
SILVER	2.2	0.12 U					
SODIUM	20.4 U	34.8					
THALLIUM	0.28 U	0.30 U					
TIN	4.5 UJ	4.8 UJ					
VANADIUM	15.7	19.6					
ZINC	19.7	16.3					
TOTAL PETROLEUM HYDROCARBONS (MG/KG)							
TPH	28.3 U	30.2 U					
INDICATOR PARAMETERS (MG/KG)							
AMMONIA	51.7	11.4					
NITRATE/NITRITE	1.9	2.6					
TOTAL ORGANIC CARBON	3320	849					

Summary of Groundwater Analytical Results - SWMU 26
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER:	26MW01	FD10	26MW01-F	26MW02	26MW02-F	26MW03	26MW03-F
FILTERING:	Unfiltered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
LOCATION:	26MW01	26MW01	26MW01	26MW02	26MW02	26MW03	26MW03
SAMPLE DATE:	10/04/95	10/04/95	10/04/95	10/04/95	10/04/95	10/04/95	10/04/95
VOLATILES (UG/L)							
1,1,1,2-TETRACHLOROETHANE	5.0 U			5.0 UJ		5.0 U	
1,1,1-TRICHLOROETHANE	0.28 U			0.28 UJ		0.28 U	
1,1,2,2-TETRACHLOROETHANE	0.49 U			0.49 UJ		0.49 U	
1,1,2-TRICHLOROETHANE	0.28 U			0.28 UJ		0.28 U	
1,1-DICHLOROETHANE	0.29 U			0.29 UJ		0.29 U	
1,1-DICHLOROETHENE	0.37 U			0.37 UJ		0.37 U	
1,2,3-TRICHLOROPROPANE	5.0 U			5.0 UJ		5.0 U	
1,2-DIBROMO-3-CHLOROPROPANE	100 U			100 UJ		100 U	
1,2-DIBROMOETHANE	5.0 U			5.0 UJ		5.0 U	
1,2-DICHLOROETHANE	0.13 U			0.13 UJ		0.13 U	
1,2-DICHLOROPROPANE	0.23 U			0.23 UJ		0.23 U	
1,4-DICHLORO-2-BUTENE	100 U			100 UJ		100 U	
1,4-DIOXANE	150 UR			150 UR		150 UR	
2-BUTANONE	1.5 U			1.5 UR		1.5 U	
2-HEXANONE	0.67 U			0.67 UJ		0.67 U	
4-METHYL-2-PENTANONE	0.52 U			0.52 UJ		0.52 U	
ACETONE	2.9 UJ			1.5 B		2.9 UJ	
ACETONITRILE	100 U			100 UJ		100 U	
ACROLEIN	2.6 UR			2.6 UJ		2.6 UR	
ACRYLONITRILE	2.0 U			2.0 UJ		2.0 U	
ALLYL CHLORIDE	5.0 U			5.0 UJ		5.0 U	
BENZENE	0.14 U			0.14 UJ		0.14 U	
BROMODICHLOROMETHANE	0.16 U			0.16 UJ		0.16 U	
BROMOFORM	0.16 U			0.16 UJ		0.16 U	
BROMOMETHANE	0.41 U			0.41 UJ		0.41 U	
CARBON DISULFIDE	0.48 U			0.48 UJ		0.48 U	
CARBON TETRACHLORIDE	0.27 U			0.27 UJ		0.27 U	
CHLOROBENZENE	0.30 U			0.30 UJ		0.30 U	
CHLOROETHANE	0.49 U			0.49 UJ		0.49 U	
CHLOROFORM	0.18 U			0.18 UJ		3.1	
CHLOROMETHANE	0.32 U			0.32 UJ		0.32 U	
CHLOROPRENE	5.0 UR			5.0 UR		5.0 UR	
CIS-1,3-DICHLOROPROPENE	0.21 U			0.21 UJ		0.21 U	

Summary of Groundwater Analytical Results - SWMU 26
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER:	26MW01	FD10	26MW01-F	26MW02	26MW02-F	26MW03	26MW03-F
FILTERING:	Unfiltered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
LOCATION:	26MW01	26MW01	26MW01	26MW02	26MW02	26MW03	26MW03
SAMPLE DATE:	10/04/95	10/04/95	10/04/95	10/04/95	10/04/95	10/04/95	10/04/95
VOLATILES (UG/L)							
DIBROMOCHLOROMETHANE	0.18 U			0.18 UJ		0.18 U	
DIBROMOMETHANE	5.0 U			5.0 UJ		5.0 U	
DICHLORODIFLUOROMETHANE	2.6 U			2.6 UJ		2.6 U	
ETHYLBENZENE	0.23 U			0.23 UJ		0.23 U	
IODOMETHANE	5.0 U			5.0 UJ		5.0 U	
ISOBUTYL ALCOHOL	50.0 U			50.0 UJ		50.0 U	
METHACRYLONITRILE	5.0 U			5.0 UJ		5.0 U	
METHYL METHACRYLATE	5.0 U			5.0 UJ		5.0 U	
METHYLENE CHLORIDE	0.45 U			1.7 B		0.45 U	
PENTACHLOROETHANE	5.0 U			5.0 UJ		5.0 U	
PROPIONITRILE	50.0 UJ			50.0 UJ		50.0 UJ	
STYRENE	0.29 U			0.29 UJ		0.29 U	
TETRACHLOROETHENE	0.23 U			0.23 UJ		0.23 U	
TOLUENE	0.17 U			0.17 UJ		0.17 U	
TRANS-1,2-DICHLOROETHENE	0.31 U			0.31 UJ		0.31 U	
TRANS-1,3-DICHLOROPROPENE	0.28 U			0.28 UJ		0.28 U	
TRICHLOROETHENE	0.15 U			0.15 UJ		0.15 U	
TRICHLOROFLUOROMETHANE	0.44 U			0.44 UJ		0.44 U	
VINYL ACETATE	0.28 U			0.28 UJ		0.28 U	
VINYL CHLORIDE	0.56 U			0.56 UJ		0.56 U	
XYLENES, TOTAL	0.24 U			0.24 UJ		0.24 U	
SEMIVOLATILES (UG/L)							
1,2,4,5-TETRACHLOROBENZENE	16.7 U			12.5 UJ		20.0 U	
1,2,4-TRICHLOROBENZENE	3.7 U			2.8 UJ		4.5 U	
1,3,5-TRINITROBENZENE	16.7 U			12.5 UJ		20.0 U	
1,3-DINITROBENZENE	16.7 U			12.5 UJ		20.0 U	
1,4-NAPHTHOQUINONE	16.7 U			12.5 UJ		20.0 U	
1-NAPHTHYLAMINE	16.7 U			12.5 UJ		20.0 U	
2,2'-OXYBIS(1-CHLOROPROPANE)	16.7 U			12.5 UJ		20.0 U	
2,3,4,6-TETRACHLOROPHENOL	16.7 U			12.5 UJ		20.0 U	
2,4,5-TRICHLOROPHENOL	1.4 U			1.0 UJ		1.7 U	
2,4,6-TRICHLOROPHENOL	3.7 U			2.8 UJ		4.4 U	
2,4-DICHLOROPHENOL	3.2 U			2.4 UJ		3.8 U	

Summary of Groundwater Analytical Results - SWMU 26
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER:	26MW01	FD10	26MW01-F	26MW02	26MW02-F	26MW03	26MW03-F
FILTERING:	Unfiltered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
LOCATION:	26MW01	26MW01	26MW01	26MW02	26MW02	26MW03	26MW03
SAMPLE DATE:	10/04/95	10/04/95	10/04/95	10/04/95	10/04/95	10/04/95	10/04/95
SEMIVOLATILES (UG/L)							
2,4-DIMETHYLPHENOL	11.4 U			8.5 UJ		13.6 U	
2,4-DINITROPHENOL	3.6 U			2.8 UJ		4.5 U	
2,4-DINITROTOLUENE	1.5 U			1.1 UJ		1.8 U	
2,6-DICHLOROPHENOL	16.7 U			12.5 UJ		20.0 U	
2,6-DINITROTOLUENE	1.8 U			1.4 UJ		2.2 U	
2-ACETYLAMINOFLUORENE	33.4 U			25.0 UJ		40.0 U	
2-CHLORONAPHTHALENE	2.8 U			2.1 UJ		3.3 U	
2-CHLOROPHENOL	2.2 U			1.7 UJ		2.6 U	
2-METHYLNAPHTHALENE	3.6 U			2.7 UJ		4.3 U	
2-METHYLPHENOL	2.0 U			1.5 UJ		2.4 U	
2-NAPHTHYLAMINE	16.7 U			12.5 UJ		20.0 U	
2-NITROANILINE	2.4 U			1.8 UJ		2.9 U	
2-NITROPHENOL	2.5 U			1.8 UJ		2.9 U	
2-PICOLINE	16.7 U			12.5 UJ		20.0 U	
3,3'-DICHLOROBENZIDINE	16.5 U			12.4 UJ		19.8 U	
3,3'-DIMETHYLBENZIDINE	16.7 U			12.5 UJ		20.0 U	
3-METHYLCHOLANTHRENE	16.7 U			12.5 UJ		20.0 U	
3-METHYLPHENOL	16.7 U			12.5 UJ		20.0 U	
3-NITROANILINE	6.9 UJ			5.2 UJ		8.3 UJ	
4,6-DINITRO-2-METHYLPHENOL	8.5 U			6.4 UJ		10.2 U	
4-AMINOBIPHENYL	33.4 U			25.0 UJ		40.0 U	
4-BROMOPHENYL PHENYL ETHER	2.0 U			1.5 UJ		2.4 U	
4-CHLORO-3-METHYLPHENOL	3.8 U			2.9 UJ		4.6 U	
4-CHLOROANILINE	1.1 U			0.81 UJ		1.3 U	
4-CHLOROPHENYL PHENYL ETHER	2.1 U			1.6 UJ		2.5 U	
4-METHYLPHENOL	1.9 U			1.4 UJ		2.2 U	
4-NITROANILINE	6.2 U			4.7 UJ		7.4 U	
4-NITROPHENOL	4.3 U			3.2 UJ		5.1 UJ	
4-NITROQUINOLINE-1-OXIDE	66.8 UR			50.0 UR		80.0 UR	
5-NITRO-O-TOLUIDINE	16.7 U			12.5 UJ		20.0 U	
7,12-DIMETHYLBENZ(A)ANTHRACENE	16.7 U			12.5 UJ		20.0 U	
A,A-DIMETHYLPHENETHYLAMINE	16.7 U			12.5 UJ		20.0 U	
ACENAPHTHENE	2.3 U			1.7 UJ		2.7 U	

Summary of Groundwater Analytical Results - SWMU 26
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER:	26MW01	FD10	26MW01-F	26MW02	26MW02 F	26MW03	26MW03 F
FILTERING:	Unfiltered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
LOCATION:	26MW01	26MW01	26MW01	26MW02	26MW02	26MW03	26MW03
SAMPLE DATE:	10/04/95	10/04/95	10/04/95	10/04/95	10/04/95	10/04/95	10/04/95
SEMIVOLATILES (UG/L)							
ACENAPHTHYLENE	2.4 U			1.8 UJ		2.8 U	
ACETOPHENONE	16.7 U			12.5 UJ		20.0 U	
ANILINE	16.7 U			12.5 UJ		20.0 U	
ANTHRACENE	2.1 U			1.6 UJ		2.5 U	
ARAMITE	33.4 U			25.0 UJ		40.0 U	
BENZO(A)ANTHRACENE	2.1 U			1.6 UJ		2.5 U	
BENZO(A)PYRENE	1.7 U			1.2 UJ		2.0 U	
BENZO(B)FLUORANTHENE	1.4 U			1.1 UJ		1.7 U	
BENZO(G,H,I)PERYLENE	6.1 U			4.6 UJ		7.3 U	
BENZO(K)FLUORANTHENE	2.9 U			2.2 UJ		3.5 U	
BENZYL ALCOHOL	3.7 U			2.8 UJ		4.5 U	
BIS(2-CHLOROETHOXY)METHANE	2.0 U			1.5 UJ		2.4 U	
BIS(2-CHLOROETHYL)ETHER	1.4 U			1.0 UJ		1.6 U	
BIS(2-ETHYLHEXYL)PHTHALATE	4.5 U			3.4 UJ		5.4 U	
BUTYL BENZYL PHTHALATE	7.6 U			5.7 UJ		9.1 U	
CHLOROBENZILATE	16.7 U			12.5 UJ		20.0 U	
CHRYSENE	2.0 U			1.5 UJ		2.4 U	
DI-N-BUTYL PHTHALATE	2.0 U			1.5 UJ		2.4 U	
DI-N-OCTYL PHTHALATE	2.9 U			2.2 UJ		3.5 U	
DIALLATE	16.7 UR			12.5 UR		20.0 UR	
DIBENZO(A,H)ANTHRACENE	2.1 U			1.6 UJ		2.5 U	
DIBENZOFURAN	2.4 U			1.8 UJ		2.8 U	
DIETHYL PHTHALATE	0.65 U			0.49 UJ		0.78 U	
DIMETHOATE	33.4 U			25.0 UJ		40.0 U	
DIMETHYL PHTHALATE	0.12 U			0.09 UJ		0.14 U	
DIPHENYLAMINE	16.7 U			12.5 UJ		20.0 U	
ETHYL METHACRYLATE	16.7 U			12.5 UJ		20.0 U	
FAMPHUR	33.4 UJ			25.0 UR		40.0 UJ	
FLUORANTHENE	2.5 U			1.8 UJ		2.9 U	
FLUORENE	2.6 U			2.0 UJ		3.1 U	
HEXACHLOROBENZENE	1.3 U			0.96 UJ		1.5 U	
HEXACHLOROBUTADIENE	3.9 U			2.9 UJ		4.7 U	
HEXACHLOROCYCLOPENTADIENE	1.6 U			1.2 UJ		1.9 U	

Summary of Groundwater Analytical Results - SWMU 26
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER: FILTERING: LOCATION: SAMPLE DATE:	26MW01 Unfiltered 26MW01 10/04/95	FD10 Unfiltered 26MW01 10/04/95	26MW01-F Filtered 26MW01 10/04/95	26MW02 Unfiltered 26MW02 10/04/95	26MW02-F Filtered 26MW02 10/04/95	26MW03 Unfiltered 26MW03 10/04/95	26MW03-F Filtered 26MW03 10/04/95
SEMIVOLATILES (UG/L)							
HEXACHLOROETHANE	3.1 U			2.3 UJ		3.7 U	
HEXACHLOROPHENE	83.5 UR			62.5 UR		100 UR	
HEXACHLOROPROPENE	16.7 U			12.5 UJ		20.0 U	
INDENO(1,2,3-CD)PYRENE	2.2 U			1.7 UJ		2.6 U	
ISODRIN	33.4 U			25.0 UJ		40.0 U	
ISOPHORONE	1.9 U			1.4 UJ		2.2 U	
ISOSAFROLE	16.7 U			12.5 UJ		20.0 U	
KEPONE	33.4 UR			25.0 UR		40.0 UR	
METHAPYRILENE	167 U			125 UJ		200 U	
METHYL METHANESULFONATE	25.0 U			18.8 UJ		30.0 U	
N-NITROSO-DI-N-PROPYLAMINE	2.9 U			2.2 UJ		3.5 U	
N-NITROSODI-N-BUTYLAMINE	16.7 U			12.5 UJ		20.0 U	
N-NITROSODIETHYLAMINE	33.4 U			25.0 UJ		40.0 U	
N-NITROSODIMETHYLAMINE	5.4 U			4.0 UJ		6.4 U	
N-NITROSODIPHENYLAMINE	2.4 U			1.8 UJ		2.9 U	
N-NITROSOMETHYLETHYLAMINE	16.7 U			12.5 UJ		20.0 U	
N-NITROSOMORPHOLINE	16.7 U			12.5 UJ		20.0 U	
N-NITROSOPIPERIDINE	33.4 U			25.0 UJ		40.0 U	
N-NITROSOPYRROLIDINE	16.7 U			12.5 UJ		20.0 U	
NAPHTHALENE	2.6 U			1.9 UJ		3.1 U	
NITROBENZENE	2.2 U			1.6 UJ		2.6 U	
O,O,O-TRIETHYLPHOSPHOROTHIOATE	16.7 U			12.5 UJ		20.0 U	
O,O-DIETHYL-O-2-PYRAZINYLPHOSPHOROT	16.7 U			12.5 UJ		20.0 U	
O-TOLUIDINE	16.7 U			12.5 UJ		20.0 U	
P-DIMETHYLAMINOAZOBENZENE	16.7 U			12.5 UJ		20.0 U	
P-PHENYLENEDIAMINE	16.7 U			12.5 UJ		20.0 U	
PENTACHLOROBENZENE	16.7 U			12.5 UJ		20.0 U	
PENTACHLORONITROBENZENE	33.4 U			25.0 UJ		40.0 U	
PENTACHLOROPHENOL	3.6 U			2.7 UJ		4.4 U	
PHENACETIN	33.4 U			25.0 UJ		40.0 U	
PHENANTHRENE	2.6 U			1.9 UJ		3.1 U	
PHENOL	3.5 U			2.6 UJ		4.2 U	
PHORATE	16.7 UR			12.5 UJ		20.0 UR	

Summary of Groundwater Analytical Results - SWMU 26
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER:	26MW01	FD10	26MW01-F	26MW02	26MW02-F	26MW03	26MW03-F
FILTERING:	Unfiltered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
LOCATION:	26MW01	26MW01	26MW01	26MW02	26MW02	26MW03	26MW03
SAMPLE DATE:	10/04/95	10/04/95	10/04/95	10/04/95	10/04/95	10/04/95	10/04/95
SEMIVOLATILES (UG/L)							
PRONAMIDE	16.7 U			12.5 UJ		20.0 U	
PYRENE	2.6 U			2.0 UJ		3.1 U	
PYRIDINE	16.7 U			12.5 UJ		20.0 U	
SAFROLE	16.7 U			12.5 UJ		20.0 U	
PESTICIDES/PCBs (UG/L)							
AROCLOR-1016	0.84 U	0.53 U		0.62 U		0.53 U	
AROCLOR-1221	0.84 U	0.53 U		0.62 U		0.53 U	
AROCLOR-1232	0.84 U	0.53 U		0.62 U		0.53 U	
AROCLOR-1242	1.1 U	0.68 U		0.80 U		0.68 U	
AROCLOR-1248	1.7 U	1.1 U		1.2 U		1.1 U	
AROCLOR-1254	1.7 U	1.1 U		1.2 U		1.1 U	
AROCLOR-1260	1.7 U	1.1 U		1.2 U		1.1 U	
EXPLOSIVES (UG/L)							
1,3 DINITROBENZENE	0.40 U			0.51 U		0.37 UJ	
1,3,5 TRINITROBENZENE	0.40 U			0.51 U		0.37 UJ	
2,4 DINITROTOLUENE	0.40 U			0.51 U		0.37 UJ	
2,4,6-TRINITROTOLUENE	0.40 U			0.51 U		0.37 UJ	
2,6 DINITROTOLUENE	0.40 U			0.51 U		0.37 UJ	
2-AMINO-4,6-DINITROTOLUENE	0.40 U			0.51 U		0.37 UJ	
2-NITROTOLUENE	0.79 U			1.0 U		0.74 UJ	
3-NITROTOLUENE	0.79 U			1.0 U		0.74 UJ	
4-AMINO-2,6-DINITROTOLUENE	0.40 U			0.51 U		0.37 UJ	
4-NITROTOLUENE	0.79 U			1.0 U		0.74 UJ	
HMX	0.79 U			1.0 U		0.74 UJ	
NITRO-BENZENE	0.40 U			0.51 U		0.37 UJ	
NITROCELLULOSE	0.36 UL			0.18 UL		0.18 UL	
NITROGLYCERIN	15.8 U			20.3 U		14.8 UJ	
NITROGUANIDINE	5.0 U			5.0 U		5.0 U	
PENTAERYTHRITOL TETRANITRATE	0.40 U			0.51 U		0.37 UJ	
RDX	0.79 U			1.0 U		0.74 UJ	
TETRYL	0.79 U			1.0 U		0.74 UJ	
INORGANICS (UG/L)							
ALUMINUM	1790 J		110 UL	5660 J	110 UL	11100 J	110 UL

Summary of Groundwater Analytical Results - SWMU 26
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Indian Head, Maryland

SAMPLE NUMBER:	26MW01	FD10	26MW01-F	26MW02	26MW02-F	26MW03	26MW03-F
FILTERING:	Unfiltered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
LOCATION:	26MW01	26MW01	26MW01	26MW02	26MW02	26MW03	26MW03
SAMPLE DATE:	10/04/95	10/04/95	10/04/95	10/04/95	10/04/95	10/04/95	10/04/95
INORGANICS (UG/L)							
ANTIMONY	1.7 U		1.7 U	1.7 U	1.7 U	1.7 U	1.7 U
ARSENIC	2.1 L		1.9 U	1.9 UL	2.0	1.9 UL	1.9 U
BARIUM	89.6		68.8	89.7	23.6	140	14.0 U
BERYLLIUM	0.90 U		0.90 U	0.90 U	0.90 U	0.90 U	0.90 U
CADMIUM	5.0 UL		5.0 UL	5.0 UL	5.0 UL	5.0 UL	5.0 UL
CALCIUM	4830 K		5200 K	5180 K	5010 K	3580 K	1980 K
CHROMIUM	10.0 UL		10.0 UL	10.0 UL	10.0 UL	14.8 L	10.0 UL
COBALT	17.6		22.0	17.8	16.2	15.6	14.0 U
COPPER	15.0 U		15.0 U	15.4	15.0 U	16.3	15.0 U
CYANIDE	5.0 U			5.0 U		5.0 U	
IRON	6120		47.0 U	14200	305	22100	47.0 U
LEAD	2.4 B		0.60 U	5.4 B	0.60 U	10.3 B	0.60 U
MAGNESIUM	4000 K		4270 K	3810 K	3440 K	2920 K	892 K
MANGANESE	297		340	1090	1160	328	106
MERCURY	0.10 B		0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
NICKEL	34.0 B		18.5 B	59.2 B	31.0 B	30.9 B	17.0 U
POTASSIUM	2010		2020	2240	1800	3640	1040
SELENIUM	1.5 U		1.5 U	1.5 U	1.5 U	1.5 U	1.5 U
SILVER	1.0 U		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
SODIUM	46200		48400	10800	11600	9120	10900
THALLIUM	2.5 UJ		2.5 U	2.5 UJ	2.5 U	2.5 UJ	2.5 U
TIN	33.6 U		33.6 U	33.6 U	33.6 U	33.6 U	33.6 U
VANADIUM	22.0 U		22.0 U	28.4	22.0 U	37.4	22.0 U
ZINC	37.0 B		28.8	74.6 B	36.7	70.1 B	6.0 U
TOTAL PETROLEUM HYDROCARBONS (MG/L)							
TPH	0.53 U	0.55 U		0.57 U		0.52 U	
INDICATOR PARAMETERS (MG/L)							
AMMONIA	0.22			0.21		0.60	
NITRATE/NITRITE	0.09 L			1.7 L		0.73 L	
PHOSPHORUS	0.06			0.03		0.21	
SULFATE	6.9 L			6.9 L		1.6 L	
TOTAL KJELDAHL NITROGEN	0.24 L			0.22 L		0.60 L	
TOTAL ORGANIC CARBON	3.7			1.0 U		4.3	

Summary of Groundwater Analytical Results - SWMU 26
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SAMPLE NUMBER:	26MW01	FD10	26MW01-F	26MW02	26MW02-F	26MW03	26MW03-F
FILTERING:	Unfiltered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
LOCATION:	26MW01	26MW01	26MW01	26MW02	26MW02	26MW03	26MW03
SAMPLE DATE:	10/04/95	10/04/95	10/04/95	10/04/95	10/04/95	10/04/95	10/04/95
INDICATOR PARAMETERS (MG/L)							
TOTAL ORGANIC HALIDES (UG/L)	22.0 L			10.0 UR		11.8 L	

Summary of Soil Analytical Results - SWMU 27
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER: DEPTH (feet): LOCATION: SAMPLE DATE:	S27-SS-001 0 - 2 SS-001 9/18/95	S27-SS-002 0 - 2 SS-002 9/18/95	-	-	-	-	-
VOLATILES (UG/KG)							
1,1,1,2-TETRACHLOROETHANE	6.1 UJ	6.2 UJ					
1,1,1-TRICHLOROETHANE	0.21 UJ	0.21 U					
1,1,2,2-TETRACHLOROETHANE	0.64 UJ	0.66 UJ					
1,1,2-TRICHLOROETHANE	0.55 UJ	0.56 U					
1,1-DICHLOROETHANE	0.40 UJ	0.41 U					
1,1-DICHLOROETHENE	0.34 UJ	0.35 U					
1,2,3-TRICHLOROPROPANE	6.1 UJ	6.2 UJ					
1,2-DIBROMO-3-CHLOROPROPANE	121 UJ	124 UJ					
1,2-DIBROMOETHANE	6.1 UJ	6.2 U					
1,2-DICHLOROETHANE	6.1 UJ	6.2 U					
1,2-DICHLOROPROPANE	6.1 UJ	6.2 U					
1,4-DICHLORO-2-BUTENE	121 UJ	124 UJ					
1,4-DIOXANE	182 UR	186 UR					
2-BUTANONE	4.6 UJ	4.7 UJ					
2-HEXANONE	2.7 UJ	2.8 UJ					
4-METHYL-2-PENTANONE	1.8 UJ	1.9 UJ					
ACETONE	20.2 B	14.7 B					
ACETONITRILE	121 UJ	124 U					
ACROLEIN	14.0 UJ	14.3 U					
ACRYLONITRILE	6.1 UJ	6.2 U					
ALLYL CHLORIDE	6.1 UJ	6.2 U					
BENZENE	0.30 UJ	0.31 U					
BROMODICHLOROMETHANE	0.23 UJ	0.24 U					
BROMOFORM	3.2 UJ	3.3 U					
BROMOMETHANE	0.23 UJ	0.24 U					
CARBON DISULFIDE	1.4 UJ	1.5 U					
CARBON TETRACHLORIDE	0.15 UJ	0.15 U					
CHLOROBENZENE	0.44 UJ	0.45 UJ					
CHLOROETHANE	0.50 UJ	0.51 U					
CHLOROFORM	0.45 UJ	0.46 U					
CHLOROMETHANE	0.59 UJ	0.61 U					
CHLOROPRENE	6.1 UR	6.2 UR					
CIS-1,3-DICHLOROPROPENE	0.33 UJ	0.34 U					

Summary of Soil Analytical Results - SWMU 27
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER: DEPTH (feet): LOCATION: SAMPLE DATE:	S27-SS-001 0 - 2 SS-001 9/18/95	S27-SS-002 0 - 2 SS-002 9/18/95	-	-	-	-	-
VOLATILES (UG/KG)							
DIBROMOCHLOROMETHANE	0.27 UJ	0.27 UJ					
DIBROMOMETHANE	6.1 UJ	6.2 U					
DICHLORODIFLUOROMETHANE	0.25 UJ	0.26 U					
ETHYLBENZENE	1.7 UJ	1.7 UJ					
IODOMETHANE	6.1 UJ	6.2 U					
ISOBUTYL ALCOHOL	60.6 UJ	62.1 U					
METHACRYLONITRILE	6.1 UJ	6.2 U					
METHYL METHACRYLATE	6.1 UJ	6.2 U					
METHYLENE CHLORIDE	69.7 J	192 J					
PENTACHLOROETHANE	6.1 UJ	6.2 UJ					
PROPIONITRILE	60.6 UJ	62.1 UJ					
STYRENE	0.36 UJ	0.37 UJ					
TETRACHLOROETHENE	1.1 UJ	1.1 UJ					
TOLUENE	19.4 J	32.1 J					
TRANS-1,2-DICHLOROETHENE	0.34 UJ	0.35 U					
TRANS-1,3-DICHLOROPROPENE	0.59 UJ	0.61 U					
TRICHLOROETHENE	0.32 UJ	0.32 U					
TRICHLOROFLUOROMETHANE	0.35 UJ	0.36 U					
VINYL ACETATE	0.34 UJ	0.35 U					
VINYL CHLORIDE	0.40 UJ	0.41 U					
XYLENES, TOTAL	0.84 UJ	0.86 UJ					
SEMIVOLATILES (UG/KG)							
1,2,4,5-TETRACHLOROBENZENE	399 U	409 U					
1,2,4-TRICHLOROBENZENE	38.2 U	39.2 U					
1,3,5-TRINITROBENZENE	399 U	409 U					
1,3-DINITROBENZENE	399 U	409 U					
1,4-NAPHTHOQUINONE	399 U	409 U					
1-NAPHTHYLAMINE	399 U	409 U					
2,2'-OXYBIS(1-CHLOROPROPANE)	399 U	409 U					
2,3,4,6-TETRACHLOROPHENOL	399 U	409 U					
2,4,5-TRICHLOROPHENOL	56.1 U	57.5 U					
2,4,6-TRICHLOROPHENOL	77.4 U	79.3 U					
2,4-DICHLOROPHENOL	55.6 U	56.9 U					

Summary of Soil Analytical Results - SWMU 27
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Indian Head, Maryland

SAMPLE NUMBER: DEPTH (feet): LOCATION: SAMPLE DATE:	S27-SS-001 0 - 2 SS-001 9/18/95	S27-SS-002 0 - 2 SS-002 9/18/95	-	-	-	-	-
SEMIVOLATILES (UG/KG)							
2,4-DIMETHYLPHENOL	125 U	128 U					
2,4-DINITROPHENOL	196 U	201 U					
2,4-DINITROTOLUENE	27.2 U	27.9 U					
2,6-DICHLOROPHENOL	399 U	409 U					
2,6-DINITROTOLUENE	17.2 U	17.6 U					
2-ACETYLAMINOFLUORENE	399 U	409 U					
2-CHLORONAPHTHALENE	29.8 U	30.5 U					
2-CHLOROPHENOL	71.2 U	72.9 U					
2-METHYLNAPHTHALENE	48.2 U	49.4 U					
2-METHYLPHENOL	58.6 U	60.1 U					
2-NAPHTHYLAMINE	399 U	409 U					
2-NITROANILINE	61.9 U	63.4 U					
2-NITROPHENOL	71.1 U	72.9 U					
2-PICOLINE	399 U	409 U					
3,3'-DICHLOROBENZIDINE	391 U	401 U					
3,3'-DIMETHYLBENZIDINE	399 U	409 U					
3-METHYLCHOLANTHRENE	399 U	409 U					
3-METHYLPHENOL	399 U	409 U					
3-NITROANILINE	150 U	153 UR					
4,6-DINITRO-2-METHYLPHENOL	68.8 U	70.5 U					
4-AMINOBIPHENYL	799 U	818 U					
4-BROMOPHENYL PHENYL ETHER	31.8 U	32.6 U					
4-CHLORO-3-METHYLPHENOL	63.4 U	65.0 U					
4-CHLOROANILINE	90.2 U	92.5 U					
4-CHLOROPHENYL PHENYL ETHER	24.0 U	24.6 U					
4-METHYLPHENOL	46.0 U	47.2 U					
4-NITROANILINE	70.6 U	72.3 U					
4-NITROPHENOL	140 U	144 U					
4-NITROQUINOLINE-1-OXIDE	1600 UR	1640 UR					
5-NITRO-O-TOLUIDINE	399 U	409 U					
7,12-DIMETHYLBENZ(A)ANTHRACENE	399 U	409 U					
A,A-DIMETHYLPHENETHYLAMINE	399 U	409 U					
ACENAPHTHENE	41.4 U	42.5 U					

Summary of Soil Analytical Results - SWMU 27
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER: DEPTH (feet): LOCATION: SAMPLE DATE:	S27-SS-001 0 - 2 SS-001 9/18/95	S27-SS-002 0 - 2 SS-002 9/18/95	-	-	-	-	-
SEMIVOLATILES (UG/KG)							
ACENAPHTHYLENE	41.0 U	42.0 U					
ACETOPHENONE	399 U	409 U					
ANILINE	399 U	409 U					
ANTHRACENE	28.1 U	28.8 U					
ARAMITE	799 U	818 U					
BENZO(A)ANTHRACENE	14.8 U	14.9 U					
BENZO(A)PYRENE	18.1 U	18.6 U					
BENZO(B)FLUORANTHENE	53.9 U	55.2 U					
BENZO(G,H,I)PERYLENE	55.5 U	56.8 U					
BENZO(K)FLUORANTHENE	44.5 U	45.6 U					
BENZYL ALCOHOL	54.4 U	55.7 U					
BIS(2-CHLOROETHOXY)METHANE	56.7 U	58.1 U					
BIS(2-CHLOROETHYL)ETHER	85.7 U	87.8 U					
BIS(2-ETHYLHEXYL)PHTHALATE	78.1 U	212 B					
BUTYL BENZYL PHTHALATE	113 U	116 U					
CHLOROBENZILATE	399 U	409 U					
CHRYSENE	22.5 U	23.1 U					
DI-N-BUTYL PHTHALATE	66.2 U	67.8 U					
DI-N-OCTYL PHTHALATE	57.3 U	58.7 U					
DIALLATE	399 UR	409 UR					
DIBENZO(A,H)ANTHRACENE	45.9 U	47.0 U					
DIBENZOFURAN	30.8 U	31.5 U					
DIETHYL PHTHALATE	43.5 U	44.6 U					
DIMETHOATE	799 U	818 U					
DIMETHYL PHTHALATE	20.2 U	20.7 U					
DIPHENYLAMINE	399 U	409 U					
ETHYL METHACRYLATE	399 U	409 U					
FAMPHUR	799 UR	818 UR					
FLUORANTHENE	54.3 U	55.6 U					
FLUORENE	29.0 U	29.7 U					
HEXACHLOROBENZENE	23.8 U	24.4 U					
HEXACHLOROBUTADIENE	43.9 U	45.0 U					
HEXACHLOROCYCLOPENTADIENE	73.4 U	75.2 U					

Summary of Soil Analytical Results - SWMU 27
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SAMPLE NUMBER: DEPTH (feet): LOCATION: SAMPLE DATE:	S27-SS-001 0 - 2 SS-001 9/18/95	S27-SS-002 0 - 2 SS-002 9/18/95	-	-	-	-	-
SEMIVOLATILES (UG/KG)							
HEXACHLOROETHANE	26.0 U	26.6 U					
HEXACHLOROPHENE	2000 UR	2050 UR					
HEXACHLOROPROPENE	399 U	409 U					
INDENO(1,2,3-CD)PYRENE	49.6 U	50.9 U					
ISODRIN	799 U	818 U					
ISOPHORONE	58.2 U	59.6 U					
ISOSAFROLE	399 U	409 U					
KEPONE	799 UR	818 UR					
METHAPYRILENE	3990 UJ	4090 U					
METHYL METHANESULFONATE	599 U	614 U					
N-NITROSO-DI-N-PROPYLAMINE	68.8 U	70.4 U					
N-NITROSODI-N-BUTYLAMINE	399 U	409 U					
N-NITROSODIETHYLAMINE	799 U	818 U					
N-NITROSODIMETHYLAMINE	60.2 U	61.6 U					
N-NITROSODIPHENYLAMINE	40.3 U	41.3 U					
N-NITROSOMETHYLETHYLAMINE	399 U	409 U					
N-NITROSOMORPHOLINE	399 U	409 U					
N-NITROSOPIPERIDINE	799 U	818 U					
N-NITROSOPYRROLIDINE	399 U	409 U					
NAPHTHALENE	36.9 U	37.8 U					
NITROBENZENE	54.4 U	55.8 U					
O,O,O-TRIETHYLPHOSPHOROTHIOATE	399 U	409 U					
O,O-DIETHYL-O-2-PYRAZINYLPHOSPHOROT	399 U	409 U					
O-TOLUIDINE	399 U	399 U					
P-DIMETHYLAMINOAZOBENZENE	399 U	399 U					
P-PHENYLENEDIAMINE	399 U	399 U					
PENTACHLOROBENZENE	399 U	399 U					
PENTACHLORONITROBENZENE	399 U	399 U					
PENTACHLOROPHENOL	127 U	127 U					
PHENACETIN	799 U	799 U					
PHENANTHRENE	45.1 U	45.1 U					
PHENOL	166 U	166 U					
PHORATE	399 U	399 U					

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Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER:	S27-SS-001	S27-SS-002					
DEPTH (feet):	0 - 2	0 - 2	-	-	-	-	-
LOCATION:	SS-001	SS-002					
SAMPLE DATE:	9/18/95	9/18/95					
SEMIVOLATILES (UG/KG)							
PRONAMIDE	399 U	399 U					
PYRENE	99.6 U	99.6 U					
PYRIDINE	399 U	399 U					
SAFROLE	399 U	399 U					
EXPLOSIVES (UG/KG)							
1,3 DINITROBENZENE	37.2 U	37.2 U					
1,3,5 TRINITROBENZENE	40.2 U	40.2 U					
2,4 DINITROTOLUENE	51.6 U	51.6 U					
2,4,6-TRINITROTOLUENE	35.6 U	35.6 U					
2,6 DINITROTOLUENE	47.6 U	47.6 U					
2-AMINO-4,6-DINITROTOLUENE	46.7 U	46.7 U					
2-NITROTOLUENE	81.4 U	81.4 U					
3-NITROTOLUENE	81.7 U	81.7 U					
4-AMINO-2,6-DINITROTOLUENE	40.8 U	40.8 U					
4-NITROTOLUENE	87.2 U	87.2 U					
HMX	70.5 U	70.5 U					
NITRO-BENZENE	35.2 U	35.2 U					
NITROCELLULOSE	8.8 U	8.0 U					
NITROGLYCERIN	10000 U	10000 U					
NITROGUANIDINE	63.0 U	63.0 U					
PENTAERYTHRITOL TETRANITRATE	250 U	250 U					
RDX	50.9 U	50.9 U					
TETRYL	163 U	163 U					
INORGANICS (MG/KG)							
ALUMINUM	11800	5300					
ANTIMONY	0.21 UL	0.67 L					
ARSENIC	3.3	2.5 K					
BARIUM	46.0	26.1					
BERYLLIUM	0.46	0.32					
CADMIUM	2.1	14.6					
CALCIUM	749 K	1630					
CHROMIUM	18.1 J	11.0 J					
COBALT	7.8	5.0					

Summary of Soil Analytical Results - SWMU 27
Stump Neck Annex, Indian Head Division
Indian Head, Maryland

SAMPLE NUMBER: DEPTH (feet): LOCATION: SAMPLE DATE:	S27-SS-001 0 - 2 SS-001 9/18/95	S27-SS-002 0 - 2 SS-002 9/18/95	-	-	-	-	-
INORGANICS (MG/KG)							
COPPER	17.8 L	30.4					
CYANIDE	1.2 U	1.2 U					
IRON	20600 J	12200 J					
LEAD	10.5 L	14.2 L					
MAGNESIUM	1800	682 K					
MANGANESE	208 J	47.3 J					
MERCURY	0.06 UL	0.05 UL					
NICKEL	12.8	8.2 K					
POTASSIUM	932	572					
SELENIUM	0.18 U	0.19 U					
SILVER	0.12 U	0.12 U					
SODIUM	64.7 B	54.5 B					
THALLIUM	0.30 U	0.31 U					
TIN	22.8 L	5.0 UL					
VANADIUM	32.6	18.4					
ZINC	56.0	131					
INDICATOR PARAMETERS (MG/KG)							
AMMONIA	35.8 L	55.9 L					
NITRATE/NITRITE	0.940 U	2.2					
TOTAL ORGANIC CARBON	317	2280					

APPENDIX J

DATA VALIDATION MEMORANDA

Brown & Root Environmental

INTERNAL CORRESPONDENCE

C-49-01-6-076

TO: LEEANN SINAGOGA

DATE: JANUARY 10, 1996

FROM: KELLY A. JOHNSON

CC: DATA VALIDATION FILE

SUBJECT: ORGANIC DATA VALIDATION - VOA, SVOA, PCB
CTO 0222, NAVAL SCHOOL, INDIAN HEAD, MARYLAND
WORK ORDER NOs. 9509188, 9509191, 9509200, 9509221, 9509224, 9509229

SAMPLES: 4/soil/Work Order 9509188 analyzed for volatile, semivolatile, and PCB organics; S27-SS-001(no PCB), S27-SS-002(NO PCB), S26-SB01-01, S26-SB01-02.

4/soil/Work Order 9509191 analyzed for semivolatile, and PCB organics: FD02(no PCB), S25-MW01-02(no PCB), S26-MW01-01, S26-MW01-02.

3/soil/Work Order 9509200 analyzed for semivolatile organics; FD04, SO5-MW01-01, SO5-MW01-02

3/soil/Work Order 9509221 analyzed for PCB organics; FD07, S26-SB02-001, S26-SB02-002.

6/soil/Work Order 9509224 analyzed for PCB organics; S26-MW02-001, S26-MW02-002, S26-SB03-001, S26-SB03-002, S26-MW03-001, S26-MW03-002.

3/soil/Work Order 9509229 analyzed for PCB organics: S26-SB04-001, S26-SB04-002, FD08.

4/field blanks/Work Order 9509188 analyzed for volatile, semivolatile, and PCB organics: S27-TB01(VOA ONLY), S27-FB01-001, S27-FB02-001, S27-RB01-001.

1/field blanks/Work Order 9509200 analyzed for semivolatile: 05-RB03-01.

1/field blanks/Work Order 9509229 analyzed for PCB organics; S26-RB07.

Overview

The sample set for the CTO 0222 Naval School Indian Head, Maryland consists of twenty-three (23) soil samples, one (1) aqueous trip blank (designated -TB), two (2) aqueous rinsate blanks (designated RB), and three (3) aqueous field blanks designated (-FB). Four field duplicates were included within this sample delivery group. The field pairs are the following: FD02/S25-MW01-02, FD04/SO5-MW01-01, FD07/S26-MW02-001, and FD08/S26-SB04-001. Samples were analyzed for Appendix IX volatile, semivolatile, and Polychlorinated Biphenyl (PCB) organic compounds.

The samples were collected by Brown & Root Environmental on September 18, 19, 20, 21, 23, and 24, 1995 and analyzed by General Physics Environmental Services. The organic compound analyses (e.g., volatile, semivolatile, and PCBs) were analyzed as Naval Energy and Environmental Support Activity (NEESA) Level D, using SW-846 Methods 8240, 8270, and 8080.

Summary

All compounds were successfully analyzed with the exception of those compound results considered unusable. The findings offered in this report are based upon a general review of all available data including data completeness, holding times until extraction/ analysis, GC/MS tuning and calibration data, laboratory and field quality control blank results, surrogate spike recoveries, internal standards performance, laboratory control sample analyses, matrix spike/matrix spike duplicate analyses, compound identification and quantitation. Tentatively identified compounds were not provided for GC/MS analyses.

Areas of concern with respect to data quality are listed below.

Major Problems

- According to the laboratory case narrative chloroprene, hexachlorophene, and kepone were not analyzed. Hence the nondetected results reported for these compounds are rejected (UR).

- The initial and continuing calibration Relative Response Factors (RRFs) for 1,4-dioxane, diallate, and 4-nitroquinoline-1-oxide were less than 0.050. Failure to meet this quality control criterion indicates that the laboratory's instruments could not achieve satisfactory sensitivity for these compounds therefore, the associated positive and nondetected results for these compounds are severely compromised. Nondetected results reported for these compounds in the affected samples are considered to be unreliable and are rejected, (UR). These results are biased very low.

- The continuing calibration RRFs for 3-nitroaniline, famphur, and phorate were less than 0.050. Failure to meet this quality control criterion indicates that the laboratory's instruments could not achieve satisfactory sensitivity for these compounds therefore, the associated positive and nondetected results for these compounds are severely compromised. Nondetected results reported for these compounds in the affected samples are considered to be unreliable and are rejected, (UR). These results are biased very low.

- The surrogate Percent Recovery (%R) for phenol-d5 was less than 10% in sample S27-FB02-001. This sample was re-extracted and reanalyzed grossly outside of the holding time. Hence, the original analysis was used in the validation of this SDG. Nondetected results reported for acid-fraction compounds are considered to be unreliable and are rejected, (UR). These results are biased very low.

Minor Problems

- Initial calibration Percent Relative Standard Deviation (%RSDs) for acetone, propionitrile, 2-butanone, 1,4-dioxane, dibromochloromethane, 1,2,3-trichloropropane, and famphur exceeded the 50% validation quality control criterion. This calibration noncompliance indicates a lack of consistency in instrumental responses which could lead to compromised quantitation of positive and nondetected results for the affected compound. The nondetected results reported for these compounds in the affected samples were qualified as estimated, (UJ). Acetone results qualified as a result of blank contamination were not further qualified. Nondetected results for 1,4-dioxane and fampher were rejected as a result of more severe calibration noncompliances. The direction of bias cannot be determined.

- An initial calibration %RSD for methylene chloride exceeded the 30% validation quality control criterion. This calibration noncompliance indicates a lack of consistency in instrumental responses which could lead to compromised quantitation of positive results for the affected compound. The positive results reported for this compound in the affected samples were qualified as estimated, (J). The direction of bias cannot be determined.

- Continuing calibration Percent Differences (%Ds) for 4-nitroquinoline-1-oxide, 3-nitroaniline, famphur, methapyrilene, a,a-dimethylphenethylamine, and 4-aminobiphenyl exceeded the 50% validation quality control criterion. This calibration noncompliance indicates a lack of consistency in instrumental responses which could lead to compromised quantitation of positive and nondetected results for the affected compound. The nondetected results reported for these compounds in the affected samples were qualified as estimated, (UJ). The direction of bias cannot be determined.

- The following compounds were found in the low level laboratory method and field quality control blanks at the maximum concentrations indicated:

Compounds	Maximum Concentrations	Action Level
methylene chloride	1.61 µg/L	16.1 µg/L
methylene chloride	2.56 µg/kg	25.6 µg/kg
acetone	1.57 µg/L	15.7 µg/L
acetone	5.28 µg/kg	52.8 µg/kg
4-methyl-2-pentanone*	2.0 µg/L	10.0 µg/kg
bromodichloromethane*	8.1 µg/L	40.5 µg/kg
chloroform*	33.3 µg/L	166.5 µg/kg
1,1,2,2-tetrachloroethane*	1.5 µg/L	7.5 µg/kg
1,2,3-trichloropropane*	2.0 µg/L	10.0 µg/kg
1,2-dibromo-3-chloropropane*	1.7 µg/L	8.5 µg/kg
dibromochloromethane*	2.4 µg/L	12.0 µg/kg

Compounds	Maximum Concentrations	Action Level
bis(2-ethylhexyl)phthalate*	1.2 µg/L	12.0 µg/L, 396 µg/kg
di-n-butylphthalate*	1.6 µg/L	16.0 µg/L, 528 µg/kg

Samples affected: All low level samples.

* - Maximum concentration was detected in a field quality control blank.

Adjustments were made for the percent moisture, dilution factors, and aliquot used for analysis. Results reported for the aforementioned compounds reported at concentrations within the action level have been qualified, (B), and are considered to be false positives (artifacts of blank contamination). No actions were necessary for 4-methyl-2-pentanone, bromodichloromethane, chloroform, 1,1,2,2-tetrachloroethane, 1,2,3-trichloropropane, 1,2-dibromo-3-chloropropane, and dibromochloromethane as these compounds were reported as nondetected in the affected environmental samples.

- The surrogate recovery for toluene-d8 was low in samples S27-FB02-001 and S27-SS-001. As a result of these noncompliances the samples were reanalyzed. However, the reanalyses were performed grossly outside of the holding time. Therefore, the original analyses were used in the validation of this SDG. Positive and nondetected results for all target compounds were qualified as estimated (J) and (UJ), respectively. The direction of bias could not be determined.

- Several surrogate recoveries were high in samples S27-SS-002 and S26-SB01-02. As a result of these noncompliances the samples were reanalyzed. However, the reanalyses were performed grossly outside of the holding time. Therefore, the original analyses were used in the validation of this SDG. Only positive results are affected by high surrogate recoveries. Positive results for all target compounds were qualified as estimated (J). The direction of bias could not be determined as these results were also affected by other noncompliances.

- All three internal standard areas were low in samples S27-FB01-001 and S26-SB01-01. As a result of this noncompliance the sample was reanalyzed. However, the reanalyses were performed grossly outside of the holding time. Therefore, the original analyses were used in the validation of this SDG and compounds quantitated using the failed internal standard areas were qualified as estimated (J) and (UJ), respectively. The direction of bias could not be determined.

- The internal standard area for chlorobenzene-d5 was low in sample S27-SS-002. As a result of this noncompliance the sample was reanalyzed. However, the reanalysis was performed grossly outside of the holding time. Therefore, the original analysis was used in the validation of this SDG and compounds quantitated using the failed internal standard area were qualified as estimated (J) and (UJ), respectively. The direction of bias could not be determined.

- The internal standard area for bromochloromethane was low in sample S26-SB01-02. As a result of this noncompliance the sample was reanalyzed. However, the reanalysis was performed grossly outside of the holding time. Therefore, the original analysis was used in the validation of this SDG and compounds quantitated using the failed internal standard area were qualified as estimated (J) and (UJ), respectively. The direction of bias could not be determined.

- Positive results reported at concentrations below the CRQL are considered to be estimated and are qualified (J). The direction of bias cannot be determined.

Notes

The %RSD for several volatile and semivolatile compounds were greater than 30%. No actions were necessary since only nondetected results were reported for the affected compounds in the affected samples.

The %RSD for Aroclor-1232 and Aroclor-1260 were greater than 20%. No actions were necessary since only nondetected results were reported for the affected compounds in the affected samples.

The page of the PCB fraction Gas Chromatograph Injection Log for instrument 5890II IJ containing the initial calibration sequence is missing from the data package.

The final continuing calibration in the PCB analytical sequence for instrument 5890II KL is missing from the data package.

Volatile and semivolatile fraction matrix spike/matrix spike duplicate noncompliances were noted. No actions were warranted according to Region III data validation guidance.

The surrogate recoveries for 2,4,6-tribromophenol were high in samples LCSA, S27-FB01-001, FD02, S25-MW01-02, FD04, S26-MW01-01, and SO5-MW01-01. Additionally, the surrogate recovery for 2-fluorophenol was low in sample 05-RB03-01. No actions were warranted for these noncompliances as only one fractional surrogate recovery was noncompliant in the affected samples.

The surrogate recovery for decachlorobiphenyl (186%) was high in sample S26-SB03-002. No actions were required since no positive results were reported for target compounds in this sample.

No other problems were noted.

Executive summary

Laboratory Performance: Methylene chloride and acetone were detected in laboratory method blanks. Several initial and continuing calibration noncompliances were present in the volatile, semivolatile, and PCB fractions.

Other Factors Affecting Data Quality: There were several noncompliant volatile and semivolatile fraction surrogate %Rs. There several volatile fraction internal standard area noncompliances. There were also several matrix spike/matrix spike duplicate noncompliances. Positive results reported at concentrations below the CRQL are considered to be estimated.

The data for these analyses were reviewed with reference to method-specific quality control criteria, the "National Functional Guidelines for Organic Data Evaluation " (9/94), as amended for use within EPA Region III, and the NEESA guidelines entitled "Sampling and Chemical Analysis Quality Assurance requirements for the Navy Installation Restoration Program" (NEESA 20.2-047B; June, 1988.)

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NEESA Guidelines and the Quality Assurance Project Plan (QAPP)."

Brown & Root Environmental
Kelly A. Johnson
Chemist/Data Validator

Brown & Root Environmental

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

Data Qualifier Summary

U - Nondetect as reported by the laboratory.

B - Positive result qualified as a result of method or field quality control blank contamination.

UR - Nondetected result considered to be unreliable as a result of extremely low surrogate %RS and low initial and continuing calibration RRFs.

UJ - Nondetect qualified as estimated as a result of calibration %Ds > 50%.

J - Estimate positive results for various technical reasons (i.e. calibration noncompliances, quantitation percent differences, and values less than the CRQL).

L - Estimate positive results due to low surrogate recoveries.

UL - Estimate nondetected results due to low surrogate recoveries.

Brown & Root Environmental

INTERNAL CORRESPONDENCE

C-49-01-6-083

TO: LEEANN SINAGOGA

DATE: JANUARY 10, 1996

FROM: KELLY A. JOHNSON

CC: DATA VALIDATION FILE

SUBJECT: ORGANIC DATA VALIDATION - EXPLOSIVES
CTO 0222, NAVAL SCHOOL, INDIAN HEAD, MARYLAND
WORK ORDER NOs. 9509188, 9509191, 9509200

SAMPLES: 4/soil/Work Order 9509188; S27-SS-001, S27-SS-002, S26-SB01-01, S26-SB01-02.

3/soil/Work Order 9509191; FD01, S25-MW01-01, S26-MW01-02.

3/soil/Work Order 9509200; FD03, SO5-MW01-01, SO5-MW01-02.

3/field blanks/Work Order 9509188; S27-FB01-001, S27-FB02-001, S27-RB01-001.

1/field blanks/Work Order 9509200; 05-RB03-01.

Overview

The sample set for the CTO 0222 Naval School Indian Head, Maryland consists of ten (10) soil samples, two (2) aqueous rinsate blanks (designated RB), and two (2) aqueous field blanks designated (-FB). Samples were analyzed in various for Target Compound List (TCL) SW-846 Method 8330 compounds plus pentaerythritol tetranitrate, nitroglycerine, and nitroguanidine.

The samples were collected by Halliburton NUS Corporation on September 18, 19, and 20, 1995 and analyzed by General Physics Environmental Services. The target compound explosive analyses were analyzed as Naval Energy and Environmental Support Activity (NEESA) Level D, using SW-846 Methods 8330 and Modified USATHAMA for nitroguanidine.

Summary

All compounds were successfully analyzed with the exception of those compound results considered unusable. The findings offered in this report are based upon a general review of all available data including data completeness, holding times until extraction/ analysis, laboratory and field quality control blank results, surrogate spike recoveries, laboratory control sample analyses, compound identification and quantitation.

Areas of concern with respect to data quality are listed below.

Major Problems

- The surrogate Percent Recovery (%R) for 4-nitroaniline was zero in sample S27-FB02-001. This sample was re-extracted and reanalyzed but still displayed a zero %R. Hence, the original analysis was used in the validation of this SDG. All target compounds except nitroguanidine are considered to be unreliable and are rejected, (UR). These results are biased very low.

Minor Problems

- Continuing calibration Percent Difference (%D) for 2-amino-4,6-dinitrotoluene exceeded the 20% validation quality control criterion. This calibration noncompliance indicates a lack of consistency in instrumental responses which could lead to compromised quantitation of positive results for the affected compound. Only positive results are affected by these calibration noncompliances. Positive results reported for this compound in the affected samples were qualified as estimated (J). The direction of bias cannot be determined.

Notes

Continuing calibration %Ds for 2-amino-dinitrotoluene, 4-amino-2,6-dinitrotoluene, and 2,6-dinitrotolunene exceeded 20% but were less than 40%. Only nondetected results were reported for the affected compounds in the affected samples, hence no actions were required for these noncompliances.

The results for 2,4,6-trinitrotoluene exceeded the instrument's linear calibration range. the samples was diluted 10-fold and reanalyzed. Only the 2,4,6-trinitrotoluene result from the 10-fold dilution analysis was used in the validation of this SDG.

No other problems were noted.

Executive summary

Laboratory Performance: No problems were noted.

Other Factors Affecting Data Quality: A poor surrogate recovery was noted in sample S27-FB02-001. Sample FD03 required dilution to bring 2,4,6-trinitrotoluene into the linear calibration range.

The data for these analyses were reviewed with reference to method-specific quality control criteria, the "National Functional Guidelines for Organic Data Evaluation ", as amended for use within EPA Region III, and the NEESA guidelines entitled "Sampling and Chemical Analysis Quality Assurance requirements for the Navy Installation Restoration Program" (NEESA 20.2-047B, June, 1988.)

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NEESA Guidelines and the Quality Assurance Project Plan (QAPP)."

Kelly A. Johnson

Brown & Root Environmental
Kelly A. Johnson
Chemist/Data Validator

Brown & Root Environmental

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

Data Qualifier Summary

U - Nondetect as reported by the laboratory.

B - Positive result qualified as a result of method or field quality control blank contamination.

UR - Nondetected result considered to be unreliable as a result of extremely low surrogate %RS and low initial and continuing calibration RRFs.

J - Estimate positive results for various technical reasons (i.e. calibration noncompliances).

Brown & Root Environmental

INTERNAL CORRESPONDENCE

C-49-12-05-285

TO:	LEE ANN SINAGOGA	DATE:	JANUARY 16, 1996
FROM:	RICKY C. DEPAUL	COPIES:	D. V. FILES

SUBJECT: INORGANIC DATA VALIDATION -
TARGET ANALYTE LIST (TAL) METALS PLUS CYANIDE AND TIN
NSWC INDIAN HEAD
SDG 9509188

SAMPLES:

6/Water/	S27-FB01-001 (cyanide)		S27-FB01-001(filtered)	
	S27-FB02-001 (cyanide)		S27-FB02-001(filtered)	
	S27-RB01-001(cyanide)		S27-RB01-001(filtered)	
4/Soil/	S26-SB01-01	S26-SB01-02	S27-SS-001	S27-SS-002

GP Environmental Laboratories analyzed four soils Target Analyte List (TAL) metals including cyanide and tin. Additionally, three field quality control blanks were analyzed for unfiltered cyanide analyses. The same field blanks were also analyzed for filtered TAL metals with the exception of tin. No field duplicates were included with this analytical data set.

These samples were collected by Brown & Root Environmental Corporation on 09/18/95 and analyzed by GP Environmental Corporation under Naval Energy and Environmental Support Activity (NEESA) Level D Quality Assurance/Quality Control (QA/QC) criteria. All analyses were conducted using Contract Laboratory Program (CLP) Statement of Work (SOW) analytical and reporting protocol.

Summary

All analytes were successfully analyzed. The findings offered in this report are based upon a general review of all available data including: data completeness, calibration data, holding times, laboratory method and field quality control blanks, ICP interference check sample results, matrix spike and duplicate results, laboratory control sample analyses, ICP serial dilution analyses, and graphite furnace atomic absorption results.

Minor Problems

- The Contract Required Detection Limit (CRDL) Standard analysis recoveries for arsenic, calcium, magnesium, and nickel exceeded the 110% upper quality control limit. Hence, positive results < 2X CRDL for arsenic, calcium, and nickel were qualified as biased high, "K". Positive results for magnesium < 2X CRDL were qualified as estimated as a result of problems noted during the ICP serial dilution analysis. Overall bias for these results could not be determined.

- The CRDL Standard analysis recoveries for cadmium, copper, and tin were below the 90% lower quality control limit. Hence, positive results < 2X CRDL and nondetects for these analytes were qualified as biased low, "L" and "UL", respectively.

- The CRDL Standard analysis recoveries for chromium were both high and low. Nondetects for this analyte were qualified as estimated, "UJ". Overall bias for these results could not be determined.

- The following contaminants were present in the laboratory method or preparation blanks at the following maximum concentrations indicated below:

Analyte	Maximum Concentration	Action Level[1]
sodium	34.282 mg/Kg	171.41 mg/Kg
tin	-41.5 ug/L	NA
zinc	1.082 mg/Kg	5.41 mg/Kg

[1]A 1gm into 100ml soil sample digestion was employed for the soils in this SDG.

An action level of 5X the maximum contaminant level has been established to evaluate the sample data based upon blank contamination. Sample weight, moisture content, and dilution factors were considered prior to the application of the action levels. Positive results for sodium within the action level were qualified as laboratory artifacts, "B". No validation actions were necessary for zinc as all positive results exceeded the action level.

- Negative blank contamination (i.e., base-line drifting and poor instrument response) was noted for tin. Hence, positive results and nondetects for this analyte in affected samples were qualified as biased low, "L" and "UL", respectively.

- The interfering analyte iron was present in samples S26-SB01-001 and S27-SS-001 at concentrations which were comparable to the amount present in the ICS solution for this analyte. Additionally, several analytes which were not supposed to be present in the ICS solution (namely, barium, copper, manganese, zinc, and tin) were present in this solution at levels which exceeded the IDLs for these analytes. Calculations of estimated interferences for these analytes indicated the possibility of negative interference affects for tin in these samples. Hence, the nondetected results for tin in sample S26-SB01-01 and sample S27-SS-001 were qualified as biased low, "UL".

Additionally, the possibility of negative interference affects exists for copper in sample S27-SS-001. Hence, the positive result for copper in this sample was qualified as biased low, "L".

- The soil matrix spike recoveries antimony, lead, and mercury were marginally below the 75% lower quality control limit, but > 30%. Positive and/or nondetected results for these analytes in the affected samples were qualified as biased low, "L" and "UL", respectively.

- The Relative Percent Differences (%RPDs) for chromium and manganese exceeded the 35% quality control limit as noted for the soil matrix when sample and duplicate results exceeded 5X CRDL for these analytes. Only positive results were reported for these analytes in affected samples and these results were qualified as estimated, "J". Overall bias for these results could not be determined.

- Problems were noted during the ICP serial dilution analysis for iron as evidenced in the soil matrix. Only positive results were reported for this analyte in the affected samples and these results were qualified as estimated, "J". Overall bias for these results could not be determined.

- Additionally, problems were noted during the ICP serial dilution analysis for calcium and magnesium as evidenced in the water matrix. Positive results for these analytes in affected water samples were qualified as estimated, "J". Insufficient evidence was present to substantiate negative interference affects and warrant qualification of nondetected magnesium results. Overall bias for these results could not be determined.

Notes

Tin analyses were not performed as noted for the water analyses.

The CRDL Standard analysis recoveries for lead, iron, and thallium, were high. However, no validation actions were warranted for lead and iron as positive results were > 2X CRDL. No actions were warranted for thallium as only nondetects were reported. The CRDL Standard analysis recoveries for chromium were both high and low. However, no validation actions were warranted for positive chromium results as these results exceeded 2X CRDL.

Contamination present in sample S27-FB02-001 was not used for blank evaluation as concentrations of analytes typically found in "hard" water which were present in this sample indicate potential problems with the origin of this blank. Contamination present in this blank may not accurately represent actual field conditions. It is suspected that this blank was collecting using potable tap water. Furthermore, blank contamination present in the remaining filtered field quality control blanks is inherently non applicable to the environmental soil samples in this SDG. Hence, contamination present in these blanks was not used during the blank evaluation scheme.

Executive Summary

Laboratory Performance: The laboratory incorrectly spiked the concentrations for some analytes as noted in the Contract Required Detection Limit (CRDL) Standard analyses. Additionally, the CRDL Standard analysis recoveries for numerous analytes were poor. Some analytes were present as contaminants in the laboratory method blanks. Base-line drifting and poor instrument response was noted for tin. Several analytes which were not supposed to be present in the ICS solution were detected in this solution at levels which exceeded the respective IDLs for these analytes. Laboratory duplicate imprecision was noted for chromium and manganese as evidenced in the soil matrix. Problems were noted during the ICP serial dilution analysis for iron as evidenced in the soil matrix. Problems were noted for calcium and magnesium as evidenced in the water matrix.

Other Factors Affecting Data Quality: The interfering analyte iron was present in samples S26-SS01-001 and S27-SS-001 at concentrations which were sufficiently high as to introduce interference affects. The soil matrix spike recoveries for antimony, lead, and mercury were marginally low (i.e., < 75%, but > 30%).

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Data Validation", as amended for use within USEPA Region III and the NEESA document entitled "Sampling and Chemical Analysis Quality Assurance requirements for the Navy Installation Restoration Program" (NEESA 20.2-047B; 6/88).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified."

Ricky C. DePaul

Brown & Root Environmental Corporation
Ricky C. DePaul
Chemist

Brown & Root Environmental Corporation
Joseph A. Samchuck
Data Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

K -

Qualify positive results < 2X CRDL as biased high as a result of CRDL Standard analysis recovery > 110%.

L -

Qualify positive results < 2X CRDL as biased low as a result of CRDL Standard analysis recovery < 90% and/or as a result of base-line drifting and poor instrument response and/or as a result of negative interference affects stemming from high interfering analyte concentration.

UL -

Qualify nondetected results as biased low as a result of CRDL Standard analysis recoveries < 90% and/or as a result of base-line drifting and poor instrument response and/or as a result of negative interference affects stemming from high interfering analyte concentration.

UJ -

Qualify nondetected results as estimated as a result of poor (i.e., both high and low) CRDL Standard analysis recovery. Overall bias for these results could not be determined.

B -

Qualify positive results as laboratory artifacts as a result of blank contamination.

J -

Qualify positive results as estimated as a result of laboratory duplicate imprecision and/or problems noted during the ICP serial dilution analysis. Overall bias for these results could not be determined.

Brown & Root Environmental

INTERNAL CORRESPONDENCE

C-49-12-05-288

TO:	LEE ANN SINAGOGA	DATE: JANUARY 15, 1996
FROM:	RICKY C. DEPAUL	COPIES: D. V. FILES
SUBJECT:	MISCELLANEOUS DATA VALIDATION - VARIOUS MISCELLANEOUS PARAMETERS NSWC INDIAN HEAD SDG 9509188	

SAMPLES:

3/Water/	S27-FB01-001 S27-FB02-001 S27-RB01-001			
4/Soil/	S26-SB01-01	S26-SB01-02	S27-SS-001	S27-SS-002

GP Environmental Laboratories analyzed two soils for nitrocellulose, total cyanide, ammonia, nitrate-nitrite, and Total Organic Carbon (TOC). The remaining two soil samples were additionally analyzed for Total Petroleum Hydrocarbons (TPH). Two field quality control blanks were analyzed for Total Organic Halides (TOX), total phosphorus, sulfate, ammonia, TOC, nitrate-nitrite, nitrocellulose, total cyanide, Total Kjeldahl Nitrogen (TKN), and TPH. The equipment rinsate blank was analyzed for ammonia, TOC, nitrate-nitrite, nitrocellulose, total cyanide, TKN and TPH. No field duplicates were included with this analytical data set.

These samples were collected by Brown & Root Environmental Corporation on 09/18/95 and analyzed by GP Environmental Corporation under Naval Energy and Environmental Support Activity (NEESA) Level C Quality Assurance/Quality Control (QA/QC) criteria. All analyses were conducted using method specific analytical and reporting protocol.

Summary

All analytes, with the exception of TOX were successfully analyzed. The findings offered in this report are based upon a general review of all available data including: data completeness, calibration data, holding times, laboratory method and field quality control blanks, matrix spike and duplicate results, and laboratory control sample analyses.

Major Problems

- The 7 day holding time until analysis for Total Organic Halides (TOX) was grossly exceeded by a factor of two. Hence, the nondetect for this parameter in the affected sample was qualified as unusable and rejected, "UR".

Minor Problems

- The 7 day holding time until analysis for TOX was grossly exceeded by a factor of two. Hence, the positive result for this parameter in the affected sample was qualified as biased low, "L".
- A Continuing Calibration Verification (CCV) Percent Recovery (%R) for ammonia (84.0%) was marginally below the 90% lower quality control limit. Positive results and nondetects for this analyte were qualified as biased low "L" and "UL", respectively.
- An Initial Calibration Verification (ICV) %R for sulfate analyses (85.4%) was marginally below the 90% lower quality control limit. Only positive results were reported for these analyses and these results were qualified as biased low, "L".
- A CCV %R for TKN analyses (113%) marginally exceeded the 110% upper quality control limit. Only positive results were reported for this parameter, which were also impacted by low LCS recovery. Hence, positive results for TKN were qualified as estimated, "J". Overall bias for these results could not be determined.
- The Laboratory Control Sample (LCS) recovery (78.1%) for TKN analyses was marginally below the 80% lower quality control limit. Only positive results were reported for this parameter which were also impacted by high CCV recovery. Hence, positive results for this parameter were qualified as estimated, "J". Overall bias for these results could not be determined.

Notes

The following contaminants were present in the field quality control blanks at the maximum concentrations indicated below:

Analyte	Maximum Concentration	Action Level
TOX	88.4 mg/L	NA[1]
phosphorus, total	2.43 mg/L	NA[1]
sulfate	10.5 mg/L	NA[1]
TKN	0.692 mg/L	NA[1]
TOC	14.9 mg/L	2

NA[1] - Analyses were performed for field quality control blanks only. Hence, no validation actions were warranted.

[2] The instrument response for TOC as noted in the field quality control blank was less than an order of magnitude below the responses noted for the environmental soils associated with this blank. Hence, no validation actions were warranted.

Nitrocellulose analyses were conducted 21 days after sample collection.

Executive Summary

Laboratory Performance: The holding times until analysis for TOX were exceeded. ICV and/or CCV recoveries for TKN, sulfate, and ammonia were outside quality control limits. The LCS recovery for TKN was low.

Other Factors Affecting Data Quality: Some blank contamination was present in the field quality control blanks for TOX, total phosphorus, sulfate, TKN, and TOC. Nitrocellulose analyses were conducted 21 days after sample collection.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Data Validation", as amended for use within USEPA Region III and the NEESA document entitled "Sampling and Chemical Analysis Quality Assurance requirements for the Navy Installation Restoration Program" (NEESA 20.2-047B; 6/88).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified."

Ricky C. DePaul

Brown & Root Environmental Corporation
Ricky C. DePaul
Chemist

Brown & Root Environmental Corporation
Joseph A. Samchuck
Data Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

Summary of Data Qualifiers:

UR -

Qualify as unusable nondetects for TOX as a result of gross holding time exceedance.

L -

Qualify as biased low positive results for TOX as a result of gross holding time exceedance. Positive results for ammonia are qualified as biased low as a result of low CCV recovery. Positive results for sulfate are qualified as biased low as a result of low CCV recovery.

UL -

Qualify nondetects for ammonia as biased low as a result of low CCV recovery.

J -

Qualify positive results for TKN as estimated as a result of high CCV recovery and low LCS recovery. Overall bias for these results could not be determined.

Brown & Root Environmental

INTERNAL CORRESPONDENCE

C-49-01-6-166

TO:	LEEANN SINAGOGA	DATE:	JANUARY 19, 1996
FROM:	ANNE K. BATTISTA	COPIES:	DV FILE

SUBJECT: ORGANIC DATA VALIDATION - VOLATILE ORGANIC COMPOUNDS
CTO 222, NSWC INDIAN HEAD, INDIAN HEAD, MARYLAND
SDG 9509191

SAMPLES: 4/Soil/

FD02 S25-MW01-02 S26-MW01-01 S26-MW01-02

1/Aqueous/

TB-02

Overview

The sample set for the CTO 222 NSWC Indian Head site, SDG 9509191 consists of four (4) soil environmental samples and one (1) trip blank, designated TB-. All samples were analyzed for Target Compound List (TCL) Appendix IX volatile organic compounds. No samples were designated by the field crew for Matrix Spike/Matrix Spike Duplicate analysis. A field duplicate pair was included in this SDG(S25-MW01-02/FD02).

The samples were collected by Brown and Root Environmental on September 19th, 1995 and analyzed by GP Environmental under Naval Energy and Environmental Support Activity (NEESA) Level D Quality Assurance/Quality Control (QA/QC) criteria. All analyses were conducted using SW-846 Method 8240 analytical and reporting protocols.

Summary

All compounds were successfully analyzed, with the exception of those compounds qualified as unreliable, (UR). The findings offered in this report are based upon a general review of all available data including data completeness, holding times until analysis, GC/MS tuning and calibration data, laboratory and field blank results, surrogate spike recoveries, laboratory control sample results, internal standards performance, field duplicate precision, tentatively identified compounds, compound identification and compound quantitation. Areas of concern with respect to data quality are listed below.

Major Problems

- Initial and/or continuing calibration Relative Response Factors (RRFs) for 1,4-dioxane and 2-butanone were less than 0.050. Failure to meet this quality control criterion indicates that the laboratory's instruments could not achieve satisfactory sensitivity for these compounds, and therefore, the associated positive and nondetected results for these compounds are severely compromised. Nondetected results reported for 1,4-dioxane and 2-butanone were considered biased very low, and unreliable. Therefore, the nondetected results in the affected samples were rejected, (UR).

Minor Problems

- Initial calibration Percent Relative Standard Deviations (%RSDs) greater than the 50% quality control limit were reported for acetone, vinyl acetate and trans-1,4-dichloro-2-butene. Positive and nondetected results are affected by these noncompliances. Nondetected results for the aforementioned compounds were qualified as estimated, (UJ), in the affected samples. The direction of bias is unknown.

- Initial calibration %RSDs greater than the 30% quality control limit were reported for acetone and carbon disulfide. Positive results only are affected by these noncompliances. Positive results for the aforementioned compounds were qualified as estimated, (J), in the affected samples. The direction of bias is unknown.

- The following table summarizes the maximum concentration of volatile compounds detected in the laboratory method blanks analyzed in this SDG:

Compound	Maximum Concentration	Action Level
Methylene Chloride	15.3 µg/Kg	153 µg/Kg
Methylene Chloride	1.6 µg/L	16 µg/L

Samples Affected: ALL

The aliquots used for analysis, percent solids and dilution factors were considered during the application of the action levels. Positive results for methylene chloride that were reported in samples at concentrations less than the validation action level were considered false positives and were qualified, (B). Positive results reported above the validation action level were not qualified.

- A high surrogate Percent Recovery (%R) was reported for 1,2-dichloroethane in sample FD02, and a high %R for toluene-d8 was reported in sample S26-MW01-01. The laboratory reanalyzed these samples due to calibration noncompliances noted below. However, the original analyses were chosen for validation. Positive results were qualified as estimated, (J), in the affected samples. The direction of bias is unknown.

- High %Rs for 1,2-dichloroethane-d4 and toluene-d8 were reported in sample S26-MW01-02. As stated above, the original analysis was used in validation. Positive results only are affected by high recoveries. Positive results in the aforementioned sample were qualified as estimated, (J). The direction of bias is unknown.

- Positive results reported at concentrations below the Contract Required Quantitation Limit (CRQL) are qualified as estimated, (J).

Notes

An initial calibration %RSD greater than 50% was reported for methylene chloride. No action was taken since the affected samples had been qualified for blank contamination.

Initial calibration %RSDs greater than 30% were reported for acrolein, acrylonitrile, and 1,1-dichloroethene. These noncompliances affect positive results only. Since only nondetected results were reported for all of the aforementioned compounds, no action was taken.

Noncompliant %RSDs and Percent Differences (%Ds) were reported for methylene chloride, acetone, propionitrile, 4-methyl-2-pentanone, acrolein, acetonitrile, idomethane and bromoform. No action was taken, however, since the affected samples were reanalyses and were not used in validation.

The laboratory case narrative states that 1,1-dichloroethene did not meet criteria for the initial calibration performed on 10/03/95. Therefore, the laboratory reanalyzed the samples associated with this calibration under a calibration which met criteria on 10/09/95. However, the samples were reanalyzed outside of holding time. As a result, the original samples were chosen for validation. It should be noted that the laboratory did not report both sets of data. The laboratory reported only the results from the reanalyses, consequently, the data reviewer had to amend the laboratory forms to report the results from the original analyses. Since no positive results were reported for 1,1-dichloroethene in the affected samples, no action was necessary.

It should be noted that the sample the laboratory analyzed for the Matrix Spike/Matrix Spike Duplicate (MS/MSD) parameter are not included in this SDG. Therefore, no evaluation could be made based on the MS/MSD parameters.

No other problems were noted.

Executive Summary

Laboratory Performance: Initial and continuing calibration RRFs less than 0.050 were reported for 1,4-dioxane and 2-butanone. Initial calibration %RSDs greater than the 50% quality control limit were reported for acetone, vinyl acetate and trans-1,4-dichloro-2-butene. Numerous compounds had initial and/or continuing calibration %RSDs and %Ds greater than 30 and 25%. Methylene chloride was detected in both the soil and aqueous laboratory method blanks. High surrogate recoveries were reported in samples FD02, S26-MW01-01 and S26-MW01-02. The laboratory did not report both sets of data for the original analyses and reanalyses of samples FD02, S25-MW01-02, S26-MW01-01 and S26-MW01-02.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Organic Data Review", as amended for use within EPA Region III, and the NEESA guidelines entitled "Sampling and Chemical Analysis Quality Assurance Requirements for the Navy Installation Restoration Program (NEESA 20.2-047B; 6/88).

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NEESA Guidelines and the Quality Assurance Project Plan (QAPP)."

Anne K. Battista

Brown and Root Environmental

Anne K. Battista
Chemist/Data Validator

Brown and Root Environmental

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

Data Qualifier Key:

U - Value is a nondetect as reported by the laboratory.

B - Positive result is an artifact of blank contamination and should not be considered present.

J - Positive value is considered estimated due to various technical noncompliances, or since it is reported at a concentration less than the CRQL.

UJ - Nondetected result is considered estimated due to various technical noncompliances.

UR - Nondetected result is considered unreliable due to initial and continuing calibration RRFs less than 0.050.

Brown & Root Environmental

INTERNAL CORRESPONDENCE

C-49-12-5-187

TO :	LEEANN SINAGOGA	DATE:	JANUARY 16, 1996
FROM:	WILLIAM J. BROTZ	COPIES:	DV FILE

SUBJECT: INORGANIC DATA VALIDATION - TAL METALS PLUS CYANIDE AND TIN
CTO 222 - INDIAN HEAD, MARYLAND
SAMPLE DELIVERY GROUP SDG - 9509191

SAMPLES:	5/Soil/	FD01	S25-MW01-01	S25-MW01-02
		S26-MW01-01	S26-MW01-02	

Overview

The sample set for SDG 9509191 Indian Head, Maryland, consists of five (5)soil samples. One and one field duplicate pair (samples FD01 and S25-MW01-01). No equipment rinsate blanks were included in this SDG.

The above samples were analyzed for Target Analyte List (TAL) metals plus cyanide and tin. The samples were collected by Brown & Root Environmental on September 19, 1995 and analyzed by Ceimic Corporation under Naval Energy and Environmental Support Activity (NEESA) Level D Quality Assurance/Quality Control (QA/QC) criteria. All analyses were conducted using Contract Laboratory (CLP) Statement of Work (SOW) ILM03.0 analytical and reporting protocols.

Summary

All analytes were successfully analyzed. The findings offered in this report are based upon a general review of all available data including data completeness, holding times, calibration data, laboratory method/preparation blanks, interference check sample (ICS) results, matrix spike recoveries, laboratory duplicate results, laboratory control sample (LCS) results, serial dilution results, detection limits, and analyte quantitation.

All analyses, with the exception of antimony, arsenic, lead, mercury, potassium, selenium, silver, sodium, thallium and cyanide were conducted using Inductively Coupled Plasma (ICP) methodologies. Mercury analysis was conducted using cold vapor AA. Cyanide, potassium and sodium analyses were conducted using flame AA. Antimony, arsenic, lead, selenium, silver and thallium analyses were conducted using Graphite Furnace Atomic Absorption (GFAA).

Areas of concern with respect to data quality are listed below.

Major Problems

None

Minor Problems

The Contract Required Detection Limit (CRDL) Percent Recoveries (%Rs) for arsenic, calcium and nickel exceeded the upper quality control limit. Positive results < 2X CRDL for calcium have been qualified as biased high, "K".

The following contaminants were detected in the laboratory method and field blanks at the following maximum concentrations :

Analyte	Maximum Concentration	Action Level-Soil
sodium	34.3 mg/kg	172 mg/kg
zinc	1.082 mg/kg	5.41 mg/kg

Samples Affected: All

A 1g to 100 ml digestion was used.

An action level of 5x the maximum contaminant level has been used to evaluate sample data for blank contamination. Sample aliquot size, percent moisture and dilution factors were taken into consideration when evaluating for blank contamination. Positive results < the action level for sodium and zinc have been qualified, "B", as a result of blank contamination.

The interfering analyte iron was present in samples S26-MW01-01 and S26-MW01-02 at concentrations which were comparable to the level of iron in the Interference Check Sample (ICS) solution. Several analytes namely, barium, beryllium, copper, manganese, tin and zinc were present in the ICS solution at concentrations which exceeded the Instrument Detection Limit (IDL). Interference affects exist for beryllium, copper and tin in the affected samples. Positive results and nondetects reported for beryllium, copper and tin in the affected sample were qualified as biased low, "L", and "UL", respectively.

The Matrix Spike (MS) Percent Recovery (%R) for antimony, lead and mercury were below the lower quality control limit. Positive results and nondetects for antimony, lead and mercury were qualified as biased low, "L", and "UL", respectively.

The ICP Serial Dilution Percent Difference (%D) for iron was outside quality control limits in the soil matrix. Positive results for iron in the soil matrix were qualified as estimated, "J".

Notes

The CRDL %R for chromium, iron and lead exceeded the upper quality control limit. No actions were necessary for chromium and nickel as all results were > 2X CRDL or nondetects.

Executive Summary

Laboratory Performance: The CRDL Standard analysis recoveries for several analytes were outside quality control limits. Several analytes were present in the laboratory method blanks. The ICP Serial Dilution %D for iron was noncompliant.

Other Factors Affecting Data Quality: The MS %R for several analytes was low. ICP interference was noted for several analytes in two samples.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Data Validation", April 1993 Revision as amended for use within USEPA Region III, and the NEESA document entitled "Sampling and Chemical Analysis Quality Assurance requirements for the Navy Installation Restoration Program" (NEESA 20.2-047B; 6/88).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NEESA Guidelines and the Quality Assurance Project Plan (QAPP)."

Brown & Root Environmental
William J. Brotz
Chemist

Brown & Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

Data Qualifier Key:

U - Value is a nondetect as reported by the laboratory.

B - Positive result is considered to be an artifact of blank contamination and should not be considered present.

K - Positive result is considered biased high as a result of high CRDL %R.

L - Positive result is considered biased low as a result of poor MS %R or ICP interference.

UL - Nondetected result is considered biased low as a result of poor MS %R or ICP interference.

J - Positive result is estimated as a result of ICP Serial Dilution outside quality control limits.

Brown & Root Environmental

INTERNAL CORRESPONDENCE

C-49-01-6-144

TO:	LEEANN SINAGOGA	DATE:	JANUARY 18, 1996
FROM:	ANNE K. BATTISTA	COPIES:	DV FILE

SUBJECT: ORGANIC DATA VALIDATION- VOLATILEORGANIC COMPOUNDS
CTO 222, NSWC INDIAN HEAD, INDIANHEAD, MARYLAND
SDG 9509200

SAMPLES: 3/Soil/

FD04	S05-MW01-01	S05-MW01-02

2/Aqueous/

TB03	05-RB03-01

Overview

The sample set for the CTO 222 NSWC Indian Head site, SDG 9509200 consists of three (3) soil environmental samples, one (1) trip blank, designated -TB-, and one (1) rinsate blank, designated -RB-. All samples were analyzed for Target Compound List (TCL) Appendix IX volatile organic compounds. No samples were designated by the field crew for Matrix Spike/Matrix Spike Duplicate analysis. A field duplicate pair was included in this SDG(S05-MW01-01/FD04).

The samples were collected by Brown and Root Environmental on September 20th, 1995 and analyzed by GP Environmental under Naval Energy and Environmental Support Activity (NEESA) Level D Quality Assurance/Quality Control (QA/QC) criteria. All analyses were conducted using SW-846 Method 8240 analytical and reporting protocols.

Summary

Allcompounds were successfully analyzed, with the exception of those compounds qualified as unreliable, (UR). The findings offered in this report are based upon a general review of all available data including data completeness, holding times until analysis, GC/MS tuning and calibration data, laboratory and field blank results, surrogate spike recoveries, laboratory control sample results, internal standards performance, tentatively identified compounds, compound identification and compound quantitation. Areas of concern with respect to data quality are listed below.

Major Problems

- Initial and/or continuing calibration Relative Response Factors (RRFs) for 1,4-dioxane and 2-butanone were less than 0.050. Failure to meet this quality control criterion indicates that the laboratory's instruments could not achieve satisfactory sensitivity for these compounds, and therefore, the associated positive and nondetected results for these compounds are severely compromised. Nondetected results reported for 1,4-dioxane and 2-butanone were considered biased very low, and unreliable. Therefore, the nondetected results in the affected samples were rejected, (UR).

Minor Problems

- Initial calibration Percent Relative Standard Deviations (%RSDs) greater than the 50% quality control limit were reported for acetone, vinyl acetate and trans-1,4-dichloro-2-butene. Positive and nondetected results are affected by these noncompliances. A positive result for acetone was qualified as estimated, (J), in sample TB03. Nondetected results for the aforementioned compounds were qualified as estimated, (UJ), in the affected samples. The direction of bias is unknown.

- The following table summarizes the maximum concentration of volatile compounds detected in the laboratory method blanks and field quality control blanks analyzed in this SDG:

Compound	Maximum Concentration	Action Level
Methylene Chloride	16 μg/Kg	160 μg/Kg
Methylene Chloride	1.6 μg/L	16 μg/L
Acetone *	4 μg/L	1,300 μg/Kg
Carbon Disulfide *	3.4 μg/L	566 μg/Kg

* - Maximum concentration detected in field quality control blank.

The aliquots used for analysis, percent solids and dilution factors were considered during the application of the action levels. Positive results for acetone and methylene chloride that were reported in samples at concentrations less than the validation action level were considered false positives and were qualified, (B). Positive results reported above the validation action level were not qualified. No action was taken for carbon disulfide since no positive results were reported. It should be noted that field quality control blanks are not qualified based on field quality control blank contamination.

- A low surrogate Percent Recovery (%R) was reported for toluene-d8 in sample FD04. Positive and nondetected results were qualified as estimated, (J) and (UJ), respectively, in the affected sample. The direction of bias is unknown.

- High %Rs for 1,2-dichloroethane-d4 and toluene-d8 were reported in samples S05-MW01-01 and S05-MW01-02. Positive results only are affected by high recoveries. Positive results in the aforementioned samples were qualified as estimated, (J). The direction of bias is unknown.

- Positive results reported at concentrations below the Contract Required Quantitation Limit (CRQL) are qualified as estimated, (J).

Notes

An initial calibration %RSD greater than 50% was reported for methylene chloride. No action was taken since the affected samples had been qualified for blank contamination.

Initial calibration %RSDs greater than 30% were reported for acrolein, acrylonitrile, acetone, carbon disulfide and 1,1-dichloroethene. These noncompliances affect positive results only. Since only nondetected results were reported for all of the aforementioned compound except acetone, no action was taken. No action was taken for acetone, in the affected samples, since they had previously been qualified for blank contamination.

Noncompliant %RSDs and Percent Differences (%Ds) were reported for methylene chloride, acetone, propionitrile, 4-methyl-2-pentanone, acrolein, acetonitrile, idomethane and bromoform. No action was taken, however, since the affected samples were reanalyses and were not used in validation.

The laboratory case narrative states that 1,1-dichloroethene did not meet criteria for the initial calibration performed on 10/03/95. Therefore, the laboratory reanalyzed the samples associated with this calibration under a calibration which met criteria on 10/09/95. However, the samples were reanalyzed outside of holding time. As a result, the original samples were chosen for validation. Since no positive results were reported for 1,1-dichloroethene in the affected samples, no action was necessary.

It should be noted that the samples the laboratory analyzed for the Matrix Spike/Matrix Spike Duplicate (MS/MSD) parameter are not included in this SDG. Therefore, no evaluation could be made based on the MS/MSD parameters.

No other problems were noted.

Executive Summary

Laboratory Performance: Initial and continuing calibration RRFs less than 0.050 were reported for 1,4-dioxane and 2-butanone. Initial calibration %RSDs greater than the 50% quality control limit were reported for acetone, vinyl acetate and trans-1,4-dichloro-2-butene. Numerous compounds had initial and/or continuing calibration %RSDs and %Ds greater than 30 and 25%. Methylene chloride was detected in both the soil and aqueous laboratory method blanks. A low surrogate %R was reported for toluene-d8 in sample FD04. High %Rs for 1,2-dichloroethane-d4 and toluene-d8 were reported in samples S05-MW01-01 and S05-MW01-02.

Other Factors Affecting Data Quality: Acetone and carbon disulfide were detected in the field quality control blanks.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Organic Data Review", as amended for use within EPA Region III, and the NEESA guidelines entitled "Sampling and Chemical Analysis Quality Assurance Requirements for the Navy Installation Restoration Program (NEESA 20.2-047B; 6/88).

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NEESA Guidelines and the Quality Assurance Project Plan (QAPP)."

Anne K. Battista

Brown and Root Environmental

Anne K. Battista
Chemist/Data Validator

Brown and Root Environmental

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

Data Qualifier Key:

U - Value is a nondetect as reported by the laboratory.

B - Positive result is an artifact of blank contamination and should not be considered present.

J - Positive value is considered estimated due to various technical noncompliances, or since it is reported at a concentration less than the CRQL.

UJ - Nondetected result is considered estimated due to various technical noncompliances.

UR - Nondetected result is considered unreliable due to initial and continuing calibration RRFs less than 0.050.

Brown & Root Environmental

INTERNAL CORRESPONDENCE

C-49-12-5-186

TO : LEEANN SINAGOGA

DATE: JANUARY 15, 1996

FROM: WILLIAM J. BROTZ

COPIES: DV FILE

SUBJECT: INORGANIC DATA VALIDATION - TAL METALS PLUS CYANIDE AND TIN
CTO 222 - INDIAN HEAD, MARYLAND
SAMPLE DELIVERY GROUP SDG - 9509200

SAMPLES: 3/Soil/ FD-03 S05-MW01-01 S05-MW01-02

1/Aqueous/ 05-RB03-01

Overview

The sample set for SDG 9509200 Indian Head, Maryland, consists of three (3) soil samples and one equipment rinsate blank (designated -RB). One field duplicate pair was included in this SDG (samples FD-03 and S05-MW01-02).

.he above samples were analyzed for Target Analyte List (TAL) metals plus cyanide and tin. The samples were collected by Brown & Root Environmental on September 20, 1995 and analyzed by Ceimic Corporation under Naval Energy and Environmental Support Activity (NEESA) Level D Quality Assurance/Quality Control (QA/QC) criteria. All analyses were conducted using Contract Laboratory (CLP) Statement of Work (SOW) ILM03.0 analytical and reporting protocols.

Summary

All analytes were successfully analyzed. The findings offered in this report are based upon a general review of all available data including data completeness, holding times, calibration data, laboratory method/preparation blanks, interference check sample (ICS) results, matrix spike recoveries, laboratory duplicate results, laboratory control sample (LCS) results, serial dilution results, detection limits, and analyte quantitation.

All analyses, with the exception of antimony, arsenic, lead, mercury, potassium, sodium, selenium, silver, thallium and cyanide were conducted using Inductively Coupled Plasma (ICP) methodologies. Mercury analysis was conducted using cold vapor AA. Cyanide, potassium and sodium analyses were conducted using flame AA. Antimony, arsenic, lead, selenium, silver and thallium analyses were conducted using Graphite Furnace Atomic Absorption (GFAA).

Areas of concern with respect to data quality are listed below.

Major Problems

None

Minor Problems

The Contract Required Detection Limit (CRDL) Percent Recoveries (%Rs) for calcium and selenium exceeded the upper quality control limit. Positive results for calcium and selenium < 2X CRDL have been qualified as biased high, "K".

The CRDL %R for cadmium was below the lower quality control limit. Positive results < 2X CRDL and nondetects reported for cadmium have been qualified as biased low, "L", and "UL", respectively.

The CRDL %R for tin exceeded the upper quality control limit. Nondetected results reported for tin have been qualified as estimated, "UJ". Bias could not be determined due to conflicting bias from ICP interference.

The CRDL for nickel exhibited recoveries both above and below quality control limits. Positive results < 2X CRDL and nondetects reported for nickel have been qualified as estimated, "J", and "UJ", respectively.

The following contaminants were detected in the laboratory method and field blanks at the following maximum concentrations :

Analyte	Maximum Concentration	Action Level-Soil	Action Level-Aqueous
arsenic[1]	3.9 ug/L	1.95 mg/kg	NA
calcium[1]	177 ug/L	88.5 mg/kg	NA
magnesium[1]	73.7 ug/L	36.9 mg/kg	NA
mercury[2]	0.1 ug/L	NA	0.5 ug/L
sodium[3]	34.3 mg/kg	172 mg/kg	NA
vanadium	23.6 ug/L	11.8 mg/kg	118 ug/L
zinc	1.082 mg/kg	5.41 mg/kg	NA

Samples Affected: All

[1] Maximum concentration found in an equipment rinsate blank.
[2] Maximum cincentration found in an aqueous preparation blank.
[2] Maximum cincentration found in a soil preparation blank.

A 1g to 100 ml digestion was used.

An action level of 5x the maximum contaminant level has been used to evaluate sample data for blank contamination. Sample aliquot size, percent moisture and dilution factors were taken into consideration when evaluating for blank contamination. Positive results < the action level for calcium and sodium have been qualified, "B", as a result of blank contamination. No action was taken for the remaining analytes since either the results were greater than the action level or were nondetects.

The interfering analyte iron was present in all soil samples at concentrations which were comparable to the level of iron in the Interference Check Sample (ICS) solution. Several analytes namely, barium, copper, manganese, tin and zinc were present in the ICS solution at concentrations which exceeded the Instrument Detection Limit (IDL). Interference affects exist for tin in the affected samples. Nondetects reported for tin in the affected samples were qualified as biased low, "UL".

The MS %Rs for antimony, lead, and mercury were below the lower quality control limit. Positive results for antimony, lead and mercury were qualified as biased low, "L", and "UL", respectively.

The ICP Serial Dilution Percent Difference (%D) for iron was outside quality control limits in the soil matrix. Positive results for iron in the soil matrix were qualified as estimated, "J".

The Graphite Furnace Atomic Absorption (GFAA) Post Digestion Spike (PDS) Percent Recovery (%R) for arsenic in sample RB0301 was below the lower quality control limit. The nondetected result reported for arsenic in sample RB0301 was qualified as biased low, "L".

Notes

The Contract Required Detection Limit (CRDL) for aluminum, chromium, iron, lead and thallium exceeded the upper quality control limit. No actions were necessary for the aforementioned analytes since all results were > 2X CRDL or nondetects.

Executive Summary

Laboratory Performance: The CRDL Standard analysis recoveries for several analytes were outside quality control limits. Several analytes were present in the laboratory method and field quality control blanks. The ICP Serial Dilution %D for iron was noncompliant.

Other Factors Affecting Data Quality: The MS %R for several analytes antimony was low. ICP interference was noted for several analytes in three samples.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Data Validation", April 1993 Revision as amended for use within USEPA Region III, and the NEESA document entitled "Sampling and Chemical Analysis Quality Assurance requirements for the Navy Installation Restoration Program" (NEESA 20.2-047B; 6/88).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NEESA Guidelines and the Quality Assurance Project Plan (QAPP)."

Brown & Root Environmental
William J. Brotz
Chemist

Brown & Root Environmental
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.

)ata Qualifier Key:

U - Value is a nondetect as reported by the laboratory.

B - Positive result is considered to be an artifact of blank contamination and should not be considere present.

K - Positive result is considered biased high as a result of high CRDL %R.

L - Positive result is considered biased low as a result of poor MS %R or GFAA PDS %R.

UL - Nondetected result is considered biased low as a result of poor CRDL %R, MS %R or ICP interference.

J - Positive result is estimated as a result of ICP Serial Dilution outside quality control limits.

UJ - Nondetected result is estimated as a result of poor CRDL %R or ICP interference

Brown & Root Environmental

INTERNAL CORRESPONDENCE

C-49-12-5-182

TO :	LEEANN SINAGOGA	DATE:	JANUARY 16, 1996
FROM:	WILLIAM J. BROTZ	COPIES:	DV FILE

SUBJECT: MISCELLANEOUS DATA VALIDATION - AMMONIA, NITRATE/NITRITE, TKN, TOC AND NITROCELLULOSE, CTO 222 - INDIAN HEAD, MARYLAND
SAMPLE DELIVERY GROUP SDG - 9509200

SAMPLES: 1/Aqueous/ 05-RB03-01

3/Soil/ FD03 S05-MW01-01 S05-MW01-02

Overview

The sample set for SDG 9509200 Indian Head, Maryland, consists of three (3) soil samples, one (1) equipment rinsate blank and one field duplicate pair (samples FD01 and S05-MW01-01).

The above samples were analyzed for ammonia, nitrate/nitrite, total organic carbon (TOC) and nitrocellulose. The samples were collected by Brown & Root Environmental on September 20, 1995 and analyzed by Ceimic Corporation under Naval Energy and Environmental Support Activity (NEESA) Level C Quality Assurance/Quality Control (QA/QC) criteria. All analyses were conducted using method specific analytical and reporting protocols.

Summary

All analytes were successfully analyzed. The findings offered in this report are based upon a general review of all available data including data completeness, holding times, calibration data, laboratory method/preparation blanks, matrix spike recoveries, laboratory duplicae results, laboratory control sample (LCS) results and detection limits.

Areas of concern with respect to data quality are listed below.

Major Problems

None

Minor Problems

The Continuing Calibration Verification (CCV) Percent Recoveries (%Rs) for ammonia, and TOC were below the lower quality control limit. Positive results for ammonia, and TOC have been qualified as biased low, "L", and "UL" respectively.

The Initial Calibration Verification (ICV) %R for TKN was above the upper quality control limit. Positive results reported for TKN have been qualified as estimated, "J". Bias could not be determined due to conflicting bias from LCS %R.

The Laboratory Control Sample (LCS) Percent Recovery (%R) for TKN was below the lower quality control limit. Positive results reported for TKN were qualified as estimated, "J". Bias could not be determined due to conflicting bias from ICV %R.

Notes:

The CCV %R for TOC was > 110%. No action was required since CCV %R was within +/- 1% of the upper control limit. The CCV %R for TKN was < 90%. No action was required since CCV %R was within +/- 1% of the lower quality control limit.

Executive Summary

Laboratory Performance: The CCV %R for several analytes were outside quality control limits. The LCS %R for TKN was low.

Other Factors Affecting Data Quality: None

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Data Validation", April 1993 Revision as amended for use within USEPA Region III, and the NEESA document entitled "Sampling and Chemical Analysis Quality Assurance requirements for the Navy Installation Restoration Program" (NEESA 20.2-047B; 6/88).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NEESA Guidelines and the Quality Assurance Project Plan (QAPP)."

Brown & Root Environmental
William J. Brotz
Chemist

Brown & Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

Data Qualifier Key:

U - Value is a nondetect as reported by the laboratory.

L - Positive result is considered biased low as a result of low CCV %R or low LCS %R.

UL - Nondetected result is considered biased low as a result of low CCV %R.

J - Positive result is considered estimated as a result of low LCS %R.

Brown & Root Environmental INTERNAL CORRESPONDENCE

C-49-01-6-121

TO:	LEEANN SINAGOGA	DATE:	JANUARY 15, 1996
FROM:	MICHELLE L. ALLEN	COPIES:	D.V. FILE

SUBJECT: ORGANIC DATA VALIDATION - APPENDIX IX TCL VOCs & SVOCs
CTO 222, INDIAN HEAD, INDIAN HEAD, MARYLAND
SDG 9509221

SAMPLES: 18/Soil/

S25-SB01-002	S25-SD002	S26-SB02-001	S26-SB02-002
FD05	S25-MW02-002	S25-SD001	S25-SD003
S26-MW02-001	S26-MW02-002	S26-MW03-001	S26-MW03-002
S26-SB03-001	S26-SB03-002	FD08	S25-SD004
S26-SB04-001	S26-SB04-002		

2/Aqueous/

S25-SW002	FD06	S25-SW001	S250SW003
S25-SW004			
S-25-TB04-01	S25-RB05-001	S26-RB07	

Overview

The sample set for the CTO 222 Indian Head site, SDG 9509221, consists of eighteen (18) soil environmental samples, five (5) aqueous environmental samples, and two (2) rinsate blanks (designated -RB-). These samples were analyzed for Appendix IX Target Compound List (TCL) semivolatile organic compounds. In addition, four soil samples (S25-SB01-002, S25-SD002, S26-SB02-001, and S26-SB02-002), one aqueous sample (S25-SW002), and one (1) trip blank (S-25-TB04-01) were analyzed for Appendix IX TCL volatile organic compounds. Three field duplicate pairs (samples FD05/S25-SD001, FD06/S25-SW001, and FD08/S26-SB04-001) were included in this SDG.

The samples were collected by Brown & Root Environmental personnel on September 21-25, 1995 and analyzed by GP Environmental Services under Naval Energy and Environmental Support Activity (NEESA) Level D Quality Assurance/Quality Control (QA/QC) criteria. All analyses were conducted using SW-846/8240 and 8270 analytical and reporting protocols.

Summary

All compounds were successfully analyzed, with the exception of those results qualified as unreliable. [UR]. The findings offered in this report are based upon a general review of all available data including data completeness, holding times until analysis, GC/MS tuning and calibration data, laboratory blank results, surrogate spike recoveries, matrix spike/matrix spike duplicate results, laboratory control sample results, field duplicate precision, internal standards performance, compound identification and compound quantitation. Tentatively identified compounds were not provided for the GC/MS analyses.

Areas of concern with respect to data quality are listed below.

MEMO TO: LEEANN SINAGOGA
DATE: JANUARY 15, 1996 - PAGE 2

Major Problems

- Initial and continuing calibrations were not performed for the volatile compound chloroprene and for the semivolatile compounds hexachlorophene and kepone. Nondetected results in the affected samples have been qualified as unreliable, [UR].

- The initial and continuing calibration Relative Response Factors (RRFs) for 1,4-dioxane and diallate were less than 0.050. In addition, the initial calibration and majority of associated continuing calibration RRFs for 4-nitroquinoline-1-oxide were below 0.050. Failure to meet this quality control criterion indicates that the laboratory's instruments could not achieve satisfactory sensitivity for these compounds, and therefore, the associated positive and nondetected results for these compounds are severely compromised. The nondetected results reported for the volatile compound 1,4-dioxane and the semivolatile compounds diallate and 4-nitroquinoline-1-oxide in the affected samples are considered to be unreliable and are rejected, [UR]. These results are biased very low.

  An initial calibration and subsequent continuing calibrations contained RRFs for 2-butanone below the 0.050 quality control limit. The nondetected results reported for this compound in the affected soil samples were qualified as rejected, [UR]. These results are biased very low.

  Some continuing calibration RRFs for 3-nitroaniline, famphur, and phorate were less than the 0.050 quality control criteria. Only nondetected results were reported for these compounds in the affected samples and these nondetects are considered unreliable and are rejected, qualified, [UR]. These results are biased very low.

Minor Problems

- The volatile analyses of samples S26-SB02-001 and S26-SB02-002 were analyzed outside of the maximum 14 day holding time. The positive and nondetected results reported for the target compounds in these samples are qualified as estimated, [J] and [UJ], respectively. The direction of bias cannot be determined.

  All the soil samples analyzed for Appendix IX TCL semivolatile organic compounds were extracted outside the Region III 7 day maximum holding time. The positive and nondetected results reported for the target compounds were qualified as estimated, [J] and [UJ], respectively. No bias can be determined.

- Some initial calibration Percent Relative Standard Deviations (%RSDs) for the volatile compounds acetone, 2-hexanone, 1,1,2,2-tetrachloroethane, and 1,2-dibromo-3-chloropropane and the semivolatile compound famphur exceeded the 50% validation quality control limit. Only nondetected results were reported for these compounds in the affected samples and these nondetects are qualified as estimated, [UJ]. No bias can be determined.

An initial calibration %RSD for methylene chloride was greater than 30%. The positive results reported for this compound in samples S26-SB02-001 and S26-SB02-002 were qualified as estimated. [J]. No bias can be determined.

- Some continuing calibration Percent Differences (%Ds) for acetone, famphur, methapyrilene, 3-nitroaniline, and 4-nitrophenol exceeded 50%. The nondetected results reported for these compounds in the affected samples were qualified as estimated, [UJ]. The direction of bias cannot be determined.

- The following table summarizes the maximum concentrations of volatile compounds detected in laboratory method and field quality control blanks analyzed in this SDG:

Compound	Maximum Concentration	Action Level
Methylene chloride	1.6 μg/L	16 μg/L
Acetone	4.6 μg/Kg	46 μg/Kg
Toluene	3.7 μg/Kg	19 μg/Kg

Percent moisture, aliquot size, and dilution factors were considered during application of all action levels. Positive results reported for these compounds in the associated samples reported at concentrations less than the respective action levels are considered false positives and are qualified, [B].

- The Percent Recovery (%R) for the surrogate spike compound toluene-d8 (TOL) was below the quality control limit in sample S25-SB01-002. The reanalysis of this sample yielded acceptable surrogate %Rs, however, this analysis was performed grossly outside of the holding time. Hence, the original analysis was used in the data validation. The positive and nondetected results reported for the target compounds in this sample were qualified as estimated, [J] and [UJ], respectively. No bias can be determined.

All three base/neutral surrogate spike compounds yielded %Rs below the lower quality control limits in sample S25-SW003. In addition, the %R for 2-fluorophenol (2FP) was low. Upon reanalysis, the surrogate %Rs were within the quality control limits, however, the sample was re-extracted grossly outside of the 7 day maximum holding time. Therefore, the original analysis of this sample was used in the validation. The nondetected results reported for the base/neutral target compounds in this sample were qualified biased low, [UL]. No action was taken for the acid fraction compounds since only one surrogate was noncompliant.

- All three volatile internal standard areas were below the lower quality control limits in sample S25-SB01-002. The reanalysis of this sample yielded acceptable internal standard areas, however, this analysis was performed grossly outside of the holding time. Hence, the original analysis was used in the data validation. The positive and nondetected results reported for the target compounds in this sample were qualified as estimated, [J] and [UJ], respectively. No bias can be determined.

- Positive results for several compounds reported at concentrations less than the Contract Required Quantitation Limit (CRQL) are considered to be estimates and are qualified, [J].

Notes

The volatile reanalysis of sample S25-SB01-002RE was performed grossly outside of the 14 day maximum holding time (i.e., > 2X maximum holding time). In addition, the semivolatile re-extraction of sample S25-SW003RE grossly exceeded the 7 day holding time from collection until extraction. No action was taken since the reviewer did not used the results from these reanalyses in the validation of the data.

Some initial calibration %RSDs and continuing calibration %Ds for several volatile and semivolatile compounds exceeded the 30% and 25% quality control limits, respectively. No actions were taken since no positive results were reported for these compounds in the affected samples and the nondetected results were not compromised.

Several samples (including quality control samples) yielded high surrogate %Rs for the acid fraction surrogate 2,4,6-tribromophenol (TBP). No qualifications were necessary to the affected environmental samples since only one acid fraction surrogate was noncompliant.

The volatile soil Matrix Spike/Matrix Spike Duplicate (MS/MSD) analyses yielded a high Relative Percent Difference (RPD) for 1,1-dichloroethene. No action was necessary since no positive result was reported for this compound in the unspiked sample.

The semivolatile aqueous Matrix Spike/Matrix Spike Duplicate (MS/MSD) analyses yielded a high %Rs for 4-nitrophenol and acenapthene. No action was necessary since the unspiked sample was not included in this SDG.

Due to the absence of quality control limits for the volatile and semivolatile Laboratory Control Sample (LCS) analyses, the %Rs reported for these samples could not be evaluated. However, in the professional opinion of the data validator, the %Rs for these laboratory quality control samples are reasonable and are not indicative of compromised quality control procedures. Therefore, the LCS %Rs did not effect the environmental data contained in this SDG.

According to EPA Region III data validation protocol, no qualifications are made for field duplicate imprecision. Tables summarizing the results reported for field duplicate sample pair analyses are presented in the attached Appendix C - Support Documentation.

No other problems were noted.

Executive Summary

Laboratory Performance: Holding times were exceeded for two samples and the reanalysis of one sample. Major calibration noncompliances were noted for 2-butanone, 1,4-dioxane, chloroprene, hexachlorophene, kepone, 3-nitroaniline, famphur, phorate, diallate, and 4-nitroquinoline-1-oxide. Some initial and continuing calibration %RSDs and %Ds were greater than 50%. Initial calibration %RSDs and continuing calibration %Ds for several compounds exceeded 30% and 25%, respectively. Some compounds were detected in the volatile laboratory method blanks. Some quality control samples had high %Rs for TBP. Quality control limits were not provided for the LCS analyses.

Other Factors Affecting Data Quality: Some samples had noncompliant volatile and/or semivolatile surrogate %Rs. Low internal standard areas were noted one volatile sample. Some MS/MSD %Rs and RPD were noncompliant. Positive results reported below the detection limit were estimated.

The data for these analyses were reviewed with reference to the "Region III Modifications to National Functional Guidelines for Organic Review Multi-Media, Multi-Concentration (OLM01.0-OLM01.9, 9/94) and the NEESA guidelines entitled "Sampling and Chemical Analysis Quality Assurance requirements for the Navy Installation Restoration Program" (NEESA 20.2-047B; June, 1988.)

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NEESA Guidelines and the Quality Assurance Project Plan (QAPP)."

Brown & Root Environmental

Michelle L. Allen
Chemist/Data Validator

Brown & Root Environmental

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

__Data Qualifier Key:__

U	-	Value is a nondetect as reported by the laboratory.
B	-	Positive result is considered to be an artifact of blank contamination, and should not be considered present.
J	-	Positive result is considered to be estimated based on various technical reasons (i.e., holding time exceedence, initial calibration %RSD > 30%, low surrogate %Rs and/or low internal standard areas, or values less than the CRQL). No bias can be determined.
UL	-	Nondetected result is considered to be biased low as a result of s low surrogate %Rs.
UJ	-	Nondetected result is considered to be estimated based on various technical reasons (i.e., holding time exceedence, noncompliant initial/continuing calibrations, low surrogate %Rs, and low internal standard areas. No bias can be determined.
UR	-	Nondetected result is considered to be rejected as a result of low initial and/or continuing calibration RRFs. These results are biased very low.

Brown & Root Environmental INTERNAL CORRESPONDENCE

C-49-01-6-121

TO:	LEEANN SINAGOGA	DATE:	JANUARY 16, 1996
FROM:	MICHELLE L. ALLEN	COPIES:	D.V. FILE

SUBJECT: ORGANIC DATA VALIDATION - EXPLOSIVES
CTO 222, INDIAN HEAD, INDIAN HEAD, MARYLAND
SDG 9509221

SAMPLES: 9/Soil/

S25-SB01-001	S25-SB01-002	S25-SD002	S26-SB02-001
FD05	S25-MW02-001	S25-MW02-002	S25-SD001
S25-SD003			

5/Aqueous/

S25-SW002	FD06	S25-SW001	S25-SW003
S25-RB05-001			

Overview

The sample set for the CTO 222 Indian Head site, SDG 9509221, consists of nine (9) soil environmental samples, five (5) aqueous environmental samples, and one (1) rinsate blank (designated -RB-). These samples were analyzed for Target Compound List (TCL) explosives. Two field duplicate pairs (samples FD05/S25-SD001 and FD06/S25-SW001) were included in this SDG.

The samples were collected by Brown & Root Environmental personnel on September 21-22, 1995 and analyzed by GP Environmental Services under Naval Energy and Environmental Support Activity (NEESA) Level D Quality Assurance/Quality Control (QA/QC) criteria. All analyses were conducted using SW-846/8330 analytical and reporting protocols.

Summary

All compounds were successfully analyzed. The findings offered in this report are based upon a general review of all available data including data completeness, holding times until analysis, initial and continuing calibration data, laboratory blank results, surrogate spike recoveries, matrix spike/matrix spike duplicate results, laboratory control sample results, field duplicate precision, compound identification and compound quantitation.

Areas of concern with respect to data quality are listed below.

Notes

Some continuing calibration Percent Differences (%Ds) for 4-amino-2,6-dinitrotoluene, 2,6-dinitrotoluene, 2-amino-4,6-dinitrotoluene, and 2,4-dinitrotoluene exceeded the 20% quality control limit. No actions were warranted since no positive results were reported for these compounds in the affected samples and the nondetected results were not compromised.

The laboratory failed to provide quality control limits for the surrogate spike Percent Recoveries (%Rs). Hence, evaluation of the preparative extraction could not be evaluated for the environmental and quality control samples. However, it is the professional opinion of the data reviewer that the %Rs reported for the surrogate spike compound (4-nitroaniline) were reasonable, and therefore, do not impact the sample data.

Due to the absence of quality control limits for the explosive Matrix Spike/Matrix Spike Duplicate (MS/MSD) and Laboratory Control Sample (LCS) analyses, the %Rs and Relative Percent Differences (RPDs) reported for these samples could not be evaluated. However, in the professional opinion of the data validator, the %Rs for these laboratory quality control samples are reasonable and are not indicative of compromised quality control procedures. Therefore, the MS/MSD and LCS %Rs and RPDs did not effect the environmental data contained in this SDG.

According to EPA Region III data validation protocol, no qualifications are made for field duplicate imprecision. Tables summarizing the results reported for field duplicate sample pair analyses are presented in the attached Appendix C - Support Documentation.

No other problems were noted.

Executive Summary

Laboratory Performance: Minor calibration noncompliances were noted for some explosives. Quality control limits were not provided for the surrogate, MS/MSD and LCS analyses.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the "Region III Modifications to National Functional Guidelines for Organic Review Multi-Media, Multi-Concentration (OLM01.0-OLM01.9, 9/94) and the NEESA guidelines entitled "Sampling and Chemical Analysis Quality Assurance requirements for the Navy Installation Restoration Program" (NEESA 20.2-047B; June, 1988.)

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NEESA Guidelines and the Quality Assurance Project Plan (QAPP)."

Brown & Root Environmental

Michelle L. Allen
Chemist/Data Validator

Brown & Root Environmental

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

Data Qualifier Key:

U	Value is a nondetect as reported by the laboratory.

Brown & Root Environmental

INTERNAL CORRESPONDENCE

C-49-01-06-131

TO:	LEE ANN SINAGOGA	DATE:	JANUARY 17, 1996
FROM:	RICKY C. DEPAUL	COPIES:	D. V. FILES

SUBJECT: INORGANIC DATA VALIDATION -
TARGET ANALYTE LIST (TAL) METALS PLUS CYANIDE AND TIN
NSWC INDIAN HEAD
SDG 9509221

SAMPLES:

2/Water/	S25-SW002 (unfiltered)	S25-SW002 (filtered)	
5/Soil/	S25-SB01-001	S25-SB01-002	
	S25-SD002	S26-SB02-001	S26-SB02-002

GP Environmental Laboratories analyzed five soils for Target Analyte List (TAL) metals including cyanide and tin. Additionally, one filtered and unfiltered aqueous sample was included for analyses. No field duplicates or field quality control blanks were included with this analytical data set.

These samples were collected by Halliburton NUS Corporation on 9/2195 and analyzed by GP Environmental Corporation under Naval Energy and Environmental Support Activity (NEESA) Level D Quality Assurance/Quality Control (QA/QC) criteria. All analyses were conducted using Contract Laboratory Program (CLP) Statement of Work (SOW) analytical and reporting protocol.

Minor Problems

- The Contract Required Detection Limit (CRDL) Standard analysis recoveries for cadmium, vanadium, copper, and zinc were below the 90% lower quality control limit. Hence, positive results < 2X CRDL and/or or nondetects for these analytes in affected samples were qualified as biased low, "L" and "UL", respectively.

- The CRDL Standard analysis recoveries for aluminum, chromium, lead, nickel, and tin were both high and low. Positive results < 2X CRDL and/or nondetects for these analytes were qualified as estimated, "J" and "UJ", respectively. Overall bias for these results could not be determined.

- The CRDL Standard analysis recoveries for calcium and magnesium were exceeded the 110% upper quality control limit. Hence, positive results < 2X CRDL for these analytes were qualified as biased high, "K".

- The following contaminants were present in the laboratory method blanks at the following maximum concentrations indicated below:

Analyte	Maximum Concentration	Action Level(s)[1]
manganese	0.695 mg/Kg	NA, 3.475 mg/Kg
mercury	0.1 ug/L	0.5 ug/L, NA
selenium	1.8 ug/L	9.0 ug/L, 0.9 mg/Kg
vanadium	23.7 ug/L	118.5 ug/L, 11.85 mg/Kg
zinc	0.920 mg/Kg	NA, 4.6 mg/Kg
zinc	25.5 ug/L	127.5 ug/L, NA

[1]A 1gm into 100ml soil sample digestion was employed for the soils in this SDG.

An action level of 5X the maximum contaminant level has been established to evaluate the sample data based upon blank contamination. Sample weight, moisture content, and dilution factors were considered prior to the application of the action levels. Positive results for selenium, vanadium, and zinc within the respective action levels were qualified as laboratory artifacts, "B". No actions were necessary for the remaining analytes as positive results for these analytes exceeded the respective action levels.

- The interfering analyte iron was present in samples S25-SB01-002, S25-SD002, and S26-SB02-001 at levels which were comparable to the amount present in the ICS solution for this analyte. Additionally, aluminum was present in sample S26-SB02-001 at a sufficiently high level as to introduce interference affects. Data qualifications were not performed based upon the difficulty encountered when referencing the ICP raw data.

- The aqueous matrix spike recoveries for aluminum, iron, and lead exceeded the 125% upper quality control limit. Positive results for iron were qualified as biased high, "K". Positive result for aluminum and lead were also impacted by low CRDL Standard analysis recoveries. Therefore, these results were qualified as estimated, "J". Overall bias for these results could not be determined.

- The aqueous matrix spike recovery for arsenic was below the 75% lower quality control limit, but > 30%. Only nondetects were reported for this analyte in affected samples and these results were qualified as biased low, "UL".

- The soil matrix spike recoveries for antimony, arsenic, and mercury were below the 75% lower quality control limit, but > 30%. Hence, positive and/or nondetects for these analytes in affected samples were qualified as biased low ""L" and "UL", respectively.

- The soil matrix spike recovery for lead exceeded the 125% upper quality control limit. Hence, positive results for this analyte in affected samples were qualified as estimated, "J", as these results were also biased low as a result of low CRDL Standard analysis recovery. Overall bias for these results could not be determined.

- Aqueous laboratory duplicate imprecision was noted for aluminum. Only positive results were reported for this analyte in affected water samples and these results were qualified as estimated, "J". Overall bias for these results could not be determined.

- The aqueous Laboratory Control Sample (LCS) recovery for tin was below the 80% lower quality control limit. Only nondetects were reported for tin in the affected samples which were further impacted by high and low CRDL Standard analysis recoveries. Hence, nondetects for tin in the affected samples were qualified as estimated, "UJ". Overall bias for these results could not be determined.

- The Graphite Furnace Atomic Absorption (GFAA) Post Digestion Spike (PDS) recoveries for lead in samples S25-SB01-002 and S26-SB02-001 were below the 85% lower quality control limit. However, positive results for lead in these affected samples were further impacted by high soil matrix spike recovery. Hence, positive results for lead in these samples were qualified as estimated, "J". Overall bias for these results could not be determined.

Notes

The CRDL Standard analysis recoveries for aluminum, iron, and selenium exceeded the 110% upper quality control limit. However, no validation actions were necessary for these analytes in the affected samples as only nondetects were reported for selenium.

The GFAA PDS recovery for selenium in sample S26-SB02-001 was below the 85% lower quality control limit. However, no validation actions were warranted for this analyte in this affected sample as this result was previously qualified as a result of blank contamination. Furthermore, the GFAA PDS recoveries for thallium in samples S25-SB01-001 and S25-SW002 exceeded the 115% upper quality control limit. However, no validation actions were warranted for thallium in these samples as only nondetects were reported.

Executive Summary

Laboratory Performance: The CRDL Standard analysis recoveries for numerous analytes were poor. Several analytes were present as contaminants in the laboratory method blanks.

Several analytes which were not supposed to be present in the ICS solution were detected in this solution at levels which exceeded the IDLs for these analytes. Laboratory duplicate imprecision was noted for aluminum. The aqueous LCS recovery for tin was below the 80% lower quality control limit.

Other Factors Affecting Data Quality: The aqueous matrix spike recoveries for aluminum, arsenic, iron, and lead were outside quality control limits. The soil matrix spike recoveries for antimony, arsenic, lead, and mercury were outside quality control limits. The GFAA PDS recoveries for lead, selenium, and thallium were outside control limits as noted in some samples.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Data Validation", April 1993 Revision as amended for use within USEPA Region III and the NEESA document entitled "Sampling and Chemical Analysis Quality Assurance requirements for the Navy Installation Restoration Program" (NEESA 20.2-047B; 6/88).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified."

Ricky C. DePaul

Brown & Root Environmental Corporation
Ricky C. DePaul
Chemist

Brown & Root Environmental Corporation
Joseph A. Samchuck
Data Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

Summary of Data Qualifiers:

L -

Qualify positive results < 2X CRDL as biased low as a result of CRDL Standard analysis recovery < 90% and/or low soil matrix spike recovery.

UL -

Qualify nondetected results as biased low as a result of CRDL Standard analysis recovery < 90% and/or low aqueous matrix spike recovery and/or low soil matrix spike recovery.

K -

Qualify positive results as biased high as a result of high CRDL recovery.

J -

Qualify positive results < 2X CRDL as estimated as a result of both high and low CRDL Standard analysis recovery and/or laboratory duplicate imprecision. Overall bias for these results could not be determined.

UJ -

Qualify nondetected results as estimated as a result of both high and low CRDL Standard analysis recovery. Overall bias for these results could not be determined.

B -

Qualify positive results within the action level as laboratory artifacts based upon blank contamination.

Brown & Root Environmental

INTERNAL CORRESPONDENCE

C-49-01-06-135

TO: LEE ANN SINAGOGA

DATE: JANUARY 17, 1996

FROM: RICKY C. DEPAUL

COPIES: D. V. FILES

SUBJECT: MISCELLANEOUS DATA VALIDATION -
VARIOUS MISCELLANEOUS PARAMETERS
NSWC INDIAN HEAD
SDG 9509221

SAMPLES:

1/Water/ ammonia, nitrate-nitrite, phosphorus, sulfate, total kjeldahl nitrogen, total organic carbon and total organic halides, nitrocellulose

S25-SW002

5/Soil/ ammonia, nitrate-nitrite, and total organic carbon

S25-SB01-001, S25-SB01-002, S25-SD002, S26-SB02-001, S26-SB02-002

1/Soil/ total petroleum hydrocarbons

FD07, S26-SB02-001, S26-SB02-002,

GP Environmental Laboratories analyzed the aforementioned soil and water samples for various miscellaneous parameters including ammonia, nitrate-nitrite, phosphorus, sulfate, Total Kjeldahl Nitrogen (TKN) Total Organic Carbon (TOC), Total Organic Halides (TOX), and Total Petroleum Hydrocarbons (TPH), and nitrocellulose. One field duplicate pair (namely samples FD07 and S26-SB02-001) was included with this analytical data set. A comparison of field duplicate results has been provided with the attached support documentation. No validation actions are warranted for field duplicate comparisons as per Region III validation protocol. No field quality control blanks were included in this data set.

These samples were collected by Brown & Root Environmental Corporation on 9/21/95 and analyzed by GP Environmental Corporation under Naval Energy and Environmental Support Activity (NEESA) Level C Quality Assurance/Quality Control (QA/QC) criteria. All analyses were conducted using method specific analytical and reporting protocol.

Summary

All analytes, with the exception of TOX analysis were successfully analyzed. The findings offered in this report are based upon a general review of all available data including: data completeness, calibration data, holding times, laboratory method and field quality control blanks, field duplicate precision, matrix spike and duplicate results, and laboratory control samples results.

Major Problems

- The 7 day holding time until analysis for TOX was grossly exceeded (i.e., exceeded by a factor or two or more). Hence, the nondetect for this parameter in the affected sample was qualified as biased extremely low and qualified unusable and rejected, "UR".

Minor Problems

- The Continuing Calibration Verification (CCV) recoveries as noted for ammonia analyses were below the 90% lower quality control limit. Only positive results were reported for ammonia analyses and these results were qualified as biased low, "L".

- Laboratory duplicate imprecision was noted for nitrate-nitrite analyses as evidenced in the soil matrix. Only nondetects were reported for this parameter in affected solid samples and these results were qualified as estimated, "UJ". Overall bias for these results could not be determined.

- The aqueous Laboratory Control Sample (LCS) recovery for the TKN analysis was below the 80% lower quality control limit. Additionally, this same TKN result was further impacted by high CCV recovery. Hence, the positive result for TKN in the affected sample was qualified as estimated, "J". Overall bias for this result could not be determined.

- The ICV recovery for the sulfate analysis was marginally low. Hence, the nondetect for this parameter in the affected sample was qualified as biased low, "UL".

Notes

Nitrocellulose analyses were conducted 18 days after sample collection.

The ICV/CCV recoveries for TOX were below the 90% lower quality control limit.

However, no validation actions were warranted for this parameter in the affected sample as this result was previously qualified as rejected and unusable as a result of gross holding time exceedance.

Executive Summary

Laboratory Performance: The laboratory grossly missed the holding time allowance for TOX analysis. A CCV for ammonia analysis was below the lower quality control limit. Soil laboratory duplicate imprecision was noted for nitrate-nitrite. The aqueous LCS recovery for TKN analyses was low. An ICV recovery for sulfate analyses was low.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Data Validation", April 1993, Revision as amended for use within USEPA Region III and the NEESA document entitled "Sampling and Chemical Analysis Quality Assurance requirements for the Navy Installation Restoration Program" (NEESA 20.2-047B; 6/88).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified."

Brown & Root Environmental Corporation
Ricky C. DePaul
Chemist

Brown & Root Environmental Corporation
Joseph A. Samchuck
Data Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

Summary of Data Qualifiers:

UR -

Qualify nondetected result for TOX in affected sample as biased extremely low as a result of gross holding time exceedance (i.e., holding time exceeded by a factor of two or more).

L -

Qualify positive results for ammonia as biased low based upon low CCV recoveries.

UJ -

Qualify nondetected results for nitrate-nitrite as estimated as a result of soil laboratory duplicate imprecision. Overall bias for these results could not be determined.

J -

Qualify positive result for TKN analysis as estimated as a result of low aqueous LCS recovery and high CCV recovery. Overall bias for this result could not be determined.

UL -

Qualify nondetected result for sulfate analysis as biased low as a result of low ICV recovery.

Brown & Root Environmental

INTERNAL CORRESPONDENCE

C-49-12-05-175

TO: LEE ANN SINAGOGA

DATE: JANUARY 16, 1996

FROM: RICKY C. DEPAUL

COPIES: D. V. FILES

SUBJECT: INORGANIC DATA VALIDATION -
TARGET ANALYTE LIST (TAL) METALS PLUS CYANIDE AND TIN
NSWC INDIAN HEAD
SDG 9509223

SAMPLES:

7/Water/	S25-RB05-001		
	FD06 (total)	FD06 (filtered)	
	S25-SW001 (total)	S25-SW001 (filtered)	
	S25-SW003 (total)	S25-SW003 (filtered)	
5/Soil/	FD05	S25-MW02-001	S25-MW02-002
	S25-SD001	S25-SD003	

GP Environmental Laboratories analyzed five soils including one field duplicate pair, (namely samples FD05 and S25-SD001) and one associated equipment rinsate blank for Target Analyte List (TAL) metals including cyanide and tin. Additionally, three waters including one field duplicate pair (namely, samples FD06 and S25-SW001) were included for filtered and unfiltered analyses of the same inorganic analyte list. A comparison of field duplicate results has been provided with the attached support documentation. No validation actions are taken based upon field duplicate results as per Region III validation guidance.

These samples were collected by Brown & Root Environmental Corporation on 9/22/95 and analyzed by GP Environmental Corporation under Naval Energy and Environmental Support Activity (NEESA) Level D Quality Assurance/Quality Control (QA/QC) criteria. All analyses were conducted using Contract Laboratory Program (CLP) Statement of Work (SOW) analytical and reporting protocol.

<u>Summary</u>

All analytes were successfully analyzed. The findings offered in this report are based upon a general review of all available data including: data completeness, calibration data, holding times, laboratory method and field quality control blanks, ICP interference check sample results, matrix spike and duplicate results, field duplicate precision, laboratory control sample results, ICP serial dilution analyses, and graphite furnace atomic absorption results.

Minor Problems

- The Contract Required Detection Limit (CRDL) Standard analysis recoveries for cadmium, vanadium, and zinc were below the 90% lower quality control limit. Only nondetects were reported for cadmium in affected samples. Positive results for vanadium and zinc exceeded 2X CRDL for this analyte. Nondetects for these analytes were qualified as biased low, "UL".

- The CRDL Standard analysis recoveries for calcium and magnesium exceeded the 110% upper quality control limit. Positive results < 2X CRDL for these analytes were qualified as biased high, "K".

- The CRDL Standard analysis recoveries for chromium and tin were both high and low. Only nondetects were reported for these analytes and these results were qualified as estimated, "UJ". Overall bias for these results could not be determined. Similarly, the CRDL Standard analysis recoveries for nickel were both high and low. Hence, positive results for nickel < 2X CRDL and nondetects were qualified as estimated, "J" and "UJ", respectively. Overall bias for these results could not be determined.

- The following contaminants were present in the laboratory and/or field quality control blanks at the following maximum concentrations indicated below:

Analyte	Maximum Concentration	Action Level[1]
calcium[2]	265 ug/L	1325 ug/L, 132.5 mg/Kg
magnesium[2]	71.9 ug/L	359.5 ug/L, 35.95 mg/Kg
selenium	1.8 ug/L	9.0 ug/L, 0.90 mg/Kg
zinc[3]	0.928 mg/Kg	NA, 4.64 mg/Kg
zinc[3]	206.2 ug/L	1031, NA
vanadium	23.7 ug/L	118.5 ug/L, 11.85 mg/Kg

[1]A 1gm into 100ml soil sample digestion was employed for the soils in this SDG.
[2]Contaminant was present at a maximum concentration level in a field quality control blank.
[3]Contaminant was detected at a maximum concentration level in a preparation blank.

An action level of 5X the maximum contaminant level has been established to evaluate the sample data based upon blank contamination. Sample weight, moisture content, and dilution factors were considered prior to the application of the action levels. Positive results for calcium, selenium, vanadium, and zinc within the respective action levels were qualified as laboratory artifacts, "B". No actions were necessary for the remaining analytes as positive results for these analytes exceeded the respective action levels.

- The interfering analyte iron was present in samples S25-MW02-002 and S25-SD001 at levels substantially high as to introduce interference affects. Data qualifications were not performed based upon the difficulty encountered when referencing the ICP raw data.

- The soil matrix spike recoveries for antimony, arsenic, and zinc were below the 75% lower quality control limit, but > 30%. Only positive results were reported for arsenic and zinc. Positive and/or nondetects for antimony, arsenic, and zinc were qualified as biased low, "L" and "UL", respectively.

  The aqueous matrix spike recoveries for aluminum, iron, and lead exceeded the 125% upper quality control limit. Hence, positive results for these analytes (with the exception of aluminum) were qualified as biased high, "K". Positive results for aluminum were further impacted by laboratory duplicate imprecision and thus, qualified as estimated, "J". Overall bias for these results could not be determined. Furthermore, the aqueous matrix spike recovery for arsenic was below the 75% lower quality control limit, but > 30%. Only nondetects were reported for arsenic in the affected waters and these results were qualified as biased low, "UL".

- The Relative Percent Differences (%RPDs) for aluminum and lead exceeded the 35% quality control limit as noted for the soil matrix when sample and duplicate results exceeded 5X CRDL for these analytes. Only positive results were reported for these analytes in the affected soils and these results were qualified as estimated, "J". Overall bias for these results could not be determined.

  Additionally, the difference between sample and duplicate results was greater than the CRDL as noted for aluminum in the water matrix. Hence, positive and nondetected results for aluminum in the affected waters were qualified as estimated, "J" and "UJ", respectively. Overall bias for these results could not be determined.

- Problems were noted during the ICP serial dilution analyses for aluminum, iron, magnesium, manganese, and zinc as evidenced in the soil matrix. Only positive results were reported for these analytes in the affected samples and these results were qualified as estimated, "J". Overall bias for these results could not be determined.

- The Graphite Furnace Atomic Absorption (GFAA) Post Digestion Spike (PDS) recovery for antimony in sample S25-SW003 was below the 85% lower quality control limit. Hence, the positive result for this analyte in the affected sample was qualified as biased low, "L".

Additionally, the GFAA PDS recoveries for thallium were below the 85% lower quality control limit as noted in samples in the filtered and unfiltered analyses of sample S25-SW003. Hence, the nondetected results for thallium in these affected samples were qualified as biased low, "UL".

Notes

The CRDL Standard analysis recoveries for iron and selenium exceeded the 110% upper quality control limit. However, no validation actions were necessary for these analytes in the affected samples as only nondetects were reported.

The laboratory performed some matrix spike and duplicate quality control analyses on samples not designated for inclusion in this SDG.

The GFAA PDS recoveries for selenium in samples S25-MW02-001, S25-MW02-002, S25-SW001 (filtered) were low. However, no validation actions were warranted for this analyte in these affected samples as positive result for selenium in these samples were qualified as laboratory artifacts based upon blank contamination. The GFAA PDS recoveries for thallium in samples FD06, S25-SW001, and S25-RB05-001 exceeded the 115% upper quality control limit. However, no validation actions were warranted for this analyte in these affected samples as only nondetects were reported. Finally, the PDS recovery for thallium as noted in sample S25-MW02-001 exceeded the 115% upper quality control limit. No corrective measures were necessary for thallium in this sample as a nondetect was reported.

Executive Summary

Laboratory Performance: The CRDL Standard analysis recoveries for numerous analytes were poor. Several analytes were detected as contaminants in the laboratory and preparation blanks. Several analytes which were not supposed to be present in the ICS solution were detected in the ICS solution at levels which exceeded the respective IDLs for these analytes. The data package raw data deliverable did not lend itself to expeditious and accurate review of this parameter. Hence, further validation actions were not taken. Laboratory duplicate imprecision was noted for aluminum and lead as evidenced in the soil matrix. Additionally, laboratory duplicate imprecision was noted for aluminum in the water matrix. Problems were noted during the ICP serial dilution analysis for aluminum, iron, magnesium, manganese, and zinc as evidenced in the soil matrix.

Other Factors Affecting Data Quality: Calcium and magnesium contamination was present in the equipment rinsate blank. The interfering analyte iron was present in samples S25-MW02-002 and S25-SD001 at concentrations which were substantially high as to introduce interference affects. Soil matrix spike recoveries for antimony, arsenic, and zinc were low. Aqueous matrix spike recoveries for aluminum, arsenic, iron, and lead were outside quality control limits. The GFAA PDS recoveries for antimony, selenium, and thallium were poor as noted in some affected samples.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Data Validation", April 1993 Revision as amended for use within USEPA Region III and the NEESA document entitled "Sampling and Chemical Analysis Quality Assurance requirements for the Navy Installation Restoration Program" (NEESA 20.2-047B; 6/88).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified."

Ricky C. DePaul

Brown & Root Environmental Corporation
Ricky C. DePaul
Chemist

Brown & Root Environmental Corporation
Joseph A. Samchuck
Data Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

Summary of Data Qualifiers:

L -

Qualify positive results as biased low as a result of low soil matrix spike recovery and/or low GFAA PDS recovery.

UL -

Qualify nondetected results as biased low as a result of low CRDL Standard analysis recovery and/or low soil matrix spike recovery and/or low aqueous matrix spike recovery and/or low GFAA PDS recovery.

K -

Qualify positive results < 2X CRDL as biased high as a result of high CRDL Standard analysis recovery and/or high aqueous matrix spike recovery.

J -

Qualify positive results < 2X CRDL as estimated based upon poor (i.e., both high and low) CRDL Standard analysis recovery and/or laboratory duplicate imprecision and/or problems noted during the ICP serial dilution analysis. Overall bias for these results could not be determined.

UJ -

Qualify nondetected results as estimated as a result of poor (i.e., both high and low) CRDL Standard analysis recovery and/or laboratory duplicate imprecision. Overall bias for these results could not be determined.

B -

Qualify positive results within the action level as laboratory artifacts based upon blank contamination.

Brown & Root Environmental

INTERNAL CORRESPONDENCE

C-49-01-06-142

TO: LEE ANN SINAGOGA

DATE: JANUARY 18, 1996

FROM: RICKY C. DEPAUL

COPIES: D. V. FILES

SUBJECT: MISCELLANEOUS DATA VALIDATION - VARIOUS MISCELLANEOUS PARAMETERS NSWC INDIAN HEAD SDG 9509223

SAMPLES:

4/Water/ ammonia, nitrate-nitrite, nitrocellulose, phosphorus, sulfate, total kjeldahl nitrogen, total organic carbon, and total organic halides

FD06, S25-RB05-001, S25-SW001, S25-SW003

5/Soil/ ammonia, nitrate-nitrite, nitrocellulose, and total organic carbon

FD05, S25-MW02-001 S25-MW02-002, S25-SD001, S25-SD003

GP Environmental Laboratories analyzed the aforementioned soil and water samples for various miscellaneous parameters including ammonia, nitrate-nitrite, nitrocellulose, phosphorus, sulfate, Total Kjeldahl Nitrogen (TKN) Total Organic Carbon (TOC), and Total Organic Halides TOX). Two field duplicate pairs (namely, samples FD06/S25-SW001 and FD05/S25-SD001) were included with this analytical data set. A comparison of field duplicate results has been provided with the attached support documentation. No validation actions are warranted for field duplicate comparisons as per Region III validation protocol.

One equipment rinsate blank (namely, sample S25-RB05-001) was included with this analytical data set.

These samples were collected by Brown & Root Environmental Corporation on 9/22/95 and analyzed by GP Environmental Corporation under Naval Energy and Environmental Support Activity (NEESA) Level C Quality Assurance/Quality Control (QA/QC) criteria. All analyses were conducted using method specific analytical and reporting protocol.

Summary

All analytes were successfully analyzed. The findings offered in this report are based upon a general review of all available data including: data completeness, calibration data, holding times, laboratory method blank and field quality control blank results, field duplicate precision, matrix spike and duplicate results, and laboratory control sample results.

Minor Problems

- The 7 day holding time until analysis was grossly exceeded (i.e., exceeded by a factor of 2 or more). Only positive results were reported for this parameter in the affected water samples and these results were qualified as biased low, "L".

- The Initial Calibration Verification (ICV) recovery for the nitrate-nitrite analyses was extremely low (10%). Hence, positive and/or nondetected nitrate-nitrite results were qualified as biased very low "L" and "UL", respectively.

- The solid LCS recovery for nitrocellulose was low. Additionally, the soil matrix spike recovery for nitrocellulose was low. Only nondetects were reported for this parameter in affected soil samples and these results were qualified as biased low, "UL".

- The ICV and/or CCV recoveries for TOX analyses were below the 90% lower quality control limit. Only positive results were reported in affected samples and these results were qualified as biased low, "L".

Executive Summary

Laboratory Performance: The laboratory grossly exceeded TOX holding times. The ICV recovery for nitrate-nitrite analyses was very low. The solid LCS recovery for nitrocellulose was low. Some ICV/CCV recoveries for TOX analyses were low. Positive and nondetected aqueous TOC results were qualified as biased low as a result of low ICV recovery.

Other Factors Affecting Data Quality: The soil matrix spike recovery for nitrocellulose was low.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Data Validation", as amended for use within USEPA Region III and the NEESA document entitled "Sampling and Chemical Analysis Quality Assurance requirements for the Navy Installation Restoration Program" (NEESA 20.2-047B; 6/88).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified."

Brown & Root Environmental Corporation
Ricky C. DePaul
Chemist

Brown & Root Environmental Corporation
Joseph A. Samchuck
Data Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

Summary of Data Qualifiers:

L -

Qualify positive TOX results as biased low as a result of grossly exceeded holding times. Positive nitrate-nitrite results were biased very low as a result of extremely low ICV recovery. Positive results for TOX analyses were qualified as biased low as a result of low ICV/CCV recovery. Positive aqueous TOC results were qualified as biased low as a result of low ICV recovery.

UL -

Qualify nondetected results for nitrate-nitrite as biased very low as a result of extremely low ICV recovery and/or as a result of low soil matrix spike recovery and/or low solid LCS recovery. Nondetected aqueous TOC results were qualified as biased low as a result of low ICV recovery.

Brown & Root Environmental

INTERNAL CORRESPONDENCE

C-49-01-6-175

TO:	LEEANN SINAGOGA	DATE:	JANUARY 22, 1996
FROM:	ANNE K. BATTISTA	COPIES:	DV FILE

SUBJECT: ORGANIC DATA VALIDATION - TCL EXPLOSIVES/ PETN/NITROGLYCERINE/NITROGUANIDINE CTO 222, NSWC INDIAN HEAD, INDIAN HEAD, MARYLAND SDG NO. 9509224

SAMPLES: 6/Soil/

S26-SB03-001	S25-MW03-001	S25-MW03-002	S25-SD004
S26-SB04-001	FD08		

2/Aqueous/

S25-SW004	S26-RB07

Overview

The sample set for CTO 222, NSWC Indian Head, SDG No. 9509224 consists of six (6) environmental soil samples, one (1) aqueous environmental sample and one (1) rinsate blank, designated RB-. All samples were analyzed for Target Compound List (TCL) explosives, plus PETN, nitroglycerine and nitroguanidine. Sample S26-SB03-001 was analyzed for Matrix Spike/Matrix Spike Duplicate parameters. One field duplicate pair was included in this SDG(S26-SB04-001/FD08).

The samples were collected by Brown and Root Environmental on September 23rd, 24th and 25th, 1995 and analyzed by GP Environmental under Naval Energy and Environmental Support Activity (NEESA) Level D Quality Assurance/Quality Control (QA/QC) criteria. All analyses were conducted using SW-846/8330 analytical and reporting protocols.

Summary

All compounds were successfully analyzed. The findings offered in this report are based upon a general review of all available data including data completeness, holding times until extraction/analysis, laboratory blank results, matrix spike/matrix spike duplicate results, laboratory control sample results, laboratory replicate results, field duplicate precision, compound identification and quantitation, and instrument performance.

Major Problems

- None.

Minor Problems

- None.

Notes

Continuing calibration Percent Differences (%Ds) greater than 20% were reported for 4-amino-2,6-dinitrotoluene, 2-amino-4,6-dinitrotoluene, and 2,6-dinitrotoluene. Positive results only are affected by these noncompliances. No action was necessary since no positive results were reported in the affected samples for the aforementioned compounds.

According to EPA Region III data validation protocol, no qualifications are made for field duplicate imprecision. A table summarizing the results reported for field duplicate sample pair analyses are presented below.

Compound	S26-SB04-001	FD08	RPD (%)
No positives were reported.			

A 2-fold dilution was performed on the samples as per method SW846-8330.

Executive Summary

Laboratory Performance: Continuing calibration %Ds were noted for several compounds.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Organic Data Validation" (3/90), as amended for use within EPA Region III, and the NEESA guidelines "Sampling and Chemical Analysis Quality Assurance requirements for the Navy Installation Restoration Program" (NEESA 20.2-047B; 6/88).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NEESA Guidelines and the Quality Assurance Project Plan (QAPP)."

Anne K. Battista

Brown and Root Environmental

Anne K. Battista
Chemist/Data Validator

Brown and Root Environmental

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

Data Qualifier Key:

U	-	Value is a nondetect as reported by the laboratory.
J	-	Positive result is considered estimated due to various technical noncompliances.
UJ	-	Nondetected result is considered estimated due to various technical noncompliances.

Brown & Root Environmental

INTERNAL CORRESPONDENCE

C-49-01-06-101

TO: LEE ANN SINAGOGA DATE: JANUARY 15, 1996

FROM: RICKY C. DEPAUL COPIES: D. V. FILES

SUBJECT: INORGANIC DATA VALIDATION
TARGET ANALYTE LIST (TAL) METALS PLUS CYANIDE AND TIN
NSWC INDIAN HEAD
SDG 9509224

SAMPLES:

6/Soil/	S26-MW02-001	S26-MW02-002	S26-MW03-001
	S26-MW03-002	S26-SB03-001	S26-SB03-002

GP Environmental Laboratories analyzed six soils for Target Analyte List (TAL) metals including cyanide and tin. No field duplicates or field quality control blanks were included with this analytical data set.

These samples were collected by Brown & Root Environmental Corporation on 9/23/95 and 9/24/95 and analyzed by GP Environmental Corporation under Naval Energy and Environmental Support Activity (NEESA) Level D Quality Assurance/Quality Control (QA/QC) criteria. All analyses were conducted using Contract Laboratory Program (CLP) Statement of Work (SOW) analytical and reporting protocol.

<u>Summary</u>

All analytes were successfully analyzed. The findings offered in this report are based upon a general review of all available data including: data completeness, calibration data, holding times, laboratory method blanks results, ICP interference check sample results, matrix spike and duplicate results, laboratory control sample analyses, ICP serial dilution analyses, and graphite furnace atomic absorption results.

<u>Minor Problems</u>

- The Contract Required Detection Limit (CRDL) Standard analysis recoveries for tin were both high and low (i.e, 121.4% and 80.6%). Therefore, positive results < 2X CRDL and nondetects for this analyte in affected samples will be qualified as estimated, "J" and "UJ", respectively. Overall bias for these results could not be determined.

- The CRDL Standard analysis recovery for arsenic marginally exceeded the 110% upper quality control limit. Only one positive result was below the CRDL for arsenic and this result was also impacted by low soil matrix spike recovery. Thus, overall bias for this result could not be determined. The positive result for arsenic < 2X CRDL was qualified as estimated, "J".

- The following contaminants were present in the laboratory method blanks at the following maximum concentrations indicated below:

Analyte	Maximum Concentration	Action Level[1]
selenium	1.8 ug/L	0.9 mg/Kg
vanadium	23.7 ug/L	11.85 mg/Kg
zinc	0.928 mg/Kg	4.64 mg/Kg

[1]A 1gm into 100ml soil sample digestion was employed for the soils in this SDG.

An action level of 5X the maximum contaminant level has been established to evaluate the sample data based upon blank contamination. Sample weight, moisture content, and dilution factors were considered prior to the application of the action levels. Positive results for selenium and vanadium within the respective action levels were qualified as laboratory artifacts, "B". No validation actions were necessary for the zinc as all positive results for this analyte exceeded the respective action level.

- The interfering analyte iron was present in samples S26-MW02-001, S26-MW02-002, S26-MW03-001, S26-MW03-002, and S26-SB03-001 at levels which were comparable to the amount present in the ICS solution for this analyte. Furthermore, aluminum was present in sample S26-MW03-001 at a sufficiently high level as to introduce interference affects. Additionally, several analytes which were not supposed to be present in the ICS solution (namely, beryllium, copper, manganese, zinc, and tin) were present in this solution at levels which exceeded the IDLs for these analytes. Calculations of estimated interferences for these analytes indicated the possibility of negative interference affects for beryllium, copper, and tin in these samples. Hence, positive results for beryllium and copper were qualified as biased low, "L". However, nondetected results for tin in these samples were also impacted by problems noted with the CRDL Standard analysis. Hence, these nondetects were qualified as estimated, "UJ". Overall bias for these results could not be determined.

- The soil matrix spike recoveries for antimony, arsenic, and zinc were below the 75% lower quality control but > 30%. Only nondetects were reported for antimony in affected samples and these results were qualified as biased low, "UL". Only positive results were reported for arsenic in the affected samples and these results were qualified as biased low, "L" with the exception of the positive result in sample S26-MW03-002 which was qualified as estimated, "J' as a result of additionally high CRDL Standard analysis recovery. Overall bias for this result could not be determined. Finally, the soil matrix spike recovery for zinc was marginally low. Only positive results were reported for zinc in the affected samples and these results were also further impacted by problems noted during the ICP serial dilution analysis. Hence, positive results for zinc were qualified as estimated, "J". Overall bias for these results could not be determined.

- Laboratory duplicate imprecision was noted for aluminum and lead. The Relative Percent Difference (%RPD) between sample and duplicate results exceeded the 35% quality control limit for soils when sample and duplicate results exceeded 5X CRDL. Only positive results were reported for aluminum and lead and these results were qualified as estimated, "J". Overall bias for these results could not be determined.

- Problems were noted during the ICP serial dilution analysis for aluminum, iron, magnesium, manganese, and zinc. The Percent Differences (%Ds) between sample and dilution results exceeded 10% when the undiluted sample result exceeded 50X IDL. Only positive results were reported for these analytes in the affected samples and these results were qualified as estimated, "J". Overall bias for these results could not be determined.

Notes

The CRDL Standard analysis recoveries for chromium and manganese were below the 90% lower quality control limit. However, no validation actions were necessary for these analytes in the affected samples as affected positive results were > 2X CRDL. No positive results were reported for these analytes. The CRDL Standard analysis recovery for selenium marginally exceeded the 110% upper quality control limit. However, no validation actions were warranted for this analyte in affected samples as only nondetects were reported for selenium.

Executive Summary

Laboratory Performance: The CRDL Standard analysis recoveries for arsenic, chromium, manganese, selenium, and tin were poor. Several analytes were detected in the laboratory method blanks. Some analytes which were not supposed to be present in the ICS solution, were detected in this solution at levels which exceeded the IDLs for these analytes. Laboratory duplicate imprecision was noted for aluminum and lead. Problems were noted during the ICP serial dilution analysis for aluminum, iron, magnesium, manganese, and zinc.

Other Factors Affecting Data Quality: The interfering analyte iron was present in samples S26-MW02-001, S26-MW02-002, S26-MW03-001, S26-MW03-002, and S26-SB03-001. Additionally, the interfering analyte aluminum was present in sample S26-MW03-001 at a sufficiently high level as to introduce interference affects. The soil matrix spike recoveries for antimony, arsenic, and zinc were below the 75% lower quality control limit, but > 30%.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Data Validation", as amended for use within USEPA Region III and the NEESA document entitled "Sampling and Chemical Analysis Quality Assurance requirements for the Navy Installation Restoration Program" (NEESA 20.2-047B; 6/88).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified."

Ricky C. DePaul

Brown & Root Environmental Corporation
Ricky C. DePaul
Chemist

Brown & Root Environmental Corporation
Joseph A. Samchuck
Data Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

Summary of Data Qualifiers:

J -

Qualify positive results as estimated based upon poor CRDL Standard analysis recovery and/or low soil matrix spike recovery and/or laboratory duplicate imprecision and/or problems noted during the ICP serial dilution analysis.

UJ -

Qualify nondetected results as estimated based upon poor CRDL Standard analysis recovery and/or as a result of negative interference affects stemming from high interfering analyte concentration.

B -

Qualify positive results within the action level as laboratory artifacts as a result of blank contamination.

L -

Qualify positive results as biased low as a result of negative interference affects stemming from high interfering analyte concentration and/or low soil matrix spike recovery.

UL -

Qualify nondetected results as biased low as a result of low soil matrix spike recovery.

Brown & Root Environmental

INTERNAL CORRESPONDENCE

C-49-12-05-293

TO: LEE ANN SINAGOGA

DATE: JANUARY 15, 1996

FROM: RICKY C. DEPAUL

COPIES: D. V. FILES

SUBJECT: MISCELLANEOUS DATA VALIDATION - VARIOUS MISCELLANEOUS PARAMETERS NSWC INDIAN HEAD SDG 9509224

SAMPLES:

6/Soil/	S26-MW02-001	S26-MW02-002	S26-MW03-001
	S26-MW03-002	S26-SB03-001	S26-SB03-002

GP Environmental Laboratories analyzed six soils for ammonia, nitrate-nitrite, Total Organic Carbon (TOC) and Total Petroleum Hydrocarbons (TPH). No field quality control blanks were included with this analytical data set. One soil was analyzed for nitrocellulose.

These samples were collected by Brown & Root Environmental Corporation on 09/23/95 and 09/24/95 and analyzed by GP Environmental Corporation under Naval Energy and Environmental Support Activity (NEESA) Level C Quality Assurance/Quality Control (QA/QC) criteria. All analyses were conducted using method specific analytical and reporting protocol.

Summary

All analytes were successfully analyzed. The findings offered in this report are based upon a general review of all available data including: data completeness, calibration data, holding times, laboratory method blank results, matrix spike and duplicate analyses, and Laboratory Control Sample (LCS) analyses and detection limits.

Minor Problems

- An ICV recovery for TPH analyses (86.5%) was marginally below the 90% lower quality control limit. Hence, positive and nondetected results for TPH analyses were qualified as biased low "L" and "UL", respectively.

- The LCS recovery for nitrocellulose (71.2%) was marginally low. Hence, the nondetected result for this parameter was qualified as biased low, "UL".

- The solid matrix spike recovery for nitrocellulose (71.0%) was marginally low. Hence, the nondetected result for this parameter was qualified as biased low, "UL".

Notes

An Initial Calibration Verification (ICV) Percent Recovery (%R) for nitrate-nitrite analyses was extremely low. However, no validation actions were warranted for associated samples as the associated Continuing Calibration Verifications (CCVs) analyzed before and after analyses of the soil samples in question, were compliant.

Laboratory Performance: The ICV recovery for TPH analyses was below the lower quality control limit. The LCS recovery for nitrocellulose was low.

Other Factors Affecting Data Quality: The solid matrix spike recovery for nitrocellulose was low.

Executive Summary

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Data Validation", as amended for use within USEPA Region III, and the NEESA document entitled "Sampling and Chemical Analysis Quality Assurance requirements for the Navy Installation Restoration Program" (NEESA 20.2-047B; 6/88).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified."

Ricky C. DePaul

Brown & Root Environmental Corporation
Ricky C. DePaul
Chemist

Brown & Root Environmental Corporation
Joseph A. Samchuck
Data Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

Summary of Data Qualifiers:

L -

Qualify positive results for TPH as biased low as a result of low ICV recovery.

UL -

Qualify nondetected results for TPH as biased low as a result of low ICV recovery. Additionally, nondetected results for nitrocellulose were qualified as biased low as a result of low LCS recovery and low solid matrix spike recovery.

Brown & Root Environmental

INTERNAL CORRESPONDENCE

C-49-12-5-176

TO :	LEEANN SINAGOGA	DATE:	JANUARY 17, 1996
FROM:	WILLIAM J. BROTZ	COPIES:	DV FILE

SUBJECT: MISCELLANEOUS DATA VALIDATION - AMMONIA, NITRATE/NITRITE, TOC, TPH AND NITROCELLULOSE, CTO 222 - INDIAN HEAD, MARYLAND SAMPLE DELIVERY GROUP SDG - 9509191

SAMPLES:	5/Soil/	FD01	S25-MW01-01	S25-MW01-02
		S26-MW01-01	S26-MW01-02	

Overview

The sample set for SDG 9509191 Indian Head, Maryland, consists of five (5) soil samples, and one field duplicate pair (samples FD01 and S05-MW01-01).

The above samples were analyzed for ammonia, nitrate/nitrite, total organic carbon (TOC), total petroleum hydrocarbons (TPH) and nitrocellulose. The samples were collected by Brown & Root Environmental on September 19, 1995 and analyzed by Ceimic Corporation under Naval Energy and Environmental Support Activity (NEESA) Level C Quality Assurance/Quality Control (QA/QC) criteria. All analyses were conducted using method specific analytical and reporting protocols.

Summary

All analytes were successfully analyzed. The findings offered in this report are based upon a general review of all available data including data completeness, holding times, calibration data, laboratory method/preparation blanks, matrix spike recoveries, laboratory duplicate results, laboratory control sample (LCS) results and detection limits.

Areas of concern with respect to data quality are listed below.

Major Problems

None

Minor Problems

The Continuing Calibration Verification (CCV) Percent Recoveries (%Rs) for ammonia were below the lower quality control limit. Nondetected results reported for ammonia have been qualified as biased low, "UL".

Executive Summary

Laboratory Performance: The CCV %R for ammonia was outside quality control limits.

Other Factors Affecting Data Quality: None

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Data Validation", April 1993 Revision as amended for use within USEPA Region III, and the NEESA document entitled "Sampling and Chemical Analysis Quality Assurance requirements for the Navy Installation Restoration Program" (NEESA 20.2-047B; 6/88).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validatio criteria as specified in the NEESA Guidelines and the Quality Assurance Project Plan (QAPP)."

Brown & Root Environmental
William J. Brotz
Chemist

Brown & Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

Data Qualifier Key:

U - Value is a nondetect as reported by the laboratory.

UL - Nondetected result is considered biased low as a result of low CCV %R.

Brown & Root Environmental

INTERNAL CORRESPONDENCE

C-49-02-06-011

TO:	LEEANN SINAGOGA	DATE:	FEBRUARY 1, 1996
FROM:	RICKY C. DEPAUL	•COPIES:	D. V. FILES

SUBJECT: INORGANIC DATA VALIDATION
TARGET ANALYTE LIST (TAL) METALS PLUS CYANIDE AND TIN
NSWC INDIAN HEAD
SDG 9509229

SAMPLES:

6/Soil/	FD08 S25-SD004	S25-MW03-001 S26-SB04-001	S25-MW03-002 S26-SB04-002
3/aqueous/	S25-SW004	S25-SW004-F	S26-RB07

GP Environmental Laboratories analyzed six soils for Target Analyte List (TAL) metals including cyanide and tin. No field duplicates were included with this analytical data set.

These samples were collected by Brown & Root Environmental Corporation on 9/24/95, 9/25/95 and analyzed by GP Environmental Corporation under Naval Energy and Environmental Support Activity (NEESA) Level D Quality Assurance/Quality Control (QA/QC) criteria. All analyses were conducted using Contract Laboratory Program (CLP) Statement of Work (SOW) analytical and reporting protocol.

Summary

All analytes were successfully analyzed. The findings offered in this report are based upon a general review of all available data including: data completeness, calibration data, holding times, laboratory method and field quality control blank results, ICP interference check sample results, matrix spike and duplicate results, laboratory control sample analyses, ICP serial dilution analyses, and graphite furnace atomic absorption results.

Minor Problems

- The Contract Required Detection Limit (CRDL) Standard analysis recoveries for cadmium were below the 90% lower quality control limit. Nondetects were reported for these analytes in affected samples and these results were qualified as biased low, "UL".

- The CRDL Standard analysis recovery for copper, vanadium, and zinc were below the

90% lower quality control limit. Hence, positive results < 2X CRDL and/or nondetects for copper and vanadium were qualified as biased low, "L" and "UL", respectively.

The CRDL Standard analysis recoveries for chromium, nickel, and tin were poor (i.e., both high and low). Hence, positive results < 2X CRDL and/or nondetects for these analytes were qualified as estimated, "J" and "UJ", respectively. Overall bias for these results could not be determined.

The CRDL Standard analysis recoveries for aluminum, calcium, and magnesium exceeded the 110% upper quality control limit. Positive results for these analytes as noted in the soil matrix were qualified as estimated, "J". Overall bias for these results could not be determined as these results were further impacted by problems noted during the ICP serial dilution analysis. Positive results for aluminum as noted in the water matrix were also qualified as estimated, "J" as these results were further impacted by aqueous laboratory duplicate imprecision. Finally, the positive result < 2X CRDL for calcium in the affected water sample was qualified as biased high, "K".

- The following contaminants were present in the laboratory method or field quality control blanks at the following maximum concentrations indicated below:

Analyte	Maximum Concentration	Action Level(s) [1]
mercury	0.1 ug/L	0.5 ug/L, 0.25 mg/Kg
calcium	245 ug/L	NA, 122.5 mg/Kg
zinc	206.2 ug/L	1031 ug/L, NA

[1] A 1gm into 100ml soil sample digestion was employed for the soils in this SDG.

An action level of 5X the maximum contaminant level has been established to evaluate the sample data based upon blank contamination. Sample weight, moisture content, and dilution factors were considered prior to the application of the action levels. Positive results for calcium and mercury within the respective action levels were qualified as laboratory artifacts, "B". No validation actions were necessary for the zinc as only nondetects were reported in the affected waters.

- The aqueous matrix spike recovery for arsenic was below the 75% lower quality control limit, but > 30%. Only nondetects were reported for arsenic in the affected waters and these results were qualified as biased low, "UL".

- The aqueous matrix spike recoveries for iron and lead exceeded the 125% upper quality control limit. Hence, positive results for these analytes were qualified as biased high, "K".

- The soil matrix spike recovery for antimony was below the 75% lower quality control limit, but > 30%. Only nondetects were reported for antimony in affected samples and these results were qualified as biased low, "UL".

- Aqueous laboratory duplicate imprecision was noted for aluminum. The difference between sample and duplicate results exceeded the CRDL for this analyte when sample and/or duplicate results were < 5X CRDL. Only nondetects were reported for this analyte in affected samples and these results were qualified as estimated, "UJ". Overall bias for these results could not be determined.

- Problems were noted during the ICP serial dilution analysis for aluminum, calcium, magnesium, and manganese as evidenced in the soil matrix. The Percent Differences (%Ds) for these analytes exceeded 10% when the undiluted sample result exceeded 50X IDL. Only positive results were reported for these analytes in affected samples and these results were qualified as estimated, "J". Overall bias for these results could not be determined.

- The Graphite Furnace Atomic Absorption (GFAA) Post Digestion Spike (PDS) recovery for selenium in samples FD08 and S25-MW03-001 were below the 85% lower quality control limit. Hence, the positive results for selenium in these affected samples were qualified as biased low, "L".

- The GFAA PDS recovery for thallium as noted in sample S25-SW004 (filtered) was below the 85% lower quality control limit. Thus, the nondetected result for thallium in this sample was qualified as biased low, "UL".

Notes

The CRDL Standard analysis recoveries for iron exceeded the 110% upper quality control limit. However, no validation actions were warranted for iron in the affected samples as affected positive results were > 2X CRDL.

The CRDL Standard analysis recoveries for zinc were below the 90% lower quality control limit. However, no validation actions were warranted for this analyte as positive results exceeded 2X CRDL.

The interfering analyte iron was present in samples S26-SB04-001 and S26-SB04-002 at levels which were comparable to the amount present in the ICS solution for this analyte.

The aqueous matrix spike recovery for aluminum exceeded the 125% upper quality control limit. However, no validation actions were warranted for this analyte in affected samples as only nondetects were reported for this analyte in the water matrix.

The GFAA PDS recoveries for thallium exceeded the 115% upper quality control limit. However, no validation actions were warranted for this analyte in the affected samples as only nondetects were reported. Sample data quality is not adversely impacted.

Executive Summary

Laboratory Performance: The CRDL Standard analysis recoveries for numerous analytes were poor. Mercury and zinc were detected as contaminants in the laboratory method blanks. Laboratory duplicate imprecision was noted for aluminum as evidenced in the water matrix. Problems were noted during the ICP serial dilution analysis for aluminum, calcium, magnesium, and manganese.

Other Factors Affecting Data Quality: Calcium was present as a contaminant in the equipment rinsate blank and could not be attributed to laboratory artifacts. The interfering analyte iron was present in samples S26-SB04-001 and S26-SB04-002 at levels which were sufficiently high as to possibly introduce interference affects. The aqueous matrix spike recoveries for aluminum, arsenic, iron, and lead were outside quality control limits. The matrix spike recovery for antimony was < 75% as noted for the soil matrix. The GFAA PDS recoveries for selenium and thallium were outside the 85-115% quality control windows as noted for several samples.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Data Validation", as amended for use within USEPA Region III and the NEESA document entitled "Sampling and Chemical Analysis Quality Assurance requirements for the Navy Installation Restoration Program" (NEESA 20.2-047B; 6/88).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified."

Ricky C. DePaul

Brown & Root Environmental Corporation
Ricky C. DePaul
Chemist

Brown & Root Environmental Corporation
Joseph A. Samchuck
Data Quality Assurance Officer

Attachments:

1. Table A
2. Appendix A - Results as Reported by the Laboratory
3. Appendix B - Support Documentation

Summary of Data Qualifiers:

UL -

Nondetected results were qualified as biased low as a result of low CRDL Standard analysis recovery and/or low aqueous matrix spike recovery and/or low soil matrix spike recovery and/or low GFAA PDS recovery.

L -

Positive results < 2X CRDL were qualified as biased low as a result of low CRDL Standard analysis recovery and/or qualify positive result in affected sample based upon low GFAA PDS recovery.

J -

Qualify positive results < 2X CRDL as estimated based upon poor CRDL Standard analysis recovery and/or qualify positive result in affected sample based upon problems noted during the ICP serial dilution analysis.

UJ -

Qualify nondetected results as estimated as a result of poor CRDL Standard analysis recovery and/or aqueous laboratory duplicate imprecision.

K -

Qualify positive result < 2X CRDL as biased high as a result of high CRDL Standard analysis recovery and/or qualify positive result in affected sample based upon high aqueous matrix spike recovery.

B -

Qualify positive results within the action level as laboratory artifacts as a result of blank contamination.

Brown & Root Environmental

INTERNAL CORRESPONDENCE

C-49-02-06-014

TO:	LEEANN SINAGOGA	DATE:	FEBRUARY 2, 1996
FROM:	RICKY C. DEPAUL	COPIES:	D. V. FILES

SUBJECT: MISCELLANEOUS DATA VALIDATION - VARIOUS MISCELLANEOUS PARAMETERS NSWC INDIAN HEAD SDG 9509229

SAMPLES:

6/Soil/	FD08	S25-MW03-001	S25-MW03-002
	S25-SD004	S26-SB04-001	S26-SB04-002
2/Aqueous/	S25-SW004	S26-RB07	

GP Environmental Laboratories analyzed six soils for Total Petroleum Hydrocarbons (TPH), ammonia, nitrate/nitrite, nitrocellulose, phosphorus, sulfate, total kjeldahl nitrogen, total organic carbon, and total organic halides. One equipment rinsate blank and one field duplicate pair (namely, samples FD08 and S26-SB04-001) were included with this analytical data set. A comparison of field duplicate results has been provided with the attached support documentation. No validation actions are warranted for field duplicates based upon Region III validation protocol.

These samples were collected by Brown & Root Environmental Corporation on 09/22/95, 09/23/95, 09/24/95, and 09/25/95 and analyzed by GP Environmental Corporation under Naval Energy and Environmental Support Activity (NEESA) Level C Quality Assurance/Quality Control (QA/QC) criteria. All analyses were conducted using method specific analytical and reporting protocol.

Summary

All analytes were successfully analyzed. The findings offered in this report are based upon a general review of all available data including: data completeness, calibration data, holding times, laboratory method blank and field results, matrix spike and duplicate analyses, field duplicate precision, and Laboratory Control Sample (LCS) analyses and detection limits.

Minor Problems

- The ICV recovery for TOC was low as noted for the water matrix. Hence, positive results and nondetects for this parameter in affected samples were qualified as biased low, "L" and "UL", respectively.

- The matrix spike recovery for nitrocellulose as noted in the soil matrix was below the lower quality control limit. Hence, positive results and nondetects for this parameter were qualified as biased low, "L" and "UL", respectively.

- The aqueous Laboratory Control Sample (LCS) recovery for nitrocellulose was low. Hence, positive results and nondetects for this parameter were qualified as biased low, "L" and "UL", respectively.

- The Initial Calibration Verification (ICV) and CCV recoveries for TOX were low. Hence the positive result for this parameter was qualified as biased low, "L".

Notes

Nitrocellulose analyses were conducted within 47 and 48 days after sample collection.

Laboratory Performance: A CCV for nitrate/nitrite analyses was extremely low. A CCV for TOC analyses was low as noted for the water samples in this SDG. The LCS recovery for nitrocellulose was below the lower quality control limit as noted for the waters. Some ICV/CCV recoveries for TOX were below the lower quality control limit. Furthermore, the laboratory incorrectly transcribed the ICV recovery for nitrate nitrite analyses as noted on the quality control form. The validator contacted the laboratory and corrected this form.

Other Factors Affecting Data Quality: The soil matrix spike recovery for nitrocellulose was low.

Executive Summary

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Data Validation", as amended for use within USEPA Region III, and the NEESA document entitled "Sampling and Chemical Analysis Quality Assurance requirements for the Navy Installation Restoration Program" (NEESA 20.2-047B; 6/88).

The text of this report has been formulated to address only those problem areas affecting data quality.

C-49-02-06-014

MEMO TO: LEEANN SINAGOGA
DATE: FEBRUARY 2, 1996 - PAGE 3

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified."

Brown & Root Environmental Corporation
Ricky C. DePaul
Chemist

Brown & Root Environmental Corporation
Joseph A. Samchuck
Data Quality Assurance Officer

Attachments:

1. Appendix A- Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

Summary of Data Qualifiers:

L -

Qualify positive results as biased low as a result of low ICV/CCV recovery, and/or low matrix spike recovery, and/or low LCS recovery.

UL -

Qualify nondetected results as biased low as a result of low CCV recovery and/or low LCS recovery.

Brown & Root Environmental

INTERNAL CORRESPONDENCE

C-49-01-6-118

TO :	LEEANN SINAGOGA	DATE:	JANUARY 16, 1996
FROM:	WILLIAM J. BROTZ	COPIES:	DV FILE

SUBJECT: INORGANIC DATA VALIDATION - TAL METALS PLUS CYANIDE AND TIN
CTO 222 - INDIAN HEAD, MARYLAND
SAMPLE DELIVERY GROUP SDG - 9510036

SAMPLES:	18/Aqueous/			
		25MW01	25MW01-F	25MW02
		25MW02-F	25MW03	25MW03-F
		26MW01	26MW01-F	26MW02
		26MW02-F	26MW03	26MW03-F
		26RB10	26RB10-F	5MW01
		5MW01-F	FD09	FD09-F

Overview

The sample set for SDG 9510036 Indian Head, Maryland, consists of eighteen (18) total and dissolved aqueous samples including one equipment rinsate and one field duplicate pair (samples FD09 and 5MW01)

The above samples were analyzed for Target Analyte List (TAL) metals plus cyanide and tin. The samples were collected by Brown & Root Environmental on October 4, 1995 and analyzed by Ceimic Corporation under Naval Energy and Environmental Support Activity (NEESA) Level D Quality Assurance/Quality Control (QA/QC) criteria. All analyses were conducted using Contract Laboratory (CLP) Statement of Work (SOW) ILM03.0 analytical and reporting protocols.

Summary

All analytes were successfully analyzed. The findings offered in this report are based upon a general review of all available data including data completeness, holding times, calibration data, laboratory method/preparation blanks, interference check sample (ICS) results, matrix spike recoveries, laboratory duplicate results, laboratory control sample (LCS) results, serial dilution results, detection limits, and analyte quantitation.

All analyses, with the exception of antimony, arsenic, lead, mercury, potassium, sodium, selenium, silver, thallium and cyanide were conducted using Inductively Coupled Plasma (ICP) methodologies. Mercury analysis was conducted using cold vapor AA. Cyanide, potassium and sodium analyses were conducted using flame AA. Antimony, arsenic, lead, selenium, silver and thallium analyses were conducted using Graphite Furnace Atomic Absorption (GFAA).

Areas of concern with respect to data quality are listed below.

Major Problems None

Minor Problems

The Contract Required Detection Limit (CRDL) Percent Recoveries (%Rs) for calcium, magnesium and thallium exceeded the upper quality control limit. Positive results < 2X CRDL for calcium, magnesium and thallium have been qualified as biased high, "K".

The CRDL %R for aluminum was below the lower quality control limit. Positive results < 2X CRDL and nondetects reported for aluminum in the total matrix were qualified as estimated, "J", and "UJ", due to conflicting bias in the matrix spike. Nondetected results reported for aluminum in the dissolved matrix were qualified as biased low, "UL".

The CRDL %Rs for cadmium and chromium were below the lower quality control limit. Positive results < 2X CRDL for cadmium and chromium have been qualified as biased low, "L", and "UL", respectively.

The following contaminants were detected in the laboratory method and field blank at the following maximum concentrations :

Analyte	Maximum Concentration	Action Level-Aqueous
calcium[2]	203 ug/L	1015 ug/L
iron[2]	127 ug/L	635 ug/L
lead[2]	2.1 ug/L	10.5 ug/L
manganese[2]	4.6 ug/L	23.0 ug/L
mercury[2]	0.11 ug/L	0.55 ug/L
nickel	21.7 ug/L	109 ug/L
silver[1]	1.0 ug/L	5.0 ug/L
sodium	222 ug/L	1110 ug/L
zinc[2]	15.4 ug/L	77.0 ug/L

Samples Affected: All

A 1g to 100 ml digestion was used.

[1] Maximum concentration found in an aqueous preparation blank.

[2] Maximum concentration found in an equipment rinsate blank (total matrix).

An action level of 5x the maximum contaminant level has been used to evaluate sample data for blank contamination. Sample aliquot size, percent moisture and dilution factors were taken into consideration when evaluating for blank contamination. Positive results < the action level for iron, lead, mercury, nickel and zinc have been qualified, "B", as a result of blank contamination. No action was taken for the remaining analytes since either the results were greater than the action level or were nondetects.

The interfering analyte iron was present in sample 25MW03 at a concentration which was comparable to the level of iron in the Interference Check Sample (ICS) solution. Several analytes namely, copper, manganese, nickel, zinc and tin were present in the ICS solution at concentrations which exceeded the Instrument Detection Limit (IDL). Interference affects exist for copper, nickel, tin, and zinc in the affected samples. The positive result reported for nickel in the affected sample was qualified as biased high, "K". Positive results and nondetects reported for copper and tin in the affected sample were qualified as biased low, "L", and "UL", respectively.

The Matrix Spike (MS) Percent Recovery (%R) for arsenic, in the total matrix, was below the lower quality control limit. Positive results and nondetects for arsenic, in the total matrix, were qualified as biased low, "L", and "UL", respectively.

The MS %R for aluminum, in the total matrix, was above the upper quality control limit. Positive results and nondetects for aluminum, in the total matrix, were qualified as estimated, "J", and "UJ", respectively, due to conflicting bias from low CRDL %R.

The MS %R for thallium, in the total matrix, was below the lower quality control limit. Nondetected results reported for thallium, in the total matrix, were qualified as estimated, "UJ", due to conflicting bias from high CRDL %R.

The Graphite Furnace Atomic Adsorption (GFAA) Post Digestion Spike (PDS) %R for selenium and silver were below the lower quality control limit for samples 5MW01 and FD09. Nondetected results reported for selenium and silver were qualified as biased low, "UL".

The GFAA PDS %R for thallium was below the lower quality control limit for samples 26MW01 and FD09. Nondetected results reported for thallium were qualified as estimated, "UJ", due to conflicting bias from CRDL and MS %R.

Notes

The CRDL %R for antimony, iron, mercury and tin exceeded the upper quality control limit. No actions were necessary for antimony, iron, mercury and tin as all results were either > 2X CRDL or nondetects.

Executive Summary

Laboratory Performance: The CRDL Standard analysis recoveries for several analytes were outside quality control limits. Several analytes were present in the laboratory method and field quality control blanks.

Other Factors Affecting Data Quality: The MS %R for several analytes was low. GFAA PDS %R for selenium and thallium was low in several samples. ICP interference was found for several analytes in several samples.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Data Validation", April 1993 Revision as amended for use within USEPA Region III, and the NEESA document entitled "Sampling and Chemical Analysis Quality Assurance requirements for the Navy Installation Restoration Program" (NEESA 20.2-047B; 6/88).

The text of this report has been formulated to address only those problem areas affecting dat quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NEESA Guidelines and the Quality Assurance Project Plan (QAPP)."

Brown & Root Environmental
William J. Brotz
Chemist

Brown & Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

Data Qualifier Key:

U	-	Value is a nondetect as reported by the laboratory.
B	-	Positive result is considered to be an artifact of blank contamination and should not be considered present.
K	-	Positive result is considered biased high as a result of high CRDL %R.
L	-	Positive result is considered biased low as a result of poor CRDL %R, MS %R or ICP interference.
UL	-	Nondetected result is considered biased low as a result of poor CRDL %R, MS %R, GFAA PDS %R, or ICP interference.
J	-	Positive result is estimated as a result of poor CRDL %R, MS %R, or ICP interference.
UJ	-	Nondetected result is considered estimated as a result of poor CRDL %R, MS %R, GFAA PDS %R, or ICP interference.

Brown & Root Environmental

INTERNAL CORRESPONDENCE

C-49-01-6-134

TO : LEEANN SINAGOGA   DATE: JANUARY 17, 1996

FROM: WILLIAM J. BROTZ   COPIES: DV FILE

SUBJECT: MISCELLANEOUS DATA VALIDATION - AMMONIA, NITRATE/NITRITE, PHOSPHOROUS, SULFATE, TKN, TOC, TOX AND NITROCELLULOSE
CTO 222 - INDIAN HEAD, MARYLAND
SAMPLE DELIVERY GROUP SDG - 9510036

SAMPLES:	10/Aqueous/			
		25MW01	25MW02	25MW03
		26MW01	26MW02	26MW03
		26RB10	5MW01	FD09
		FD10		

Overview

The sample set for SDG 9510036 Indian Head, Maryland, consists of ten (10) aqueous samples, including one equipment rinsate blank. Included within are two field duplicates.

The above samples were analyzed for ammonia, nitrate/nitrite, phosphorous, sulfate, total Kjeldahl nitrogen (TKN), total organic carbon (TOC), total organic halides (TOX), and nitrocellulose. Additionally, some samples were analyzed for total petroleum hydrocarbons (TPH). The samples were collected by Brown & Root Environmental on October 4, 1995 and analyzed by Ceimic Corporation under Naval Energy and Environmental Support Activity (NEESA) Level C Quality Assurance/Quality Control (QA/QC) criteria. All analyses were conducted using method specific analytical and reporting protocols.

Summary

All analytes were successfully analyzed, with the exception of those qualified as rejected, "UR". The findings offered in this report are based upon a general review of all available data including data completeness, holding times, calibration data, laboratory method/preparation blanks, matrix spike recoveries, laboratory duplicate results, laboratory control sample (LCS) results and detection limits.

Areas of concern with respect to data quality are listed below.

Major Problems

The analytical holding times for TOX were grossly exceeded. Positive results reported for TOX were qualified as biased extremely low, "L". Nondetected results reported for TOX were qualified as rejected, "UR".

Minor Problems

The Continuing Calibration Verification (CCV) Percent Recoveries (%Rs) for nitrate/nitrite and TKN were below the lower quality control limits. Positive results and nondetects reported for nitrate/nitrite and TKN have been qualified as biased low, "L" and "UL", respectively.

The Matrix Spike (MS) Percent Recovery (%R) for nitrocellulose was below the lower quality control limit. Positive results and nondetects reported for nitrocellulose have been qualified as biased low, "L", and "UL", respectively.

The Laboratory Control Sample (LCS) Percent Recovery (%R) for nitrocellulose and sulfate were below the lower quality control limit. Positive results and nondetects reported for nitrocellulose and sulfate have been qualified as biased low, "L", and "UL", respectively.

Notes

The matrix spike for TOX was low. However no actions were required since TOX was previously qualified due to gross holding time exceedance, JAS

Executive Summary

Laboratory Performance: The CCV %R for nitrate/nitrite and TKN were outside quality control limits. The LCS %R for nitrocellulose and sulfate were outside quality control limits. Holding times for TOC were exceeded.

Other Factors Affecting Data Quality: The MS %R for nitrocellulose and TOX were outside quality control limits.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Data Validation", April 1993 Revision as amended for use within USEPA Region III, and the NEESA document entitled "Sampling and Chemical Analysis Quality Assurance requirements for the Navy Installation Restoration Program" (NEESA 20.2-047B; 6/88).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NEESA Guidelines and the Quality Assurance Project Plan (QAPP)."

Brown & Root Environmental
William J. Brotz
Chemist

Brown & Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

Data Qualifier Key:

U	-	Value is a nondetect as reported by the laboratory.
L	-	Positive result is considered biased low as a result of low CCV %R, MS %R, LCS %R or holding times exceedence.
UL	-	Nondetected result is considered biased low as a result of low CCV %R, MS %R, LCS %R, or holding times exceedence.
UR	-	Nondetected result is considered rejected due to gross holding time exceedance.

Brown & Root Environmental

INTERNAL CORRESPONDENCE

C-49-01-6-168

TO:	LEEANN SINAGOGA	DATE:	JANUARY 24, 1996
FROM:	ANNE K. BATTISTA	COPIES:	DV FILE

SUBJECT: ORGANIC DATA VALIDATION - VOA/SVOA/PCB
CTO #222, NSWC INDIAN HEAD, INDIAN HEAD, MARYLAND
SDG 9510025

SAMPLES: 16/Soils/

FD05	S25-MW02-002	S25-SD001
S25-SD003	S26-MW02-001	S26-MW02-002
S26-MW03-001	S26-MW03-002	S26-SB03-001
S26-SB03-002	FD08	S25-SD004
S26-SB04-001	S26-SB04-002	S25-SB02-002
S25-SB03-002		

21/Aqueous/

FD06	S25-SW001	S25-SW003
S25-SW004	26MW03	5MW01
FD09	25MW01	25MW02
25MW03	26MW01	26MW02
26MW03	FD10	
S25-RB05-001	TB05	S26-TB06
S26-RB07	S26-TB07	25-RB09
S25-TB08	26RB10	26TB09

Overview

The sample set for the CTO 222 NSWC Indian Head site, SDG 9510025, consists of sixteen (16) soil environmental samples, twelve (12) aqueous environmental samples, five (5) trip blanks and four (4) rinsate blanks. The samples were analyzed for Target Compound List (TCL) Appendix IX volatile and semivolatile organic compounds, and/or polychlorinated biphenyl compounds (PCBs). Each sample was not analyzed for all three parameters. The field crew designated samples S26-SB03-001 and 26MW01 for Matrix Spike/Matrix Spike Duplicate (MS/MSD) analyses. Five field duplicate pairs were included in this SDG(5MW01/FD09, S26-SB04-001/FD08, S25-SD001/FD05, S25-SW001/FD06 and S26MW01/FD10).

The samples were collected by Brown and Root Environmental on September 22nd, 23rd, 24th, 25th and October 3rd and 4th, 1995 and analyzed by GP Environmental under Naval Energy and Environmental Support Activity (NEESA) Level D Quality Assurance/Quality Control (QA/QC) criteria. All analyses were conducted using SW-846 Methods 8240, 8270 and 8080 analytical and reporting protocols.

Summary

All compounds were successfully analyzed, with the exception of those results qualified as unreliable. (UR). The findings offered in this report are based upon a general review of all available data including data completeness, holding times until analysis, GC/MS tuning and calibration data, laboratory and field blank results, surrogate spike recoveries, laboratory control sample results, internal standards performance, field duplicate precision, compound identification and compound quantitation. Areas of concern with respect to data quality are listed below.

Major Problems

- Initial and/or continuing calibration Relative Response Factors (RRF) for 1,4-dioxane, 2-butanone, acrolein, 4-nitroquinoline-1-oxide, diallate and phorate were less than 0.050. Failure to meet this quality control criterion indicates that the laboratory's instruments could not achieve satisfactory sensitivity for these compounds, and therefore, the associated positive and nondetected results for these compounds are severely compromised. The nondetected results reported for the aforementioned compounds are considered unreliable and were rejected. (UR), in the affected samples. These results are considered biased very low.

- The laboratory did not run calibration standards for the volatile compound chloroprene and semivolatile compounds hexachlorophene and kepone. As a result, these compounds should not have been reported on the laboratory Form Is. However, since the laboratory did report these compounds nondetected results for chloroprene. hexachlorophene and kepone were considered unreliable and rejected, (UR), in all samples.

Minor Problems

- Samples 26MW02, 5MW01, FD09, 26TB09 and 26RB10 were analyzed outside the volatile 14 day holding time. As a result, positive and nondetected results were qualified as estimated, (J) and (UJ), in the affected samples.

- As stated in the case narrative, the laboratory reanalyzed sample FD05 since the original analysis was out of tune. However, the reanalysis was performed outside of holding time. As a result, nondetected results in sample FD05 were qualified as estimated, (UJ).

- The original volatile analyses of samples S25-MW02-002, S25-SD001 and S25-SD003 were performed on October 6, 1995 without the additional volatile Appendix IX compounds. As a result, the laboratory reanalyzed these samples, however the analyses were performed outside of holding time. Since numerous compounds were not calibrated for in the original analyses of the aforementioned samples, the reanalyses were chosen for validation. Nondetected results were qualified as estimated, (UJ), in the aforementioned samples as a result of holding time exceedences.

- The semivolatile 7 day extraction holding time was exceeded by 2 days in samples S25-SB02-002 and S25-SB03-002. As a result, positive and nondetected results were qualified as estimated, (J) and (UJ), in the affected samples.

- Initial calibration Percent Relative Standard Deviations (%RSDs) greater than the 50% and 30% quality control limits were reported for acetone. Positive and nondetected results were qualified as estimated, (J) and (UJ), respectively, in the affected samples. The direction of bias is unknown.

- An initial calibration %RSD greater than 50% was reported for the semivolatile compound famphur. Positive and nondetected results were qualified as estimated, (J) and (UJ), respectively, in the affected samples. The direction of bias cannot be determined.

- Bromoform, acetone, propionitrile, acrolein and acrylonitrile had continuing calibration Percent Differences (%Ds) greater than 50%. Positive and nondetected results are affected by these noncompliances. Positive and nondetected results were qualified as estimated, (J) and (UJ), in the affected samples. The direction of bias cannot be determined.

- Continuing calibration %Ds for 3-nitroaniline, 4-nitrophenol and famphur exceeded the 50% quality control limit. Positive and nondetected results are affected by these noncompliances. Nondetected results were qualified as estimated, (UJ), in the affected samples. The direction of bias cannot be determined.

- Continuing calibration %Ds greater than the 25% quality control limit were reported for acetone and methylene chloride. Positive results only are affected by these noncompliances. Positive results, not qualified for blank contamination, were qualified as estimated, (J), in the affected samples.

- The following table summarizes the maximum concentration of volatile and semivolatile compounds detected in the laboratory method and field quality control blanks analyzed in this SDG:

Compound	Maximum Concentration	Action Level
Acetone *	41 µg/L	410 µg/L, µg/Kg
Methylene chloride *	3.0 µg/L	30 µg/l, µg/Kg
Carbon Disulfide *	2.6 µg/L	13 µg/L, µg/Kg
2-Butanone *	1.6 µg/L	8 µg/L, µg/Kg
Toluene	1.9 µg/L	19 µg/L
Toluene	3.5 µg/L	35 µg/Kg
2-Hexanone *	1.0 µg/L	5 µg/L, µg/Kg
1,1,1-Trichloroethane *	6.0 µg/L	30 µg/L, µg/Kg
Naphthalene	1.1 µg/L	5.5 µg/L

* - Maximum concentration detected in field quality control blank.

Samples Affected: ALL

The aliquots used for analysis, percent solids and dilution factors were considered during the application of the action level. Any positive results reported for the aforementioned compounds that were reported in samples at concentrations less than the validation action level were considered false positives and were qualified, (B). Positive results reported above the validation action level were not qualified. No action was taken for 2-butanone and naphthalene since no positive results were reported in the affected samples. It should be noted that field quality control blanks are not qualified based on field quality control blank contamination.

- High surrogate Percent Recoveries (%Rs) were reported for 1,2-dichloroethane-d4 in samples S25-TB08 and 25MW03. The laboratory reanalyzed these samples, however the reanalyses were performed outside the holding time. Also, the reanalysis of sample S25-TB08 yielded low %Rs for toluene-d8 and bromofluorobenzene. Therefore, the original analyses were chosen for validation. Positive results in the aforementioned samples were qualified as estimated, (J).

- Samples 25MW02 and 26MW02 had surrogate recoveries less than 10% reported for 2-fluorophenol. As a result of these extremely poor recoveries the laboratory re-extracted and reanalyzed these samples. The re-extraction, however, was performed 8 days outside of the holding period. It is the professional opinion of the data reviewer that the holding time noncompliance is less severe than the low surrogate %Rs. Therefore, the reanalyses were chosen for validation. Positive and nondetected results were qualified as estimated, (J) and (UJ), respectively, in the aforementioned samples.

- Positive results reported below the Contract Required Quantitation Limit (CRQL) are qualified as estimated, (J).

Notes

2-Hexanone, 1,1,2,2-tetrachloroethane and 1,2-dibromo-3-chloropropane had initial calibration %RSDs greater than 50%. Several other compounds had %RSDs greater than 30% also. No action was necessary since the affected samples were not used in validation.

Initial calibration %RSDs for dichlorodifluoromethane, acrolein, methylene chloride, acetone, propionitrile, 4-methyl-2-pentanone, 1,4-phenylenediamine and 1,4-naphthoquinone exceeded the 30% quality control limit. Numerous volatile and semivolatile compounds had continuing calibration %Ds greater than 25%. These aforementioned noncompliances affect positive results only, and since only nondetected results were reported for these compounds, in the affected samples, no action was required.

A semivolatile continuing calibration performed on 10/24/95 contained numerous noncompliances. No action was necessary since the affected samples were reanalyses and were not used in validation.

Samples S25-MW02-002 and S25-SD001 had high recoveries reported for one or more volatile surrogates. However, the laboratory reanalyzed these samples due to calibration noncompliances noted above. The reanalyses of the aforementioned samples had compliant recoveries for all three surrogates. No action was taken since the reanalyses were chosen for validation.

High surrogate recoveries were reported in sample S26-SB03-002. A reanalysis of this sample was performed, however low surrogate recoveries were reported. As a result, the original analysis was chosen for validation. Positive results only are affected by high recoveries. No action was necessary since nondetected results were reported in the original analysis.

Samples 25MW03 and 26RB10 had a high %R reported for the semivolatile surrogate 2,4,6-tribromophenol. No action was necessary since only one recovery in each sample was noncompliant.

The Matrix Spike/Matrix Spike Duplicate (MS/MSD) analyses of sample S26-SB03-001 yielded a high %R for trichloroethene. No action was taken based on Region III data validation protocol.

The MS/MSD analyses of sample 26MW01 contained noncompliant recoveries and high Relative Percent Differences (RPDs) for 4-nitrophenol and pentachlorophenol. However, no action was necessary based on Region III data validation protocol.

The aqueous Laboratory Control Spike/Laboratory Control Spike Duplicate (LCS/LCSD) samples yielded a high %R for bromoform and a low %R for vinyl chloride. No action was necessary based on Region III data validation protocol.

Poor internal standard areas were reported for all three volatile internal standards in sample S25-MW02-002. No action was taken since the reanalysis of this sample was used in validation, and all internal standard area were compliant in the reanalysis.

It should be noted that no action has been taken as a result of field duplicate imprecision

No problems were noted in the PCB fraction.

It should be noted that the laboratory inadvertently failed to report the Tentatively Identified Compounds (TICs). No action has been taken as a result of this noncompliance.

No other problems were noted.

<u>Executive Summary</u>

Laboratory Performance: Initial and/or continuing calibration RRFs for 1,4-dioxane, 2-butanone, acrolein, 4-nitroquinoline-1-oxide, diallate and phorate were less than 0.050. Samples 26MW02, 5MW01, FD09 26TB09 and 26RB10 were analyzed outside the volatile 14 day holding time. The reanalyses of samples 25MW02 and 26MW02 were chosen for validation, however the re-extractions were preformed outside of holding time. The semivolatile 7 day extraction holding time was exceeded by 2 days in samples S25-SB02-002 and S25-SB03-002. Nondetected results for chloroprene, hexachlorophene and kepone were rejected since no calibrations were performed for these compounds. Initial calibration %RSDs greater than 50% were reported for acetone and the semivolatile compound famphur. Bromoform, acetone, propionitrile, acrolein, acrylonitrile, 3-nitroaniline, 4-nitrophenol and famphur had continuing calibration %Ds greater than 50%. Numerous volatile and semivolatile compounds had continuing calibration %Ds greater than 25%. Acetone, methylene chloride, toluene and 2-hexanone were detected in the aqueous laboratory method blanks. Acetone, methylene chloride and toluene were reported in the soil laboratory method blanks. Samples S25-MW02-002, S25-SD001, S25-TB08 and 25MW03 had high recoveries reported for one or more volatile surrogates. Samples 25MW03 and 26RB10 had a high %R reported for the semivolatile surrogate 2,4,6-tribromophenol. The aqueous LCS/LCSD samples yielded a high %R for bromoform and a low %R for vinyl chloride.

Other Factors Affecting Data Quality: 1,1,1-Trichloroethane, acetone, methylene chloride, carbon disulfide, 2-butanone, and toluene were detected in the field quality control blanks. The MS/MSD analyses of sample S26-SB03-001 yielded a high %R for trichloroethene. The MS/MSD analyses of sample 26MW01 contained noncompliant recoveries and high RPDs for 4-nitrophenol and pentachlorophenol. Poor internal standard areas were reported for all three volatile internal standards in sample S25-MW02-002.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Organic Data Validation" (3/90), as amended for use within EPA Region III, and the NEESA guidelines entitled "Sampling and Chemical Analysis Quality Assurance Requirements for the Navy Installation Restoration Program (NEESA 20.2-047B; 6/88).

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NEESA Guidelines and the Quality Assurance Project Plan (QAPP)."

Anne K. Battista
Brown and Root Environmental

Anne K. Battista
Chemist/Data Validator

Brown and Root Environmental

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

Data Qualifier Key:

U - Value is a nondetect as reported by the laboratory.

B - Positive result is considered to be an artifact of blank contamination, and should not be considered present.

UJ - Nondetect is estimated due to various technical noncompliances.

J - Positive result is considered estimated due to various technical noncompliances or is reported at a concentration below the CRQL.

UR - Nondetected result is considered unreliable due to severe calibration noncompliances.

Brown & Root Environmental

INTERNAL CORRESPONDENCE

C-49-01-6-174

TO:	LEEANN SINAGOGA	DATE:	JANUARY 22, 1996
FROM:	ANNE K. BATTISTA	COPIES:	DV FILE

SUBJECT: ORGANIC DATA VALIDATION - TCL EXPLOSIVES/ PETN/NITROGLYCERINE/NITROGUANIDINE CTO 222, NSWC INDIAN HEAD, INDIAN HEAD, MARYLAND SDG NO. 9510025

SAMPLES: 4/Soil/

S25-SB02-001	S25-SB02-002	S25-SB03-001	S25-SB03-002

10/Aqueous/

25MW01	25MW02	25MW03	26MW01
26MW02	26MW03	5MW01	FD09
26RB10	25RB09		

Overview

The sample set for CTO 222, NSWC Indian Head, SDG No. 9510025 consists of four (4) environmental soil samples, eight (8) aqueous environmental samples and two (2) rinsate blanks, designated RB-. All samples were analyzed for Target Compound List (TCL) explosives, plus PETN, nitroglycerine and nitroguanidine. Samples 26MW01 and S25-SB02-001 were analyzed for Matrix Spike/Matrix Spike Duplicate parameters. One field duplicate pair was included in this SDG(5MW01/FD09).

The samples were collected by Brown and Root Environmental on October 3rd and 4th, 1995 and analyzed by GP Environmental under Naval Energy and Environmental Support Activity (NEESA) Level D Quality Assurance/Quality Control (QA/QC) criteria. All analyses were conducted using SW-846/8330 analytical and reporting protocols.

Summary

All compounds were successfully analyzed. The findings offered in this report are based upon a general review of all available data including data completeness, holding times until extraction/analysis, laboratory blank results, matrix spike/matrix spike duplicate results, laboratory control sample results, laboratory replicate results, field duplicate precision, compound identification and quantitation, and instrument performance.

Major Problems

- None.

Minor Problems

- A continuing calibration Percent Difference (%D) greater than 20% was reported for 2,4,6-trinitrotoluene. Positive results only are affected by this noncompliance. Positive results for 2,4,6-trinitrotoluene were qualified as estimated, (J), in the affected samples.

- Samples 5MW01 and FD09 had positive results reported for several compounds. therefore, the laboratory analyzed the samples on secondary column for confirmation. The case narrative states that the results for 2,4-dinitrotoluene, in both samples, could not be confirmed due to matrix interference. As a result, positive results for 2,4-dinitrotoluene were qualified as estimated, (J). It should be noted that 2,4-dinitrotoluene was detected by GC/MS analysis in the semivolatile fraction of the aforementioned samples.

- Low surrogate Percent Recoveries (%Rs) were reported for samples 25MW01 and 26MW03. Positive and nondetected results are affected by low %Rs. Nondetected results in the aforementioned samples were quaified as estimated, (UJ).

- Samples 5MW01 and FD09 had extremely high surrogate reocveries reported. The case narrative states that the high %Rs are due to matrix interfence. Positive results were qualfied as estimated, (J), in the affected samples.

Notes

Continuing calibration %Ds greater than 20% were reported for 4-amino-2,6-dinitrotoluene and 2,6-dinitrotoluene. Positive results only are affected by these noncompliances. No action was necessary since no postive results were reported in the affected samples for the aforementioned compounds.

The Matrix Spike/Matrix Spike Duplicate (MS/MSD) analyses of sample S25-SB02-001 yielded a high %R and a high Relative Percent Difference (RPD) for nitroguanidine. No action was taken based on Region III data validation protocol.

It should be noted that various dilutions were performed on samples 5MW01 and FD09. Positive results for 1,3-dinitrobenzene and 2,4-dinitrotoluene were reported from a 10-fold dilution. 2,4,6-Trinitrotoluene and RDX are reported from a 50-fold dilution. Positive results for 2-amino-2,6-dinitrotoluene are reported from a 5,000 fold dilution.

According to EPA Region III data validation protocol, no qualifications are made for field duplicate imprecision. A table summarizing the results reported for field duplicate sample pair analyses are presented below.

Compound	5MW01	FD09	RPD (%)
Nitroguanidine	42.1 µg/L	50.2 µg/L	17.5
RDX	658 µg/L	426 µg/L	43.0
1,3-Dinitrobenzene	4.4 µg/L	4.5 µg/L	2.0
2,4,6-Trinitrotoluene	242 µg/L	173 µg/L	33.2
2,4-Dinitrotoluene	17.3 µg/L	16.2 µg/L	6.5
2-amino-4,6-dinitrotoluene	4230 µg/L	4700 µg/L	10.5

A 2-fold dilution was performed on the samples as per method SW846-8330.

Executive Summary

Laboratory Performance: Continuing calibration %Ds were noted for several compounds. The laboratory could not confirm a positive result for 2,4-dinitrotoluene in samples 5MW01 and FD09. The laboratory performed and reported results from numerous dilutions in samples 5MW01 and FD09.

Other Factors Affecting Data Quality: Poor surrogate recoveries were reported in several samples. The MS/MSD analyses of sample S25-SB02-001 yielded a high %R and a high RPD for nitroguanidine.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Organic Data Validation" (3/90), as amended for use within EPA Region III. and the NEESA guidelines "Sampling and Chemical Analysis Quality Assurance requirements for the Navy Installation Restoration Program" (NEESA 20.2-047B; 6/88).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NEESA Guidelines and the Quality Assurance Project Plan (QAPP)."

Anne K. Battista
Brown and Root Environmental

Anne K. Battista
Chemist/Data Validator

Brown and Root Environmental

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

Data Qualifier Key: -

U - Value is a nondetect as reported by the laboratory.

J - Positive result is considered estimated due to various technical noncompliances.

UJ - Nondetected result is considered estimated due to various technical noncompliances.

Brown & Root Environmental

INTERNAL CORRESPONDENCE

C-49-01-6-044

TO :	LEANN SINAGOGA	DATE:	JANUARY 15, 1996
FROM:	WILLIAM J. BROTZ	COPIES:	DV FILE

SUBJECT: INORGANIC DATA VALIDATION - TAL METALS PLUS CYANIDE AND TIN
CTO 222 - INDIAN HEAD, MARYLAND
SAMPLE DELIVERY GROUP SDG - 9510025

SAMPLES: 13/SOIL/ S25-SB02-001 S25-SB02-002 S25-SB03-001
S25-SB03-002

1/Aqueous/ 25-RB09

Overview

The sample set for SDG 9510025 Indian Head, Maryland, consists of four (4) soil samples and one equipment rinsate blank (designated -RB). No field duplicates were included in this SDG.

The above samples were analyzed for Target Analyte List (TAL) metals plus cyanide and tin. The samples were collected by Brown & Root Environmental on October 3, 1995 and analyzed by Ceimic Corporation under Naval Energy and Environmental Support Activity (NEESA) Level D Quality Assurance/Quality Control (QA/QC) criteria. All analyses were conducted using Contract Laboratory (CLP) Statement of Work (SOW) ILM03.0 analytical and reporting protocols.

Summary

All analytes were successfully analyzed except for those qualified as rejected "UR". The findings offered in this report are based upon a general review of all available data including data completeness, holding times, calibration data, laboratory method/preparation blanks, interference check sample (ICS) results, matrix spike recoveries, laboratory duplicate results, laboratory control sample (LCS) results, serial dilution results, detection limits, and analyte quantitation.

All analyses, with the exception of antimony, arsenic, lead, mercury, potassium, selenium, silver, thallium and cyanide were conducted using Inductively Coupled Plasma (ICP) methodologies. Mercury analyses was conducted using cold vapor AA, cyanide, potassium and sodium analyses were conducted using flame AA and antimony, arsenic, lead, selenium, silver and thallium analyses were conducted using Graphite Furnace Atomic Absorption (GFAA).

Areas of concern with respect to data quality are listed below.

Major Problems

- The Matrix Spike (MS) Percent Recovery (%R) for antimony and manganese were extremely low (< 30%). Nondetects were qualified as rejected, "UR". Positive results have been qualified "J", bias could not be determined.

Minor Problems

- The Contract Required Detection Limit (CRDL) Percent Recoveries (%Rs) for calcium and magnesium exceeded the upper quality control limit. Positive results for calcium and magnesium < 2X CRDL have been qualified as biased high, "K".

- The CRDL %Rs for cadmium, chromium, cobalt, copper, iron, manganese and tin were below the lower quality control limit. Positive results < 2X CRDL and nondetects for cadmium, chromium, cobalt, copper, iron, manganese and tin have been qualified as biased low, "L", and "UL", respectively.

- The CRDL %R for aluminum exhibited recoveries both above and below quality control limits. The nondetected result reported for aluminum has been qualified as estimated, "UJ". Bias could not be determined.

- The following contaminants were detected in the laboratory method and field blanks at the following maximum concentrations :

Analyte	Maximum Concentration	Action Level-Soil	Action Level-Aqueous
calcium[1]	171 ug/L	85.5 mg/kg	855 ug/L
copper[2]	1.81 mg/kg	9.1 mg/kg	NA
lead[1]	0.64 ug/L	0.32 mg/kg	3.2 ug/L
manganese	1.05 mg/kg	5.25 mg/kg	NA
mercury	0.1 ug/L	0.05 mg/kg	0.5 ug/L
nickel	21.7 ug/L	10.9 mg/kg	109 ug/L
potassium	28.7 mg/kg	144 mg/kg	NA
selenium	1.5 ug/L	0.75 mg/kg	7.5 ug/L

Samples Affected: All

A 1g to 100 ml digestion was used.

An action level of 5x the maximum contaminant level has been used to evaluate sample data for blank contamination. Sample aliquot size, percent moisture and dilution factors were taken into consideration when evaluating for blank contamination. Positive results < the action level for calcium, copper, nickel and selenium have been qualified, "B", as a result of blank contamination. No action was taken for the remaining analytes since either the results were greater than the action level or were nondetects.

- The interfering analyte iron was present in all soil samples at concentrations which were comparable to the level of iron in the Interference Check Sample (ICS) solution. Several analytes namely, copper, manganese, nickel, tin and zinc were present in the ICS solution at concentrations which exceeded the Instrument Detection Limit (IDL). Interference affects exist for copper and tin in the affected samples. Positive results for copper were not affected since all results were qualified as the result of blank contamination. Nondetects reported for tin in the affected samples were qualified as biased low, "UL".

- The MS %Rs for arsenic and lead were below the lower quality control limit. Positive results were qualified as biased low, "L".

- The MS %R for chromium and manganese were below the lower quality control limit. Positive results were qualified as estimated, "J". The direction of Bias is unknown.

- Laboratory Duplicate imprecision was noted for chromium, iron and manganese in the soil matrix. Positive results for chromium, iron and manganese in the soil matrix were qualified as estimated, "J". The direction of bias is unknown.

- The ICP Serial Dilution Percent Difference (%D) for manganese was outside quality control limits for manganese in the soil matrix. Positive results for manganese in the soil matrix were qualified as estimated, "J".

Notes

- The Contract Required Detection Limit (CRDL) for mercury and selenium exceeded the upper quality control limit. No actions were necessary for mercury and selenium as all results were > 2X CRDL or nondetects.

Executive Summary

Laboratory Performance: The CRDL Standard analysis recoveries for several analytes were outside quality control limits. Several analytes were present in the laboratory method and field quality control blanks.

Other Factors Affecting Data Quality: The MS %R for antimony was extremely low (< 30%). Nondetected results for antimony were rejected. Several analytes had low matriex spike recoveries. ICP interference was noted for tin.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Data Validation", April 1993 Revision as amended for use within USEPA Region III, and the NEESA document entitled "Sampling and Chemical Analysis Quality Assurance requirements for the Navy Installation Restoration Program" (NEESA 20.2-047B; 6/88).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NEESA Guidelines and the Quality Assurance Project Plan (QAPP)."

Brown & Root Environmental
William J. Brotz
Chemist

Brown & Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

Data Qualifier Key:

U	-	Value is a nondetect as reported by the laboratory.
B	-	Positive result is considered to be an artifact of blank contamination and should not be considere present.
K	-	Positive result is considered biased high as a result of high CRDL %R.
L	-	Positive result is considered biased low as a result of poor CRDL %R or MS %R .
UL	-	Nondetected result is considered biased low as a result of poor CRDL %R, MS %R or ICP interference.
J	-	Positive result is estimated as a result of poor MS %R, laboratory duplicate imprecision or ICP Seria Dilution outside quality control limits.
UJ	-	Nondetected result is estimated as a result of poor CRDL %R.
UR	-	Nondetected result is considered unusable and rejected as a result of extremely low matrix spik recovery.

Brown & Root Environmental

INTERNAL CORRESPONDENCE

C-49-01-6-132

TO : LEEANN SINAGOGA

DATE: JANUARY 17, 1996

FROM: WILLIAM J. BROTZ

COPIES: DV FILE

SUBJECT: MISCELLANEOUS DATA VALIDATION - AMMONIA, NITRATE/NITRITE, TOC, AND NITROCELLULOSE, CTO 222 - INDIAN HEAD, MARYLAND
SAMPLE DELIVERY GROUP SDG - 9510025

SAMPLES: 1/Aqueous/ 25-RB09

4/Soil/ S25-SB02-001 S25-SB02-002 S25-SB03-001
S25-SB03-002

Overview

The sample set for SDG 9510025 Indian Head, Maryland, consists of four (4) soil samples, and one equipment rinsate blank.

The above samples were analyzed for ammonia, nitrate/nitrite, total organic carbon (TOC), and nitrocellulose. The samples were collected by Brown & Root Environmental on October 3, 1995 and analyzed by Ceimic Corporation under Naval Energy and Environmental Support Activity (NEESA) Level C Quality Assurance/Quality Control (QA/QC) criteria. All analyses were conducted using method specific analytical and reporting protocols.

Summary

All analytes were successfully analyzed. The findings offered in this report are based upon a general review of all available data including data completeness, holding times, calibration data, laboratory method/preparation blanks, matrix spike recoveries, laboratory duplicate results, and laboratory control sample (LCS) results.

Areas of concern with respect to data quality are listed below.

Major Problems

None

Minor Problems

The analytical holding times for TOC in samples S25-SB02-001, S25-SB02-002, S25-SB03-001, and S25-SB03-002 were exceeded. Positive results for TOC in the aforementioned samples were qualified as biased low, "L".

The Continuing Calibration Verification (CCV) Percent Recoveries (%Rs) for nitrate/nitrite were below the lower quality control limit. Nondetected results reported for nitrate/nitrite have been qualified as biased low, "UL".

The Matrix Spike (MS) Percent Recovery (%R) for nitrocellulose in the soil matrix was below the lower quality control limit. Nondetected results reported for nitrocellulose in the soil matrix have been qualified as biased low, "UL".

The Laboratory Control Sample (LCS) Percent Recovery (%R) for nitrocellulose was below the lower quality control limit. Nondetected results reported for nitrocellulose have been qualified as biased low, "UL".

Executive Summary

Laboratory Performance: The CCV %R for nitrate/nitrite was outside quality control limits. The LC' %R for nitrocellulose was outside quality control limits.

Other Factors Affecting Data Quality: The MS %R for nitrocellulose was outside quality control limits.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Data Validation", April 1993 Revision as amended for use within USEPA Region III, and the NEESA document entitled "Sampling and Chemical Analysis Quality Assurance requirements for the Navy Installation Restoration Program" (NEESA 20.2-047B; 6/88).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NEESA Guidelines and the Quality Assurance Project Plan (QAPP)."

Brown & Root Environmental
William J. Brotz
Chemist

Brown & Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

Data Qualifier Key:

U	-	Value is a nondetect as reported by the laboratory.
L	-	Positive result is considered biased low as a result of holding times exceedence.
UL	-	Nondetected result is considered biased low as a result of low CCV %R.

APPENDIX K

RISK ASSESSMENT

Example Exposure Dose
Calculations for
Risk Assessment

CALCULATION WORKSHEET Order No. 19118 (01-91) PAGE 1 OF

CLIENT INDIAN HEAD	JOB NUMBER	
SUBJECT DERMAL CONTACT WITH SOIL: INTAKE AND RISK ESTIMATION - RESIDENTIAL SCENARIO		
BASED ON	DRAWING NUMBER	
BY EVW	CHECKED BY TAS	APPROVED BY	DATE 2/4/96

Purpose: To estimate exposure intakes and noncarcinogenic/carcinogenic risks associated with dermal contact with soil for a residential scenario

Relevant Equations:

$$DEX = \frac{C \times SA \times AF \times ABS \times EF \times ED}{BW \times AT \times 10^6}$$

Where:
- C = contamination concentration in soil (mg/kg)
- SA = skin surface area available for contact (cm^2/day)
- AF = adherence factor (mg/cm^2)
- ABS = absorption factor (unitless)
- EF = exposure frequency (days/year)
- ED = exposure duration (years)
- BW = body weight (kg)
- AT = Averaging time (days)

$HQ = DEX_{nc} / RfD_{derm}$
$ICR = DEX_c \times CSF_{derm}$

Where:
- HQ = Hazard Quotient (unitless)
- DEX_{nc} = intake for noncarcinogenic effects (mg/kg-day)
- RfD_{derm} = dermal Reference Dose (mg/kg-day)
- ICR = Incremental Cancer Risk (unitless)
- DEX_c = Intake for carcinogenic effects (mg/kg-day)
- CSF_{derm} = dermal cancer slope factor (kg-day/mg)

CALCULATION WORKSHEET Order No. 19116 (01-81) PAGE 2 OF

CLIENT
Indian Head

JOB NUMBER

SUBJECT
Dermal Contact with Soil: Intake and Risk Estimation - Residential Scenario

BASED ON

DRAWING NUMBER

BY
EVW

CHECKED BY
[illegible]

APPROVED BY

DATE
2-9-96

Sample calculations:

For the residential scenario, the following assumptions where made for child & adult residents as outlined below: (Note the child resident was used for the sample calculation of noncarcinogenic risks; and ~~an adult re~~ carcinogenic risks use a time weighted average to include risks for an individual over both child & adulthood.

C = maximum soil concentration

SA = 1800 cm^2 for child

~~5000~~ 2434 cm^2 for adult (timeweighted average)

AF = 1.0 mg/cm^2 (upper bound value)

ABS = VOCs: 0.1

BNAs/Pesticides: 0.05

PCBs: 0.03

Metals 0.001 (Regional defaults)

EF = 350 days/year

ED = 24 years - adult; 6 years - child

BW = 15 Kg - child

70 Kg - adult

AT = 365 days/year x ED - Noncarcinogens

365 days/year x 70 - Carcinogens

10^6 = conversion factor (mg/kg)

For arsenic at a maximum concentration of 9.6 $\frac{mg}{Kg}$ at Site 8 (SWMU 25) intakes are calculated as follows:

CALCULATION WORKSHEET Order No. 19118 (01-81)

CLIENT INDIAN HEAD	JOB NUMBER
SUBJECT DERMAL CONTACT WITH SOIL: INTAKE AND RISK ESTIMATION - RESIDENTIAL SCENARIO	
BASED ON	DRAWING NUMBER
BY EVW / CHECKED BY	APPROVED BY / DATE 2-9-96

for the child resident

$$Dev_{nc} = \frac{(9.6 \frac{mg}{kg})(1800 \frac{cm^2}{day})(1 \frac{kg}{cm^2})(0.001)(350 \frac{days}{year})(6\ years)}{15\,kg \times 365 \frac{days}{year} \times 6\ years \times 10^6 \frac{mg}{kg}}$$

$$\boxed{= 1.10E-6\ mg/kg\text{-}day}$$ ✓

$$Dev_c = \frac{(9.6 \frac{mg}{kg})(2434 \frac{cm^2}{day})(\frac{1\,mg}{cm^2})(0.001)(350 \frac{days}{year})}{365\ days/year \times 70\ years \times 10^6 \frac{mg}{kg}}$$

$$\boxed{= 3.20\,E-7\ mg/kg\text{-}day}$$ ✓

Risks are then calculated as follows:

$HQ = (1.10\,E-6\ mg/kg\text{-}day)/(2.94\,E^{-4}\ mg/kg\text{-}day) = \boxed{3.74\,E-3}$ ✓

$ICR = (3.20\,E-7\ mg/kg\text{-}day)(1.53\,E+0\ mg/kg\text{-}day) = \boxed{4.90\,E-7}$ ✓

CALCULATION WORKSHEET Order No. 19116 (01-91) PAGE 4 OF

CLIENT INDIAN HEAD	JOB NUMBER
SUBJECT INGESTION OF SOIL INTAKE AND RISK ESTIMATION (Residential & ...)	
BASED ON	DRAWING NUMBER

BY	CHECKED BY	APPROVED BY	DATE
EVW	TBS		2/9/96

Purpose: To estimate exposure intakes and noncarcinogenic/carcinogenic risks associated with the incidental ingestion of soil under a Residential Land Use Scenario.

Relevant Equations:

$$IEX = \frac{C \times IR \times F_i \times EF \times ED}{BW \times AT \times 10^6}$$

Where:
IEX = ingestional exposure dose (mg/kg/day)
C = mean concentration in soil sample (mg/kg)
IR = soil ingestion rate (mg/event)
EF = exposure frequency (events/year)
F_i = fraction from contaminated source
ED = Exposure duration (years)
BW = Body weight (Kg)
AT = Averaging time (Days)

$$HQ = IEX_{nc} / RfD_{ing}$$
$$ICR = IEX_c \times CSF_{ing}$$

where: HQ = Hazard Quotient (unitless)
IEX_{nc} = ingestional exposure for noncarcinogenic effects (mg/kg-day)
RfD_{ing} = ingestion Reference dose (mg/kg-day)
ICR = Incremental cancer risk (unitless)
IEX_c = ingestional exposure for carcinogenic effects (mg/kg-day)
CSF_{ing} = cancer slope factor for ingestion/oral exposure (kg-day/mg)

CALCULATION WORKSHEET Order No. 19118 (01-91)

CLIENT Indian Head

JOB NUMBER

SUBJECT Ingestion of Soil Intake and Risk Assessment (Residentia Scenar

BASED ON

DRAWING NUMBER

BY EVW

CHECKED BY [initials]

APPROVED BY

DATE 2/9/96

Sample Calculations:

For the residential scenario, the following assumptions where made: (Note, A child resident was used in the sample calculation for noncarcinogenic intakes and risks; and an adult resident was used for the calculation of carcinogenic risks:

C = ~~maximum concentration~~ in soil
1.14.29 timeweighted average

IR = 100 mg/day (upper bound value) - adult
200 mg/day (upper bound value) - child.

F_i = 1 (professional judgement).

EF = 350 days/year

ED = 24 years - adult
6 years - child

BW = 70 kg - adult
15 kg - child

AT = 365 days/year x ED = Noncarcinogens
365 days/year x 70 - Carcinogens,

For arsenic at a concentration of 9.6 $\frac{mg}{kg}$ at Site 8 (SWMU 25) intakes are calculated as follows:
for the child resident (noncarcinogenic risks.

$$IEV_{AC} = \frac{(9.6 \frac{mg}{kg})(200 \frac{mg}{day})(350 \frac{days}{year})(6 years)(10^{-6} kg/mg)}{15 kg \times 365 \frac{days}{year} \times 6 years}$$

$$\boxed{= 1.23 E\text{-}4 \ mg/kg\text{-}day}$$ ✓

For the adult resident, carcinogenic risks are calculated as follows:

CALCULATION WORKSHEET Order No. 19118 (01-91)

CLIENT: INDIAN HEAD

JOB NUMBER:

SUBJECT: INGESTION OF SOIL INTAKE AND RISK ASSESSMENT (RESIDENTIAL SCENARIO)

BASED ON:

DRAWING NUMBER:

BY: EVW

CHECKED BY: [signature]

APPROVED BY:

DATE: 2/9/96

$$IEX_c = \frac{\left(9.6 \frac{mg}{kg}\right)\left(114.29 \left(\frac{mg\text{-}y}{kg\text{-}d}\right)\right)\left(350 \frac{days}{year}\right)\left(10^{-6} \frac{kg}{mg}\right)}{365 \frac{days}{year} \times 70\ years}$$

$$\boxed{= 1.50\ E\text{-}5\ mg/kg\text{-}day} \checkmark$$

Risks are the calculated as follows:

$$HQ\ (child) = (1.23E\text{-}4\ mg/kg\text{-}day / 3.0E\text{-}4\ mg/kg\text{-}day)$$

$$\boxed{= 4.10\ E\text{-}1} \checkmark$$

$$ICR\ (adult) = (1.50\ E\text{-}5\ mg/kg\text{-}day)(1.50\ E0\ mg/kg\text{-}day)$$

$$\boxed{= 2.25\ E\text{-}5} \checkmark$$

CALCULATION WORKSHEET Order No. 19118 (01-91) PAGE 7 OF

CLIENT Indian Head	JOB NUMBER	
SUBJECT Ingestion of Soil Intake and Risk Estimation (Industrial Scenario)		
BASED ON	DRAWING NUMBER	
BY EVW / CHECKED BY TRS	APPROVED BY	DATE 2/9/96

Purpose: To estimate exposure intakes and noncarcinogenic/carcinogenic risks associated with the incidental ingestion of soil under an Industrial Land Use Scenario

Relevant Equations:

$$IEX = \frac{C \times IR \times F_i \times EF \times ED}{BW \times AT \times 10^6}$$

Where: IEX = ingestional exposure dose (mg/kg/day)
C = mean concentration in soil sample (mg/kg)
IR = soil ingestion rate (mg/event)
EF = exposure frequency (events/year)
F_i = fraction from contaminated source
ED = Exposure duration (years)
BW = Body weight (kg)
AT = Averaging time (Days)

$HQ = IEX_{nc} \div RfD_{ing}$
$ICR = IEX_c \div CSF_{ing}$

Where: HQ = Hazard Quotient (unitless)
IEX_{nc} = ingestional exposure for noncarcinogenic effects (mg/kg-day)
RfD_{ing} = Reference dose for ingestion/oral exposure (mg/kg-day)
ICR = Incremental cancer risk (unitless)
IEX_c = ingestional exposure for carcinogenic effects (mg/kg-day)
CSF_{ing} = cancer slope factor for ingestion/oral exposure (kg-day/mg)

CALCULATION WORKSHEET Order No. 19116 (81-91) PAGE 8 OF

CLIENT: INDIAN HEAD		JOB NUMBER:	
SUBJECT: INGESTION OF SOIL INTAKE AND RISK ESTIMATION (INDUSTRIAL SCENARIO)			
BASED ON:		DRAWING NUMBER:	
BY: EVW	CHECKED BY: TAS	APPROVED BY:	DATE: 2/9/96

Sample Calculations:

For an adult worker in an industrial scenario, the following assumptions are made

C = maximum concentration
IR = 100 mg/day (upper bound limit)
FI = 0.5 (professional judgement)
EF = 250 days/year
ED = 25 years
BW = 70 kg (average value)
AT = 365 days/year x ED - Noncarcinogens
= 365 days/year x 70 - Carcinogens

For arsenic at a maximum concentration of 9.6 $\frac{mg}{kg}$ at Site 8, (SWMU25), intakes are calculated as follows.

$$IEX_{nc} = \frac{\left(9.6\frac{mg}{kg}\right)\left(100\frac{mg}{day}\right)(0.5)\left(250\frac{days}{year}\right) \times 25\ years}{70\ kg \times 365\ \frac{days}{year} \times 25\ years \times 10^{6}\frac{mg}{kg}}$$

$$\boxed{= 4.70E-6\ mg/kg\text{-}day}$$ ✓

$$IEX_{c} = \frac{\left(9.6\frac{mg}{kg}\right)\left(100\frac{mg}{day}\right)(0.5)\left(250\frac{days}{year}\right)(25\ years)}{70\ kg \times 365\ \frac{days}{year} \times 70\ years \times 10^{6}\frac{mg}{kg}}$$

$$\boxed{= 1.68E-6\ mg/kg\text{-}day}$$ ✓

Risks are the calculated as follows:

$HQ = (4.70E-6\ mg/kg\text{-}day)/(3.0E-4\ mg/kg\text{-}day) = \boxed{1.57E-2}$ ✓

$ICR = (1.68E-6\ mg/kg\text{-}day)(1.50E+0\ mg/kg\text{-}day) = \boxed{2.52E-6}$ ✓

CLIENT: INDIAN HEAD

JOB NUMBER:

SUBJECT: DERMAL CONTACT WITH SOIL : INTAKE AND RISK ESTIMATION - INDUSTRIAL SCENARIO

BASED ON:

DRAWING NUMBER:

BY: EVW

CHECKED BY: [signature]

APPROVED BY:

DATE: 2/9/96

Purpose: To estimate exposure intakes and noncarcinogenic/carcinogenic risks associated with dermal contact with soil under an industrial land use scenario.

Relevant Equations

$$DEX = \frac{C \times SA \times AF \times ABS \times ED}{BW \times AT \times IEL}$$

Where: C = contamination concentration in soil (mg/kg)
SA = skin surface area available for contact (cm^2/day)
AF = adherence factor (mg/cm^2)
ABS = absorption factor (unitless)
EF = exposure frequency (days/year)
ED = exposure duration (years)
BW = body weight (kg)
AT = Averaging time (days)

$HQ = DEX_{nc} / RfD_{derm}$
$ICR = DEX_c \times CSF_{derm}$

Where: HQ = Hazard Quotient (unitless)
DEX_{nc} = intake for noncarcinogenic effects (mg/kg-day)
RfD_{derm} = dermal Reference Dose (mg/kg-day)
ICR = Incremental Cancer Risk (unitless)
DEX_c = Intake for carcinogenic effects (mg/kg-day)
CSF_{derm} = dermal cancer slope factor (kg-day/mg)

CALCULATION WORKSHEET Order No. 19115 [01-91]

PAGE 10 OF

CLIENT: Indian Head

JOB NUMBER:

SUBJECT: Dermal Contact with Soil: Intake and Risk Estimation - Industrial Scenario

BASED ON:

DRAWING NUMBER:

BY: EVW

CHECKED BY: [illegible]

APPROVED BY:

DATE: 2/9/96

Sample calculations:

For the adult worker under the industrial scenario, the following assumptions where made:

C = maximum soil concentration
SA = 3450 cm^2
AF = 1 mg/cm^2 (upper bound value)
ABS = VOCs: 0.1
BNAs/Pesticides: 0.05
PCB's: 0.03
Metals 0.001 (Regional defaults)
EF = 250 days/year
ED = 25 years
BW = 70 Kg
AT = 365 days/year × ED - Noncarcinogens
365 days/year × 70 - Carcinogens
10^6 = conversion factor (mg/kg)

For arsenic at a maximum concentration of 9.6 $\frac{mg}{kg}$ at Site 8 (SWMU 25) intakes are calculates as follows:

$$Dex_{NC} = \frac{\left(9.6 \frac{mg}{kg}\right)\left(3450 \frac{cm^2}{day}\right)\left(1 \frac{mg}{cm^2}\right)(0.001)\left(250 \frac{days}{year}\right)(25 \text{ years})}{70 \text{ kg} \times 25 \text{ years} \times 365 \frac{days}{year} \times 10^6 \frac{mg}{kg}}$$

$$\boxed{= 3.24E-7 \text{ mg/kg-day}}$$ ✓

$$Dex_{C} = \frac{\left(9.6 \frac{mg}{kg}\right)\left(3450 \frac{cm^2}{day}\right)\left(1 \frac{mg}{cm^2}\right)(0.001)\left(250 \frac{days}{year}\right)(25 \text{ years})}{70 \text{ kg} \times 70 \text{ years} \times 365 \frac{days}{year} \times 10^6 \frac{kg}{kg}}$$

$$\boxed{= 1.16E-7 \text{ mg/kg-day}}$$ ✓

CALCULATION WORKSHEET Order No. 19116 (01-91) PAGE 11 OF

CLIENT		JOB NUMBER	
INDIAN HEAD			
SUBJECT			
DERMAL CONTACT WITH SOIL: INTAKE AND RISK ESTIMATION - INDUSTRIAL SCENARIO			
BASED ON		DRAWING NUMBER	
BY EAW	CHECKED BY [signature]	APPROVED BY	DATE 2/19/96

Risks are then Calculated as follows:

$$HQ = (3.24E\text{-}7 \text{ mg/kg-day}) / (2.94E\text{-}4 \text{ mg/kg-day}) = \boxed{1.10E\text{-}3} \checkmark$$

$$ICR = (1.16E\text{-}7 \text{ mg/kg-day})(1.53E{+}0 \text{ mg/kg-day}) = \boxed{1.77E\text{-}7} \checkmark$$

CLIENT	JOB NUMBER
U.S. Navy - Northern Division	CTO-222- 5280
SUBJECT	
Evaluation of Incidental Ingestion of Area 8 Sediments	
BASED ON	DRAWING NUMBER
VI Data	

BY	CHECKED BY	APPROVED BY	DATE
L.A. SINAGOGA	EVW		2/9/96

Objective: Determine exposure dose and risk associated with the incidental ingestion of COCs in sediments at Area 8

Exposure assumptions:

- Averaging time (yrs - 70 (carcinogens); ED (noncarcinogens))
- Ingestion rate - 50 mg/day
- Exposure frequency - 24 days/yr
- Exposure duration - 25 yrs
- Adult body weight - 70 kg
- Fraction ingested - 1

Example calculation:

$$\text{Exposure dose } (mg/Kg/d) = \frac{C(mg/Kg) \times IR(mg/d) \times FI \times EF(d/yrs) \times ED(yrs)}{BW(Kg) \times 365\, d/yr \times AT(yrs) \times 1E^{6}\, mg/Kg}$$

Conversion factors for non-carcinogens:

$$= \frac{C(mg/Kg) \times 50\, mg/d \times 1 \times 24\, d/yrs \times 25\, yrs}{70\, Kg \times 365\, d/yr \times 25\, yrs \times 1E6\, mg/Kg}$$

$$= C(mg/Kg) \times 4.7E\text{-}08 \checkmark\checkmark$$

Conversion factor for carcinogens:

$$= \frac{C(mg/Kg) \times 50\, mg/d \times 1 \times 24\, d/yrs \times 25\, yrs}{70\, Kg \times 365\, d/yr \times 70\, yrs \times 1E6\, mg/Kg} = C(mg/Kg) \times 1.7E\text{-}08 \checkmark\checkmark$$

CLIENT: U.S. Navy - Northern Division

JOB NUMBER: CTO-222-5280

SUBJECT: Evaluation of dermal contact with Area 8 sediments

BASED ON: VI data

DRAWING NUMBER:

BY: L.A. SINAGOGA | CHECKED BY: EVW | APPROVED BY: | DATE: 2/9/96

Objective: Determine absorbed dose and risk associated with the dermal contact with COCs in sediments at Area 8.

Exposure Assumptions:

- Averaging time (yrs - 70 (carcinogens); ED (noncarcinogens))
- Skin surface area - 2,200 cm^2 (SA)
- Adherence factor - 1 mg/cm^2 (AF)
- Absorption fraction - Chemical specific (ABS)
- Exposure frequency - 24 day/yrs (EF)
- Exposure duration - 25 yrs (ED)
- Body weight - 70 Kg (BW)

Example calculation:

$$\text{Absorbed dose (mg/Kg/day)} = \frac{C(mg/Kg) \times SA(cm^2) \times AF(mg/cm^2) \times ABS \times EF(d/yr) \times ED(yrs)}{BW(Kg) \times 365\,d/yr \times AT(yrs) \times 1E6(mg/Kg)}$$

Conversion factor for non-carcinogens:

$$= \frac{C(mg/Kg) \times ABS \times 2{,}200\,cm^2 \times 1\,mg/cm^2 \times 24\,d/yrs \times 25\,yrs}{70\,Kg \times 365\,d/yr \times 25\,yrs \times 1E6(mg/Kg)}$$

$= C(mg/Kg) \times ABS \times 2.1E-06$ — 2.07E-6 ✓

Conversion factor for carcinogens:

$$= \frac{C(mg/Kg) \times ABS \times 2200\,cm^2 \times 1\,mg/cm^2 \times 24\,d/yrs \times 25\,yrs}{70\,Kg \times 365\,d/yr \times 70\,yrs \times 1E6\,mg/kg}$$

$= C(mg/Kg) \times ABS \times 7.38E-07$ ✓

CALCULATION WORKSHEET Order No. 19*16 (01-91)

CLIENT: U.S. Navy - Northern Division		JOB NUMBER: CTO-222 5280	
SUBJECT: Evaluation of Dermal Contact with Area 8 - Surface Waters			
BASED ON: VI Data		DRAWING NUMBER	
BY: L. A. Sinagoga	CHECKED BY: EVW	APPROVED BY	DATE: 2/9/96

Objective: Determine absorbed dose and risk associated with dermal contact with COCs in surface waters at Area 8.

Exposure assumptions:

- Averaging time (yrs) - 70 (carcinogens); ED (Non-carcinogens)
- Surface area available for contact (SA) = 0.22
- Exposure time (ET) = 1 event/day
- Exposure duration (ED) = 25 yrs
- Exposure frequency (EF) = 24 days/yr
- Adult body weight (BW) = 70 Kg
- Permeability constant (PC) = Chemical specific L/m²-event (assuming 2 hrs/day exposure)

Example calculation:

$$\text{Absorbed dose (mg/Kg/day)} = \frac{C(\text{mg/L}) \times SA(m^2) \times PC(L/m^2\text{-event}) \times ED(\text{yrs}) \times EF(\text{d/yrs}) \times \frac{1\text{ event}}{\text{day}}}{BW(\text{Kg}) \times 365\text{ d/yr} \times AT(\text{yrs})}$$

Conversion factor for Noncarcinogens:

$$= \frac{C(\text{mg/L}) \times PC(L/m^2\text{-event}) \times 0.22\,m^2 \times 25\text{ yrs} \times 24\text{ day/yr} \times 1\text{ event/day}}{70\text{ Kg} \times 365\text{ d/yrs} \times 25\text{ yrs}}$$

$$= C(\text{mg/L}) \times PC(L/m^2\text{-event}) \times 2.07E\text{-}04 \checkmark$$

Conversion factor for carcinogens:

$$= \frac{C(\text{mg/L}) \times PC(L/m^2\text{-event}) \times 0.22\,m^2 \times 25\text{ yrs} \times 24\text{ d/yrs} \times 1\text{ event/d}}{70\text{ Kg} \times 365\text{ d/yrs} \times 70\text{ yrs}}$$

$$= C(\text{mg/L}) \times PC(L/m^2\text{-event}) \times 7.38E\text{-}05 \checkmark$$

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT	JOB NUMBER		
U.S. Navy-Northern Division	CTO-222 5280		
SUBJECT: Evaluation of Ingestion of Groundwater Exposure Pathway			
BASED ON: VI Data	DRAWING NUMBER		
BY: L.H. SINAGOGA	CHECKED BY: EUW	APPROVED BY	DATE: 2/9/96

Objective: Determine exposure dose and risk associated with the routine ingestion of COPCs in groundwater.

Exposure assumptions:

- C(mg/L) = Representative concentration
- Ingestion rate (IR)
  - Adult - 2L/d
  - Child - 1L/d
  - Age-Adjusted - 1.09 L-y /Kg-d
- Exposure frequency (EF) - 350 days/yr
- Exposure duration (per lifetime) - ED_{Tot} = 30yrs
- Exposure duration (child) - ED_c = 6yrs
- Averaging time carcinogens AT_c = 25550 days
- Averaging time non-carcinogens AT_{NC} = ED * 365 days
- Body weight of adult receptor (BW_A) = 70Kg

EPA Region III Exposure Assumptions

Exposure dose equation (Carcinogens):

$$= \frac{C(mg/L) \times IR(adj)(L\text{-}y/Kg\text{-}d) \times EF\ days/yr}{AT_C\ (days)}$$

$$= \frac{C(mg/L) \times 1.09\,L\text{-}y/kg\text{-}d \times 350\ days/yr}{25550\ days} = C\,mg/L \times 1.49E\text{-}02 \checkmark$$

Exposure dose equation (Noncarcinogens):

$$= \frac{C\,mg/L \times IR_A\,(L/d) \times ED_{Tot}\,(yrs) \times EF\,(days/yr)}{BW_A(Kg) \times ED(yrs) \times 365\ days/year} = mg/L$$

$$= \frac{C\,mg/L \times 2L/d \times 30yrs \times 350 days/yr}{70Kg \times 365 d/yr \times 30yrs} = C\,mg/L \times 2.74E\text{-}02 \checkmark$$

CLIENT		JOB NUMBER	
U.S. Navy		CTO-222 5280	
SUBJECT			
Evaluation of VOCs in Water - Domestic water supply USE			
BASED ON		DRAWING NUMBER	
VI Data			
BY	CHECKED BY	APPROVED BY	DATE
L.A. SINAGOGA	EVH		2/9/96

Objective: Determine exposure dose and risk associated with the inhalation of VOCs as a result of the domestic use of a water supply

Exposure Assumptions:

- Representative concentration in water source (C) in mg/L
- Inhalation rate - adult (IRA_a) = 20 m^3/day
- Inhalation rate - age adjusted ($IFAad_i$) = 11.66 m^3-y/Kg-d
- Body weight - adult (Kg) = 70 Kg
- Exposure frequency (EF) = 350 d/yr
- Exposure duration during lifetime (ED) = 30 yrs
- Volatilization factor (K) = 0.5 L/m^3
- Averaging time for carcinogens (AT_C) = 25550 days
- Averaging time for noncarcinogens (AT_N) = (ED * 365) days

EPA Region III Exposure Assumption

Exposure dose equation - carcinogens:

$$= \frac{C(mg/L) \times IFAad_i(m^3\text{-}y/Kg\text{-}d) \times EF(days/yr) \times K(L/m^3)}{AT_C\ (days)}$$

$$= \frac{C(mg/L) \times 11.66(m^3\text{-}y/Kg\text{-}d) \times 350(days/yr) \times 0.5\,L/m^3}{25550\ days}$$

$$= C(mg/L) \times 7.9E\text{-}02$$

Exposure dose equation - Non carcinogens:

$$= \frac{C(mg/L) \times IRA_a(m^3/d) \times EF(days/yr) \times ED(yrs) \times K(L/m^3)}{BW_A(Kg) \times 365\ days/yr \times ED(yrs)}$$

$$= \frac{C(mg/L) \times 20\,m^3/day \times 350\,days/yr \times 30\,yrs \times 0.5\,L/m^3}{70\,Kg \times 365\,days/yr \times 30\,yrs}$$

$$= C\,mg/L \times 1.37E\text{-}01$$

CLIENT	JOB NUMBER		
U.S. Navy	CTO-222 5280		
SUBJECT: Evaluation of Dermal Exposure to COPCs in Water While Bathing			
BASED ON: VI Data	DRAWING NUMBER		
BY: L. A. Sinagoga	CHECKED BY: EVW	APPROVED BY	DATE: 2/9/96

Objective: Determine absorbed dose and risk associated with dermal contact with COPCs in water while bathing

Exposure assumptions:

- Representative concentration in water source (C) in mg/L
- Body weight adult (Kg) = 70 Kg
- Exposure frequency (EF) = 350 d/yr
- Exposure Duration during lifetime (ED) = 30 yrs
- Averaging time for carcinogens (AT_C) = 25550 days
- Averaging time for noncarcinogens (AT_N) = (ED × 365) days
- Adult skin surface area (SA_A) = 1.94 m^2
- Skin surface area adjusted (SA_{adj}) = .9531 (yrs · m^2)/Kg
- Permeability constant (PC) is contaminant specific (L/m^2-event)
- Events per day

Exposure dose equation - carcinogens:

$$= \frac{C(mg/L) \times SA_{adj}(yrs \cdot m^2/Kg) \cdot EF(days/yr) \times PC(L/m^2\text{-event}) \times ET(events/days)}{AT_C(days)}$$

$$= \frac{C(mg/L) \times 0.9531(yrs \cdot m^2)/Kg \times 350\,days/yr \times PC(L/m^2\text{-event}) \times 1\,event/day}{25550\,days}$$

$$= C(mg/L) \times 1.3E\text{-}02 \times PC$$

Exposure dose equation - Noncarcinogens:

$$= \frac{C(mg/L) \times SA_A(m^2) \times ED(yrs) \times EF(days/yr) \times PC(L/m^2\text{-event}) \times ET(events/day)}{BW_A(Kg) \times 365\,days/yr \times ED\,yrs}$$

$$= \frac{C(mg/L) \times 1.94\,m^2 \times 30\,yrs \times 350\,days/yr \times PC(L/m^2\text{-event}) \times 1\,event/d}{70\,Kg \times 365\,d/yr \times 30\,yrs}$$

$$= 2.66E\text{-}02 \times C(mg/L) \times PC$$

Determination of exposure point concentrations for Area 8 Soils

(the maximum detected concentration was used as the exposure point concentration for all other media and areas of concern)

Soil Data (0-10') - Sw, Z5 : Indian Head

~~Table X~~
Selection of Constituents of Potential Concern

Constituent	Frequency of Detection	Range of Detection	Dist	Average Positive Hits	Represent. Concent.	T-Test Y-reject Ho N-accept Ho na-not applicable	WRS Test Y-reject Ho N-accept Ho na-not applicable	Test of Proportions Y-reject Ho N-accept Ho na-not applicable	Exceed the 95th Percentile Y-Yes N-No na-not applicable	Above Background Y-Yes N-No	Comment
ALUMINUM	10/10	1780.0000 8340.0000	Log	4328.5000	6420(b)	na	na	na	na	na	
ANTIMONY	1/6	0.5100 0.5100	Und	0.5100	0.51(d)	na	na	na	na	na	
ARSENIC	10/10	0.6700 12.4000	Log	3.7410	9.6(b)	na	na	na	na	na	
BARIUM	10/10	13.4000 55.0000	Log	26.0650	35.2(b)	na	na	na	na	na	
BERYLLIUM	9/10	0.2400 0.8400	Und	0.3656	0.84(d)	na	na	na	na	na	
CADMIUM	2/10	0.5600 0.6100	Und	0.5850	0.61(d)	na	na	na	na	na	
CALCIUM	10/10	39.7000 303.0000	Und	94.8400	303(d)	na	na	na	na	na	
CHROMIUM	10/10	4.5000 18.4000	Log	10.6950	15.3(b)	na	na	na	na	na	
COBALT	10/10	1.3250 21.2000	Log	5.3825	9.5(b)	na	na	na	na	na	
COPPER	10/10	1.5000 20.0000	Log	5.0300	8.9(b)	na	na	na	na	na	
CYANIDE	2/10	1.1000 1.5000	Und	1.3000	1.5(d)	na	na	na	na	na	
IRON	10/10	2300.0000 34900.0000	Log	14904.5000	34900(c)	na	na	na	na	na	

a ⇒ UCL - Normal Distribution

b ⇒ UCL - Lognormal Distribution

c ⇒ maximum detect, since UCL > max detect

d ⇒ Maximum detect, undefined distribution

Table X
Selection of Constituents of Potential Concern

Constituent	Frequency of Detection	Range of Detection	Dist	Average Positive Hits	Represent. Concent.	T-Test Y-reject Ho N-accept Ho na-not applicable	WRS Test Y-reject Ho N-accept Ho na-not applicable	Test of Proportions Y-reject Ho N-accept Ho na-not applicable	Exceed the 95th Percentile Y-Yes N-No na-not applicable	Above Back-ground Y-Yes N-No	Comment
LEAD	10/10	1.9000 8.2000	Norm ✓	4.6000	5.9(a)	na	na	na	na	na	
MAGNESIUM	10/10	63.1000 1540.0000	Log ✓	356.1100	792(b)	na	na	na	na	na	
MANGANESE	10/10	10.6000 171.0000	Norm ✓	71.8400	98.9(a)	na	na	na	na	na	
NICKEL	8/10	1.9000 25.4000	Log ✓	7.3625	16.8(b)	na	na	na	na	na	
POTASSIUM	10/10	153.0000 761.0000	Log ✓	307.5000	446(b)	na	na	na	na	na	
SODIUM	1/10	26.2000 26.2000	Und ✓	26.2000	26.2(d)	na	na	na	na	na	
VANADIUM	10/10	5.5000 34.3000	Log ✓	13.6800	20.2(b)	na	na	na	na	na	
ZINC	9/10	5.0750 92.1000	Log ✓	19.3750	40.8(b)	na	na	na	na	na	
ACETONE	2/5	8.7500 17.0000	Und ✓	12.8750	17(d)	na	na	na	na	na	
CARBON DISULFIDE	3/5	1.1400 1.6750	Norm ✓	1.4050	1.54(a)	na	na	na	na	na	
CHLOROFORM	2/5	1.2000 3.0000	Und	2.1000	3(d)	na	na	na	na	na	
METHYLENE CHLORIDE	4/5	5.0000 32.8000	Norm	15.9000	32.8(a)	na	na	na	na	na	

Table X
Selection of Constituents of Potential Concern

Constituent	Frequency of Detection	Range of Detection	Dist	Average Positive Hits	Represent. Concent.	T-Test Y-reject Ho N-accept Ho na-not applicable	WRS Test Y-reject Ho N-accept Ho na-not applicable	Test of Proportions Y-reject Ho N-accept Ho na-not applicable	Exceed the 95th Percentile Y-Yes N-No na-not applicable	Above Back-ground Y-Yes N-No	Comment
TRICHLOROETHENE	1/5	1.9000 1.9000	Und	1.9000	1.9(d)	na	na	na	na	na	
XYLENES, TOTAL	1/5	2.1000 2.1000	Und	2.1000	2.1(d)	na	na	na	na	na	
AMMONIA	8/10	12.5000 66.5000	Log	35.0000	66.5(d)	na	na	na	na	na	
TOTAL ORGANIC CARBON	10/10	698.0000 5250.0000	Log	1903.2000	3150(b)	na	na	na	na	na	

3

Dataset: UTM ES
Media : SOIL DATA (0 - 10') - STUMP NECK ANNEX, INDIAN HEAD
Group : SWMU-25

Parameter : ALUMINUM (MG/KG)

	Sample Results	Background Results
Count	10.0000	2.0000
Number of Detects	10.0000	2.0000
Average	4328.5000	3540.0000
Detection Limit - Minimum	NA	NA
Detection Limits - Maximum	NA	NA
Positive Hits - Minimum	1780.0000	3070.0000
Positive Hits - Maximum	8340.0000	4010.0000
Average Of Positive Hits	4328.5000	3540.0000
Standard Deviation	2093.8800	664.6804
Upper Confidence Limit - Normal	~~5642.2081~~	**************
Upper Confidence Limit - Lognormal	6424.4806 Rel Conc	5431.5938
95th Percentile - Nonparametric	~~8340.0000~~	4010.0000
95th Percentile - Normal	7772.9327	4633.3992
95th Percentile - Lognormal	8924.0893	4787.1658

Shapiro-Wilk and Probabilty Plot Results:

	Sample Results	Background Results
Corr Coeff - Detected - Normal	0.9693	1.0000
Corr Coeff - Detected - Lognormal	0.9802	1.0000
Corr Coeff - Total - Normal	0.9693	1.0000
Corr Coeff - Total - Lognormal	0.9802	0.0000
Corr Coeff - Crit Val - Detected	0.9170	**************
Corr Coeff - Crit Val - Total	0.9170	**************
W-Test - Table Value	0.8420	0.0000
W-Test - Normal	0.9329	1.0000
W-Test - Lognormal	0.9480	1.0000
Type of Distribution	LOGNORMAL ✓	UNDEFINED

Test Results:

G

Dataset: UTMP RES
Media : SOIL DATA (0 - 10') - STUMP NECK ANNEX, INDIAN HEAD
Group : SWMU-25

Parameter : ANTIMONY (MG/KG)

	Sample Results	Background Results
Count	6.0000	2.0000
Number of Detects	1.0000	0.0000
Average	0.1658	0.0875
Detection Limit - Minimum	0.0900	0.0850
Detection Limits - Maximum	0.1050	0.0900
Positive Hits - Minimum	~~0.5100~~	NA
Positive Hits - Maximum	0.5100 Rep Conc	NA
Average Of Positive Hits	0.5100	
Standard Deviation	0.1687	0.0035
Upper Confidence Limit - Normal	0.3046	*************
Upper Confidence Limit - Lognormal	0.4313	0.0947
95th Percentile - Nonparametric	0.5100	0.0900
95th Percentile - Normal	0.4434	0.0933
95th Percentile - Lognormal	0.3920	0.0935

Shapiro-Wilk and Probabilty Plot Results:

	Sample Results	Background Results
Corr Coeff - Detected - Normal		
Corr Coeff - Detected - Lognormal		
Corr Coeff - Total - Normal	0.7089	
Corr Coeff - Total - Lognormal	0.7475	
Corr Coeff - Crit Val - Detected	0.8790	
Corr Coeff - Crit Val - Total	0.8900	
W-Test - Table Value	0.7880	0.0000
W-Test - Normal	0.5319	1.0000
W-Test - Lognormal	0.5859	1.0000
Type of Distribution	Undefined✓	Undefined

Test Results:

NO STATISTICAL COMPARISON IS NECESSARY SINCE ANTIMONY WAS NOT DETECTED IN BACKGROUND.

6

Dataset: UTA ES
Media : SOIL DATA (0 - 10') - STUMP NECK ANNEX, INDIAN HEAD
Group : SWMU-25

Parameter : ARSENIC (MG/KG)

	Sample Results	Background Results
Count	10.0000	2.0000
Number of Detects	10.0000	2.0000
Average	3.7410	2.9500
Detection Limit - Minimum	NA	NA
Detection Limits - Maximum	NA	NA
Positive Hits - Minimum	0.6700	2.2000
Positive Hits - Maximum	12.4000	3.7000
Average Of Positive Hits	3.7410	2.9500
Standard Deviation	4.1189	1.0607
Upper Confidence Limit - Normal	~~6.1285~~	**************
Upper Confidence Limit - Lognormal	9.6509 Rep Conc	10.5075
95th Percentile - Nonparametric	~~12.4000~~	3.7000
95th Percentile - Normal	10.5165	4.6948
95th Percentile - Lognormal	11.3696	5.2232

Shapiro-Wilk and Probabilty Plot Results:

	Sample Results	Background Results
Corr Coeff - Detected - Normal	0.8422	1.0000
Corr Coeff - Detected - Lognormal	0.9544	1.0000
Corr Coeff - Total - Normal	0.8422	0.0000
Corr Coeff - Total - Lognormal	0.9544	0.0000
Corr Coeff - Crit Val - Detected	0.9170	**************
Corr Coeff - Crit Val - Total	0.9170	**************
W-Test - Table Value	0.8420	0.0000
W-Test - Normal	0.7111	1.0000
W-Test - Lognormal	0.9055	1.0000
Type of Distribution	LOGNORMAL ✓	UNDEFINED

Test Results:

H

Dataset: UTMP RES
Media : SOIL DATA (0 - 10') - STUMP NECK ANNEX, INDIAN HEAD
Group : SWMU-25

Parameter : BARIUM (MG/KG)

	Sample Results	Background Results
Count	10.0000	2.0000
Number of Detects	10.0000	2.0000
Average	26.0650	19.4500
Detection Limit - Minimum	NA	NA
Detection Limits - Maximum	NA	NA
Positive Hits - Minimum	13.4000	9.1000
Positive Hits - Maximum	55.0000	29.8000
Average Of Positive Hits	26.0650	19.4500
Standard Deviation	13.2954	14.6371
Upper Confidence Limit - Normal	33.7716	**************
Upper Confidence Limit - Lognormal	35.2278 Rep Conc	13417.3530
95th Percentile - Nonparametric	55.0000	29.8000
95th Percentile - Normal	47.9359	43.5280
95th Percentile - Lognormal	47.9731	65.4448

Shapiro-Wilk and Probabilty Plot Results:

	Sample Results	Background Results
Corr Coeff - Detected - Normal	0.8537	1.0000
Corr Coeff - Detected - Lognormal	0.9144	1.0000
Corr Coeff - Total - Normal	0.8537	1.0000
Corr Coeff - Total - Lognormal	0.9144	0.0000
Corr Coeff - Crit Val - Detected	0.9170	**************
Corr Coeff - Crit Val - Total	0.9170	**************
W-Test - Table Value	0.8420	0.0000
W-Test - Normal	0.7412	1.0000
W-Test - Lognormal	0.8480	1.0000
Type of Distribution	LOGNORMAL	UNDEFINED

Test Results:

Dataset: UTI RES
Media : SOIL DATA (0 - 10') - STUMP NECK ANNEX, INDIAN HEAD
Group : SWMU-25

Parameter : BERYLLIUM (MG/KG)

	Sample Results	Background Results
Count	10.0000	2.0000
Number of Detects	9.0000	2.0000
Average	0.3345	0.1700
Detection Limit - Minimum	0.0550	NA
Detection Limits - Maximum	0.0550	NA
Positive Hits - Minimum	0.2400	0.1400
Positive Hits - Maximum	0.8400 Rep Conc	0.2000
Average Of Positive Hits	~~0.3656~~	0.1700
Standard Deviation	0.2026	0.0424
Upper Confidence Limit - Normal	0.4519	**************
Upper Confidence Limit - Lognormal	0.6279	0.3298
95th Percentile - Nonparametric	0.8400	0.2000
95th Percentile - Normal	0.6678	0.2398
95th Percentile - Lognormal	0.8647	0.2534

Shapiro-Wilk and Probabilty Plot Results:

	Sample Results	Background Results
Corr Coeff - Detected - Normal	0.7396	1.0000
Corr Coeff - Detected - Lognormal	0.8442	1.0000
Corr Coeff - Total - Normal	0.8747	1.0000
Corr Coeff - Total - Lognormal	0.8891	1.0000
Corr Coeff - Crit Val - Detected	0.9120	**************
Corr Coeff - Crit Val - Total	0.9170	**************
W-Test - Table Value	0.8420	0.0000
W-Test - Normal	0.8066	1.0000
W-Test - Lognormal	0.8356	1.0000
Type of Distribution	UNDEFINED ✓	UNDEFINED

Test Results:

Dataset: UTMP RES
Media : SOIL DATA (0 - 10') - STUMP NECK ANNEX, INDIAN HEAD
Group : SWMU-25

Parameter : CADMIUM (MG/KG)

	Sample Results	Background Results
Count	10.0000	2.0000
Number of Detects	2.0000	0.0000
Average	0.3400	0.2625
Detection Limit - Minimum	0.2600	0.2550
Detection Limits - Maximum	0.3100	0.2700
Positive Hits - Minimum	~~0.5600~~	NA
Positive Hits - Maximum	0.6100 Rep Conc	NA
Average Of Positive Hits	~~0.5850~~	
Standard Deviation	0.1309	0.0106
Upper Confidence Limit - Normal	0.4159	*************
Upper Confidence Limit - Lognormal	0.4204	0.2841
95th Percentile - Nonparametric	0.6100	0.2700
95th Percentile - Normal	0.5554	0.2799
95th Percentile - Lognormal	0.5464	0.2804

Shapiro-Wilk and Probabilty Plot Results:

	Sample Results	Background Results
Corr Coeff - Detected - Normal	1.0000	
Corr Coeff - Detected - Lognormal	1.0000	
Corr Coeff - Total - Normal	0.7980	
Corr Coeff - Total - Lognormal	0.8250	
Corr Coeff - Crit Val - Detected	0.8790	
Corr Coeff - Crit Val - Total	0.9170	
W-Test - Table Value	0.8420	0.0000
W-Test - Normal	0.6377	1.0000
W-Test - Lognormal	0.6773	1.0000
Type of Distribution	Undefined ✓	Undefined

Test Results:

NO STATISTICAL COMPARISON IS NECESSARY SINCE CADMIUM WAS NOT DETECTED IN BACKGROUND.

Dataset: UT RES
Media : SO. ATA (0 - 10') STUMP NECK ANNEX, INDIAN HEAD
Group : SWMU-25
6YSample Results

Calcium (mg/kg)

		Background Results
Count	10.0000	2.0000
Number of Detects	10.0000	0.0000
Average	94.8400	53.5000
Detection Limit - Minimum	NA	50.5000
Detection Limits - Maximum	NA	56.5000
Positive Hits - Minimum	39.7000	NA
Positive Hits - Maximum	303.0000 Rep Conc	NA
Average Of Positive Hits	94.8400	
Standard Deviation	93.5170	4.2426
Upper Confidence Limit - Normal	149.0467	**************
Upper Confidence Limit - Lognormal	173.3678	62.2791
95th Percentile - Nonparametric	303.0000	56.5000
95th Percentile - Normal	248.6754	60.4791
95th Percentile - Lognormal	234.8066	60.8673

Shapiro-Wilk and Probabilty Plot Results:

Corr Coeff - Detected - Normal	0.7946	
Corr Coeff - Detected - Lognormal	0.8673	
Corr Coeff - Total - Normal	0.7946	
Corr Coeff - Total - Lognormal	0.8673	
Corr Coeff - Crit Val - Detected	0.9170	
Corr Coeff - Crit Val - Total	0.9170	
W-Test - Table Value	0.8420	0.0000
W-Test - Normal	0.6383	1.0000
W-Test - Lognormal	0.7468	1.0000
Type of Distribution	UNDEFINED ✓	Undefined

Test Results:

NO STATISTICAL COMPARISON IS NECESSARY SINCE CALCIUM WAS NOT DETECTED IN BACKGROUND.

//

Dataset: UTMP RES
Media : SOIL DATA (0 - 10') - STUMP NECK ANNEX, INDIAN HEAD
Group : SWMU-25

Parameter : CHROMIUM (MG/KG)

	Sample Results	Background Results
Count	10.0000	2.0000
Number of Detects	10.0000	2.0000
Average	10.6950	9.5000
Detection Limit - Minimum	NA	NA
Detection Limits - Maximum	NA	NA
Positive Hits - Minimum	4.5000	8.5000
Positive Hits - Maximum	18.4000	10.5000
Average Of Positive Hits	10.6950	9.5000
Standard Deviation	4.9889	1.4142
Upper Confidence Limit - Normal	~~13.5068~~	**************
Upper Confidence Limit - Lognormal	15.2834 [illegible]	13.0018
95th Percentile - Nonparametric	~~18.4000~~	10.5000
95th Percentile - Normal	18.9017	11.8264
95th Percentile - Lognormal	21.0836	12.0795

Shapiro-Wilk and Probabilty Plot Results:

	Sample Results	Background Results
Corr Coeff - Detected - Normal	0.9488	1.0000
Corr Coeff - Detected - Lognormal	0.9762	1.0000
Corr Coeff - Total - Normal	0.9488	1.0000
Corr Coeff - Total - Lognormal	0.9762	0.0000
Corr Coeff - Crit Val - Detected	0.9170	**************
Corr Coeff - Crit Val - Total	0.9170	**************
W-Test - Table Value	0.8420	0.0000
W-Test - Normal	0.8815	1.0000
W-Test - Lognormal	0.9386	1.0000
Type of Distribution	LOGNORMAL ✓	UNDEFINED

Test Results:

12

Dataset: UT ES
Media : SOIL DATA (0 - 10') - STUMP NECK ANNEX, INDIAN HEAD
Group : SWMU-25

Parameter : COBALT (MG/KG)

	Sample Results	Background Results
Count	10.0000	2.0000
Number of Detects	10.0000	2.0000
Average	5.3825	3.4000
Detection Limit - Minimum	NA	NA
Detection Limits - Maximum	NA	NA
Positive Hits - Minimum	1.3250	3.3000
Positive Hits - Maximum	21.2000	3.5000
Average Of Positive Hits	5.3825	3.4000
Standard Deviation	5.6844	0.1414
Upper Confidence Limit - Normal	~~8.6774~~	**************
Upper Confidence Limit - Lognormal	9.4677 Rep Conc	3.6881
95th Percentile - Nonparametric	~~21.2000~~	3.5000
95th Percentile - Normal	14.7334	3.6326
95th Percentile - Lognormal	12.9617	3.6393

Shapiro-Wilk and Probabilty Plot Results:

	Sample Results	Background Results
Corr Coeff - Detected - Normal	0.7304	1.0000
Corr Coeff - Detected - Lognormal	0.9137	1.0000
Corr Coeff - Total - Normal	0.7304	1.0000
Corr Coeff - Total - Lognormal	0.9137	0.0000
Corr Coeff - Crit Val - Detected	0.9170	**************
Corr Coeff - Crit Val - Total	0.9170	**************
W-Test - Table Value	0.8420	0.0000
W-Test - Normal	0.5724	1.0000
W-Test - Lognormal	0.8750	1.0000
Type of Distribution	LOGNORMAL✓	UNDEFINED

Test Results:

13

Dataset: UTMP_RES
Media : SOIL DATA (0 - 10') - STUMP NECK ANNEX, INDIAN HEAD
Group : SWMU-25

Parameter : COPPER (MG/KG)

	Sample Results	Background Results
Count	10.0000	2.0000
Number of Detects	10.0000	1.0000
Average	5.0300	1.6250
Detection Limit - Minimum	NA	0.7500
Detection Limits - Maximum	NA	0.7500
Positive Hits - Minimum	1.5000	2.5000
Positive Hits - Maximum	20.0000	2.5000
Average Of Positive Hits	5.0300	2.5000
Standard Deviation	5.3839	1.2374
Upper Confidence Limit - Normal	8.1508	**************
Upper Confidence Limit - Lognormal	8.9273 Rep Conc	1365.9558
95th Percentile - Nonparametric	20.0000	2.5000
95th Percentile - Normal	13.8866	3.6606
95th Percentile - Lognormal	12.1864	5.5553

Shapiro-Wilk and Probabilty Plot Results:

	Sample Results	Background Results
Corr Coeff - Detected - Normal	0.7302	
Corr Coeff - Detected - Lognormal	0.9111	
Corr Coeff - Total - Normal	0.7302	0.0000
Corr Coeff - Total - Lognormal	0.9111	1.0000
Corr Coeff - Crit Val - Detected	0.9170	**************
Corr Coeff - Crit Val - Total	0.9170	**************
W-Test - Table Value	0.8420	0.0000
W-Test - Normal	0.5700	1.0000
W-Test - Lognormal	0.8571	1.0000
Type of Distribution	LOGNORMAL✓	UNDEFINED

Test Results:

H

Dataset: UTI 'ES
Media : SOIL ATA (0 - 10') STUMP NECK ANNEX, INDIAN HEAD
Group : SWMU 25

Parameter : CYANIDE (MG/KG)

	Sample Results	Background Results
Count	10.0000	2.0000
Number of Detects	2.0000	0.0000
Average	0.7075	0.5250
Detection Limit - Minimum	0.5000	0.5000
Detection Limits - Maximum	0.6250	0.5500
Positive Hits - Minimum	1.1000	NA
Positive Hits - Maximum	1.5000 Rep Conc	NA
Average Of Positive Hits	~~1.3000~~	
Standard Deviation	0.3279	0.0354
Upper Confidence Limit - Normal	0.8976	**************
Upper Confidence Limit - Lognormal	0.9032	0.5978
95th Percentile - Nonparametric	1.5000	0.5500
95th Percentile - Normal	1.2469	0.5832
95th Percentile - Lognormal	1.1996	0.5859

Shapiro-Wilk and Probabilty Plot Results:

	Sample Results	Background Results
Corr Coeff - Detected - Normal	1.0000	
Corr Coeff - Detected - Lognormal	1.0000	
Corr Coeff - Total - Normal	0.7785	
Corr Coeff - Total - Lognormal	0.8140	
Corr Coeff - Crit Val - Detected	0.8790	
Corr Coeff - Crit Val - Total	0.9170	
W-Test - Table Value	0.8420	0.0000
W-Test - Normal	0.6241	1.0000
W-Test - Lognormal	0.6754	1.0000
Type of Distribution	Undefined ✓	Undefined

Test Results:

NO STATISTICAL COMPARISON IS NECESSARY SINCE CYANIDE WAS NOT DETECTED IN BACKGROUND.

15

Dataset: UTMP_RES
Media : SOIL DATA (0 - 10') STUMP NECK ANNEX, INDIAN HEAD
Group : SWMU-25

Parameter : IRON (MG/KG)

	Sample Results	Background Results
Count	10.0000	2.0000
Number of Detects	10.0000	2.0000
Average	14904.5000	9065.0000
Detection Limit - Minimum	NA	NA
Detection Limits - Maximum	NA	NA
Positive Hits - Minimum	2300.0000 Rep Conc	7930.0000
Positive Hits - Maximum	34900.0000	10200.0000
Average Of Positive Hits	~~14904.5000~~	9065.0000
Standard Deviation	10602.4768	1605.1324
Upper Confidence Limit - Normal	21050.1779	**************
Upper Confidence Limit - Lognormal	35727.5108 > max hit	13459.8658
95th Percentile - Nonparametric	34900.0000	10200.0000
95th Percentile - Normal	32345.5743	11705.4426
95th Percentile - Lognormal	45578.4039	12053.2678

Shapiro-Wilk and Probabilty Plot Results:

	Sample Results	Background Results
Corr Coeff - Detected - Normal	0.9709	1.0000
Corr Coeff - Detected - Lognormal	0.9858	1.0000
Corr Coeff - Total - Normal	0.9709	0.0000
Corr Coeff - Total - Lognormal	0.9858	1.0000
Corr Coeff - Crit Val - Detected	0.9170	**************
Corr Coeff - Crit Val - Total	0.9170	**************
W-Test - Table Value	0.8420	0.0000
W-Test - Normal	0.9336	1.0000
W-Test - Lognormal	0.9669	1.0000
Type of Distribution	LOGNORMAL	UNDEFINED

Test Results:

16

Dataset: UTM .IES
Media : SOIL DATA (0 - 10') - STUMP NECK ANNEX, INDIAN HEAD
Group : SWMU-25

Parameter : LEAD (MG/KG)

	Sample Results	Background Results
Count	10.0000	2.0000
Number of Detects	10.0000	2.0000
Average	4.6000	6.5500
Detection Limit - Minimum	NA	NA
Detection Limits - Maximum	NA	NA
Positive Hits - Minimum	1.9000	3.1000
Positive Hits - Maximum	8.2000	10.0000
Average Of Positive Hits	4.6000	6.5500
Standard Deviation	2.2833	4.8790
Upper Confidence Limit - Normal	5.9235 Rep Conc	**************
Upper Confidence Limit - Lognormal	~~7.1782~~	3829.6985
95th Percentile - Nonparametric	8.2000	10.0000
95th Percentile - Normal	8.3560	14.5760
95th Percentile - Lognormal	10.0139	21.7432

Shapiro-Wilk and Probabilty Plot Results:

	Sample Results	Background Results
Corr Coeff - Detected - Normal	0.9639	1.0000
Corr Coeff - Detected - Lognormal	0.9575	1.0000
Corr Coeff - Total - Normal	0.9639	1.0000
Corr Coeff - Total - Lognormal	0.9575	1.0000
Corr Coeff - Crit Val - Detected	0.9170	**************
Corr Coeff - Crit Val - Total	0.9170	**************
W-Test - Table Value	0.8420	0.0000
W-Test - Normal	0.9063	1.0000
W-Test - Lognormal	0.8904	1.0000
Type of Distribution	NORMAL	UNDEFINED

Test Results:

17

Dataset: UTN ES
Media : SOIL DATA (0 - 10') - STUMP NECK ANNEX, INDIAN HEAD
Group : SWMU-25

Parameter : MAGNESIUM (MG/KG)

	Sample Results	Background Results
Count	10.0000	2.0000
Number of Detects	10.0000	2.0000
Average	356.1100	225.5000
Detection Limit - Minimum	NA	NA
Detection Limits - Maximum	NA	NA
Positive Hits - Minimum	63.1000	215.0000
Positive Hits - Maximum	1540.0000	236.0000
Average Of Positive Hits	356.1100	225.5000
Standard Deviation	429.2099	14.8492
Upper Confidence Limit - Normal	604.8986	**************
Upper Confidence Limit - Lognormal	792.4194 Rec Conc	256.0601
95th Percentile - Nonparametric	1540.0000	236.0000
95th Percentile - Normal	1062.1603	249.9270
95th Percentile - Lognormal	997.7551	251.0462

Shapiro-Wilk and Probabilty Plot Results:

	Sample Results	Background Results
Corr Coeff - Detected - Normal	0.7558	1.0000
Corr Coeff - Detected - Lognormal	0.9624	1.0000
Corr Coeff - Total - Normal	0.7558	0.0000
Corr Coeff - Total - Lognormal	0.9624	0.0000
Corr Coeff - Crit Val - Detected	0.9170	**************
Corr Coeff - Crit Val - Total	0.9170	**************
W-Test - Table Value	0.8420	0.0000
W-Test - Normal	0.6059	1.0000
W-Test - Lognormal	0.9484	1.0000
Type of Distribution	LOGNORMAL ✓	UNDEFINED

Test Results:

8

Dataset: UTMP_RES
Media : SOIL DATA (0 - 10') - STUMP NECK ANNEX, INDIAN HEAD
Group : SWMU-25

Parameter : MANGANESE (MG/KG)

	Sample Results	Background Results
Count	10.0000	2.0000
Number of Detects	10.0000	2.0000
Average	71.8400	86.5500
Detection Limit - Minimum	NA	NA
Detection Limits - Maximum	NA	NA
Positive Hits - Minimum	10.6000	50.1000
Positive Hits - Maximum	171.0000	123.0000
Average Of Positive Hits	71.8400	86.5500
Standard Deviation	46.6509	51.5481
Upper Confidence Limit - Normal	98.8810 Rec Conc	**************
Upper Confidence Limit - Lognormal	172.7824	3640.2620
95th Percentile - Nonparametric	171.0000	123.0000
95th Percentile - Normal	148.5808	171.3466
95th Percentile - Lognormal	221.9415	223.1486

Shapiro-Wilk and Probabilty Plot Results:

	Sample Results	Background Results
Corr Coeff - Detected - Normal	0.9582	1.0000
Corr Coeff - Detected - Lognormal	0.9433	1.0000
Corr Coeff - Total - Normal	0.9582	1.0000
Corr Coeff - Total - Lognormal	0.9433	0.0000
Corr Coeff - Crit Val - Detected	0.9170	**************
Corr Coeff - Crit Val - Total	0.9170	**************
W-Test - Table Value	0.8420	0.0000
W-Test - Normal	0.9295	1.0000
W-Test - Lognormal	0.8981	1.0000
Type of Distribution	NORMAL ✓	UNDEFINED

Test Results:

Dataset: UTI .ES
Media : SOIL DATA (0 - 10') - STUMP NECK ANNEX, INDIAN HEAD
Group : SWMU-25

Parameter : NICKEL (MG/KG)

	Sample Results	Background Results
Count	10.0000	2.0000
Number of Detects	8.0000	2.0000
Average	6.1000	2.8000
Detection Limit - Minimum	1.0500	NA
Detection Limits - Maximum	1.0500	NA
Positive Hits - Minimum	1.9000	2.3000
Positive Hits - Maximum	25.4000	3.3000
Average Of Positive Hits	7.3625	2.8000
Standard Deviation	7.2590	0.7071
Upper Confidence Limit - Normal	~~10.3076~~	**************
Upper Confidence Limit - Lognormal ...	16.8396 Rep Conc	5.5016
95th Percentile - Nonparametric.......	~~25.4000~~	3.3000
95th Percentile - Normal..............	18.0410	3.9632
95th Percentile - Lognormal	19.2573	4.1927

Shapiro-Wilk and Probabilty Plot Results:

	Sample Results	Background Results
Corr Coeff - Detected - Normal	0.6554	1.0000
Corr Coeff - Detected - Lognormal	0.8248	1.0000
Corr Coeff - Total - Normal	0.8063	1.0000
Corr Coeff - Total - Lognormal	0.9763	0.0000
Corr Coeff - Crit Val - Detected	0.9050	**************
Corr Coeff - Crit Val - Total	0.9170	**************
W-Test - Table Value	0.8420	0.0000
W-Test - Normal	0.6769	1.0000
W-Test - Lognormal	0.9529	1.0000
Type of Distribution	LOGNORMAL✓	UNDEFINED

Test Results:

22

Dataset: UTMP_RES
Media : SOIL DATA (0 - 10') - STUMP NECK ANNEX, INDIAN HEAD
Group : SWMU-25

Parameter : POTASSIUM (MG/KG)

	Sample Results	Background Results
Count	10.0000	2.0000
Number of Detects	10.0000	2.0000
Average	307.5000	235.5000
Detection Limit - Minimum	NA	NA
Detection Limits - Maximum	NA	NA
Positive Hits - Minimum	153.0000	221.0000
Positive Hits - Maximum	761.0000	250.0000
Average Of Positive Hits	307.5000	235.5000
Standard Deviation	179.5576	20.5061
Upper Confidence Limit - Normal	~~411.5798~~	**************
Upper Confidence Limit - Lognormal	446.2931 Rep Conc	278.0629
95th Percentile - Nonparametric	~~761.0000~~	250.0000
95th Percentile - Normal	602.8723	269.2325
95th Percentile - Lognormal	619.1557	271.3016

Shapiro-Wilk and Probabilty Plot Results:

	Sample Results	Background Results
Corr Coeff - Detected - Normal	0.8730	1.0000
Corr Coeff - Detected - Lognormal	0.9554	1.0000
Corr Coeff - Total - Normal	0.8730	1.0000
Corr Coeff - Total - Lognormal	0.9554	1.0000
Corr Coeff - Crit Val - Detected	0.9170	**************
Corr Coeff - Crit Val - Total	0.9170	**************
W-Test - Table Value	0.8420	0.0000
W-Test - Normal	0.7821	1.0000
W-Test - Lognormal	0.9130	1.0000
Type of Distribution	LOGNORMAL ✓	UNDEFINED

Test Results:

21

Dataset: UTI   IES
Media : SOIL DATA (0 - 10') - STUMP NECK ANNEX, INDIAN HEAD
Group : SWMU-25

Parameter : SODIUM (MG/KG)

	Sample Results	Background Results
Count	10.0000	2.0000
Number of Detects	1.0000	0.0000
Average	15.6100	9.4000
Detection Limit - Minimum	9.3000	9.2000
Detection Limits - Maximum	36.0000	9.6000
Positive Hits - Minimum	26.2000	NA
Positive Hits - Maximum	26.2000 Rso Conc	NA
Average Of Positive Hits	~~26.2000~~	
Standard Deviation	10.1076	0.2828
Upper Confidence Limit - Normal	21.4688	**************
Upper Confidence Limit - Lognormal	23.7512	9.9734
95th Percentile - Nonparametric	36.0000	9.6000
95th Percentile - Normal	32.2370	9.8653
95th Percentile - Lognormal	33.1370	9.8748

Shapiro-Wilk and Probabilty Plot Results:

	Sample Results	Background Results
Corr Coeff - Detected - Normal		
Corr Coeff - Detected - Lognormal		
Corr Coeff - Total - Normal	0.8188	
Corr Coeff - Total - Lognormal	0.8197	
Corr Coeff - Crit Val - Detected	0.8790	
Corr Coeff - Crit Val - Total	0.9170	
W-Test - Table Value	0.8420	0.0000
W-Test - Normal	0.6661	1.0000
W-Test - Lognormal	0.6599	1.0000
Type of Distribution	Undefined ✓	Undefined

Test Results:

NO STATISTICAL COMPARISON IS NECESSARY SINCE SODIUM WAS NOT DETECTED IN BACKGROUND.

22

Dataset: UTMP RES
Media : SOIL DATA (0 - 10') - STUMP NECK ANNEX, INDIAN HEAD
Group : SWMU-25

Parameter : VANADIUM (MG/KG)

	Sample Results	Background Results
Count	10.0000	2.0000
Number of Detects	10.0000	2.0000
Average	13.6800	9.8000
Detection Limit - Minimum	NA	NA
Detection Limits - Maximum	NA	NA
Positive Hits - Minimum	5.5000	9.8000
Positive Hits - Maximum	34.3000	9.8000
Average Of Positive Hits	13.6800	9.8000
Standard Deviation	8.2821	0.0000
Upper Confidence Limit - Normal	~~18.4807~~	**************
Upper Confidence Limit - Lognormal	20.2262 Rec Conc	9.8000
95th Percentile - Nonparametric	~~34.3000~~	9.8000
95th Percentile - Normal	27.3040	9.8000
95th Percentile - Lognormal	28.1339	9.8000

Shapiro-Wilk and Probabilty Plot Results:

	Sample Results	Background Results
Corr Coeff - Detected - Normal	0.8855	**************
Corr Coeff - Detected - Lognormal	0.9768	**************
Corr Coeff - Total - Normal	0.8855	0.0000
Corr Coeff - Total - Lognormal	0.9768	0.0000
Corr Coeff - Crit Val - Detected	0.9170	**************
Corr Coeff - Crit Val - Total	0.9170	**************
W-Test - Table Value	0.8420	0.0000
W-Test - Normal	0.8067	**************
W-Test - Lognormal	0.9668	**************
Type of Distribution	LOGNORMAL ✓	UNDEFINED

Test Results:

23

Dataset: UTI IES
Media : SOIL DATA (0 - 10') - STUMP NECK ANNEX, INDIAN HEAD
Group : SWMU-25

Parameter : ZINC (MG/KG)

	Sample Results	Background Results
Count	10.0000	2.0000
Number of Detects	9.0000	2.0000
Average	17.6875	11.3500
Detection Limit - Minimum	2.5000	NA
Detection Limits - Maximum	2.5000	NA
Positive Hits - Minimum	5.0750	11.3000
Positive Hits - Maximum	92.1000	11.4000
Average Of Positive Hits	19.3750	11.3500
Standard Deviation	26.4378	0.0707
Upper Confidence Limit - Normal	~~33.0120~~	**************
Upper Confidence Limit - Lognormal	40.8548 RGD Conc	11.4918
95th Percentile - Nonparametric	~~92.1000~~	11.4000
95th Percentile - Normal	61.1776	11.4663
95th Percentile - Lognormal	48.9598	11.4668

Shapiro-Wilk and Probabilty Plot Results:

	Sample Results	Background Results
Corr Coeff - Detected - Normal	0.5973	1.0000
Corr Coeff - Detected - Lognormal	0.8032	1.0000
Corr Coeff - Total - Normal	0.6886	0.0000
Corr Coeff - Total - Lognormal	0.9228	1.0000
Corr Coeff - Crit Val - Detected	0.9120	**************
Corr Coeff - Crit Val - Total	0.9170	**************
W-Test - Table Value	0.8420	0.0000
W-Test - Normal	0.5121	1.0000
W-Test - Lognormal	0.8886	1.0000
Type of Distribution	LOGNORMAL ✓	UNDEFINED

Test Results:

274

Datasot: UTMP RES
Media : SOIL DATA (0 - 10') - STUMP NECK ANNEX, INDIAN HEAD
Group : SWMU-25

Parameter : ACETONE (UG/KG)

	Sample Results	Background Results
Count	5.0000	No samples
Number of Detects	2.0000	
Average	6.4000	
Detection Limit - Minimum	2.0000	
Detection Limits - Maximum	2.2000	
Positive Hits - Minimum	~~8.7500~~	
Positive Hits - Maximum	17.0000 Rep Conc	
Average Of Positive Hits	12.8750	
Standard Deviation	6.5918	
Upper Confidence Limit - Normal	12.6850	
Upper Confidence Limit - Lognormal	79.5464	
95th Percentile - Nonparametric	17.0000	
95th Percentile - Normal	17.2434	
95th Percentile - Lognormal	21.7688	

Shapiro-Wilk and Probabilty Plot Results:

	Sample Results	Background Results
Corr Coeff - Detected - Normal	1.0000	
Corr Coeff - Detected - Lognormal	1.0000	
Corr Coeff - Total - Normal	0.8811	
Corr Coeff - Total - Lognormal	0.9005	
Corr Coeff - Crit Val - Detected	0.8790	
Corr Coeff - Crit Val - Total	0.8790	
W-Test - Table Value	0.7620	NA
W-Test - Normal	0.7723	NA
W-Test - Lognormal	0.7901	NA
Type of Distribution	Undefined ✓	

Test Results:

25

Dataset: UTI IES
Media : SOIL DATA (0 - 10') - STUMP NECK ANNEX, INDIAN HEAD
Group : SWMU-25

Parameter : CARBON DISULFIDE (UG/KG)

	Sample Results	Background Results
Count	5.0000	No samples
Number of Detects	3.0000	
Average	1.0930	
Detection Limit - Minimum	0.6000	
Detection Limits - Maximum	0.6500	
Positive Hits - Minimum	1.1400	
Positive Hits - Maximum	1.6750	
Average Of Positive Hits	1.4050	
Standard Deviation	0.4676	
Upper Confidence Limit - Normal	1.5388 Rpo Conc	
Upper Confidence Limit - Lognormal	2.1427	
95th Percentile - Nonparametric	1.6750	
95th Percentile - Normal	1.8621	
95th Percentile - Lognormal	2.1454	

Shapiro-Wilk and Probabilty Plot Results:

	Sample Results	Background Results
Corr Coeff - Detected - Normal	0.0162	
Corr Coeff - Detected - Lognormal	-0.0391	
Corr Coeff - Total - Normal	0.9708	
Corr Coeff - Total - Lognormal	0.9600	
Corr Coeff - Crit Val - Detected	0.8790	
Corr Coeff - Crit Val - Total	0.8790	
W-Test - Table Value	0.7620	NA
W-Test - Normal	0.9169	NA
W-Test - Lognormal	0.8930	NA
Type of Distribution	NORMAL ✓	

Test Results:

21

Dataset: UTMP RES
Media : SOIL DATA (0 - 10') - STUMP NECK ANNEX, INDIAN HEAD
Group : SWMU-25

Parameter : CHLOROFORM (UG/KG)

	Sample Results	Background Results
Count	5.0000	No samples
Number of Detects	2.0000	
Average	0.9610	
Detection Limit - Minimum	0.1950	
Detection Limits - Maximum	0.2100	
Positive Hits - Minimum	1.2000	
Positive Hits - Maximum	3.0000 Rep Conc	
Average Of Positive Hits	~~2.1000~~	
Standard Deviation	1.2191	
Upper Confidence Limit - Normal	2.1233	
Upper Confidence Limit - Lognormal	53.0643 > max hit	
95th Percentile - Nonparametric	3.0000	
95th Percentile - Normal	2.9664	
95th Percentile - Lognormal	3.9945	

Shapiro-Wilk and Probabilty Plot Results:

	Sample Results	Background Results
Corr Coeff - Detected - Normal	1.0000	
Corr Coeff - Detected - Lognormal	1.0000	
Corr Coeff - Total - Normal	0.8619	
Corr Coeff - Total - Lognormal	0.8959	
Corr Coeff - Crit Val - Detected	0.8790	
Corr Coeff - Crit Val - Total	0.8790	
W-Test - Table Value	0.7620	NA
W-Test - Normal	0.7458	NA
W-Test - Lognormal	0.7835	NA
Type of Distribution	Undefined ✓	

Test Results:

Dataset: UT IES
Media : SOIL DATA (0 - 10') - STUMP NECK ANNEX, INDIAN HEAD
Group : SWMU-25

Parameter : METHYLENE CHLORIDE (UG/KG)

	Sample Results	Background Results
Count	5.0000	No samples
Number of Detects	4.0000	
Average	20.2650	
Detection Limit - Minimum	37.7250	
Detection Limits - Maximum	37.7250	
Positive Hits - Minimum	5.0000	
Positive Hits - Maximum	32.8000 Rep Conc	
Average Of Positive Hits	~~15.9000~~	
Standard Deviation	14.7742	
Upper Confidence Limit - Normal	34.3516 > max hit	
Upper Confidence Limit - Lognormal	178.5055	
95th Percentile - Nonparametric	37.7250	
95th Percentile - Normal	44.5685	
95th Percentile - Lognormal	67.7792	

Shapiro-Wilk and Probabilty Plot Results:

	Sample Results	Background Results
Corr Coeff - Detected - Normal	0.9561	
Corr Coeff - Detected - Lognormal	0.9775	
Corr Coeff - Total - Normal	0.9634	
Corr Coeff - Total - Lognormal	0.9601	
Corr Coeff - Crit Val - Detected	0.8680	
Corr Coeff - Crit Val - Total	0.8790	
W-Test - Table Value	0.7620	NA
W-Test - Normal	0.8963	NA
W-Test - Lognormal	0.8919	NA
Type of Distribution	NORMAL ✓	

Test Results:

78

Dataset: UTMP RES
Media : SOIL DATA (0 - 10') - STUMP NECK ANNEX, INDIAN HEAD
Group : SWMU-25

Parameter : TRICHLOROETHENE (UG/KG)

	Sample Results	Background Results
Count	5.0000	No samples
Number of Detects	1.0000	
Average	0.4950	
Detection Limit - Minimum	0.1350	
Detection Limits - Maximum	0.1650	
Positive Hits - Minimum	1.9000	
Positive Hits - Maximum	1.9000 Rep Conc	
Average Of Positive Hits	~~1.9000~~	
Standard Deviation	0.7855	
Upper Confidence Limit - Normal	1.2440	
Upper Confidence Limit - Lognormal	12.0876	
95th Percentile - Nonparametric	1.9000	
95th Percentile - Normal	1.7872	
95th Percentile - Lognormal	1.6168	

Shapiro-Wilk and Probabilty Plot Results:

	Sample Results	Background Results
Corr Coeff - Detected - Normal		
Corr Coeff - Detected - Lognormal		
Corr Coeff - Total - Normal	0.7351	
Corr Coeff - Total - Lognormal	0.7651	
Corr Coeff - Crit Val - Detected	0.8790	
Corr Coeff - Crit Val - Total	0.8790	
W-Test - Table Value	0.7620	NA
W-Test - Normal	0.5644	NA
W-Test - Lognormal	0.6069	NA
Type of Distribution	Undefined ✓	

Test Results:

79

Dataset: UT. RES
Media : SOIL DATA (0 - 10') STUMP NECK ANNEX, INDIAN HEAD
Group : SWMU-25

Parameter : XYLENES, TOTAL (UG/KG)

	Sample Results	Background Results
Count	5.0000	No samples
Number of Detects	1.0000	
Average	0.7325	
Detection Limit - Minimum	0.3650	
Detection Limits - Maximum	0.4325	
Positive Hits - Minimum	2.1000	
Positive Hits - Maximum	2.1000 Rep Conc	
Average Of Positive Hits	~~2.1000~~	
Standard Deviation	0.7649	
Upper Confidence Limit - Normal	1.4618	
Upper Confidence Limit - Lognormal	3.1583	
95th Percentile - Nonparametric	2.1000	
95th Percentile - Normal	1.9908	
95th Percentile - Lognormal	1.8936	

Shapiro-Wilk and Probabilty Plot Results:

	Sample Results	Background Results
Corr Coeff - Detected - Normal		
Corr Coeff - Detected - Lognormal		
Corr Coeff - Total - Normal	0.7481	
Corr Coeff - Total - Lognormal	0.7803	
Corr Coeff - Crit Val - Detected	0.8790	
Corr Coeff - Crit Val - Total	0.8790	
W-Test - Table Value	0.7620	NA
W-Test - Normal	0.5831	NA
W-Test - Lognormal	0.6302	NA
Type of Distribution	Undefined ✓	

Test Results:

830

Dataset: UTMP RES
Media : SOIL DATA (0 - 10') - STUMP NECK ANNEX, INDIAN HEAD
Group : SWMU-25

Parameter : AMMONIA (MG/KG)

	Sample Results	Background Results
Count	10.0000	2.0000
Number of Detects	8.0000	2.0000
Average	29.1500	14.8500
Detection Limit - Minimum	5.7000	NA
Detection Limits - Maximum	5.8000	NA
Positive Hits - Minimum	~~12.5000~~	7.8000
Positive Hits - Maximum	66.5000 Rep Conc	21.9000
Average Of Positive Hits	~~35.0000~~	14.8500
Standard Deviation	20.8644	9.9702
Upper Confidence Limit - Normal	41.2440	**************
Upper Confidence Limit - Lognormal	73.2358 > max h.t	2087.9134
95th Percentile - Nonparametric	66.5000	21.9000
95th Percentile - Normal	63.4720	31.2510
95th Percentile - Lognormal	91.6431	43.4295

Shapiro-Wilk and Probabilty Plot Results:

	Sample Results	Background Results
Corr Coeff - Detected - Normal	0.9132	1.0000
Corr Coeff - Detected - Lognormal	0.9505	1.0000
Corr Coeff - Total - Normal	0.9685	0.0000
Corr Coeff - Total - Lognormal	0.9713	1.0000
Corr Coeff - Crit Val - Detected	0.9050	**************
Corr Coeff - Crit Val - Total	0.9170	**************
W-Test - Table Value	0.8420	0.0000
W-Test - Normal	0.9217	1.0000
W-Test - Lognormal	0.9218	1.0000
Type of Distribution	LOGNORMAL✓	UNDEFINED

Test Results:

ω

Dataset: UT ?ES
Media : SOIL DATA (0 - 10') - STUMP NECK ANNEX, INDIAN HEAD
Group : SWMU-25

Parameter : TOTAL ORGANIC CARBON (MG/KG)

	Sample Results	Background Results
Count	10.0000	2.0000
Number of Detects	10.0000	1.0000
Average	1903.2000	831.8750
Detection Limit - Minimum	NA	43.7500
Detection Limits - Maximum	NA	43.7500
Positive Hits - Minimum	698.0000	1620.0000
Positive Hits - Maximum	5250.0000	1620.0000
Average Of Positive Hits	1903.2000	1620.0000
Standard Deviation	1360.6041	1114.5771
Upper Confidence Limit - Normal	~~2691.8680~~	**************
Upper Confidence Limit - Lognormal	3153.3814 Rep Conc	.30060653E+30
95th Percentile - Nonparametric	~~5250.0000~~	1620.0000
95th Percentile - Normal	4141.3937	2665.3543
95th Percentile - Lognormal	4392.3512	17772.7269

Shapiro-Wilk and Probabilty Plot Results:

	Sample Results	Background Results
Corr Coeff - Detected - Normal	0.8790	
Corr Coeff - Detected - Lognormal	0.9667	
Corr Coeff - Total - Normal	0.8790	0.0000
Corr Coeff - Total - Lognormal	0.9667	1.0000
Corr Coeff - Crit Val - Detected	0.9170	**************
Corr Coeff - Crit Val - Total	0.9170	**************
W-Test - Table Value	0.8420	0.0000
W-Test - Normal	0.7901	1.0000
W-Test - Lognormal	0.9350	1.0000
Type of Distribution	LOGNORMAL ✓	UNDEFINED

Test Results:

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Risk Assessment Spreadsheets
for the IED

	A	B
1	Site Name	Indian Head, Maryland
2	Location	IED--French Drain
3	Date	2/9/96
4		
5	**Chemical**	**Concentration (mg/Kg)**
6		
7	Arsenic	4.7
8	Iron	5,840
9	Lead	95.7
10	Manganese	265
11	Nickel	8.5
12		
13		
14		
15		

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL - INDUSTRIAL LAND USE

SITE NAME:	Indian Head, Maryland
LOCATION:	IED-French Drain
DATE:	2/9/98
RECEPTOR:	

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET
ASSUMPTIONS ARE OUTLINED BELOW

EXPOSURE SCENARIO: TYPICAL ADULT WORKER AND CONSTRUCTION WORKER

RELEVANT EQUATION: IEX = (C x IR x Fi x EF x ED)/(BW x AT x 10^6)

WHERE:

C = MEAN CONCENTRATION IN SOIL SAMPLE (MG/KG)
IR = SOIL INGESTION RATE (MG/EVENT)
EF = EXPOSURE FREQUENCY (EVENTS/YEAR)
Fi = FRACTION FROM CONTAMINATED SOURCE
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
AT = AVERAGING TIME (DAYS)

ENTER INPUT PARAMETERS

TYPICAL ADULT WORKER

IR	100
EF	250
Fi	0.5
ED	25
BW	70
AT(CAR)	25550
AT(NON)	9125

DETERMINE CONVERSION FACTORS
ADULT

CF: 4.89E-07 CF (Cancer) 1.75E-07

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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)
Indian Head, Maryland
IED--French Drain
CALCULATE DOSES

CHEMICAL	C (MG/KG)	ADULT ANNUAL DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG DAY/MG)
Arsenic	4.7	2.30E-06	8.21E-07	3.00E-04	1.50E+00
Iron	5840	2.86E-03	1.02E-03	3.00E-01	0.00E+00
Lead	95.7	4.68E-05	1.67E-05	0.00E+00	0.00E+00
Manganese	265	1.30E-04	4.63E-05	1.40E-01	0.00E+00
Nickel	8.5	4.16E-06	1.49E-06	2.00E-02	0.00E+00
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		

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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE THREE)
Indian Head, Maryland
IEO-French Drain
DETERMINE HAZARD INDICES AND CANCER RISK

CHEMICAL	HAZARD INDEX ADULT	INCREMENTAL CANCER RISK
Arsenic	7.68E-03	1.27E-06
Iron	9.52E-03	0.00E+00
Lead	0.00E+00	0.00E+00
Manganese	9.25E-04	0.00E+00
Nickel	2.08E-04	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
TOTAL	1.83E-02	1.27E-06

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RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL - INDUSTRIAL LAND USE

SITE NAME:	Indian Head, Maryland
LOCATION:	IHD—French Drain
DATE:	2/8/96
RECEPTOR:	

EXPOSURE SCENARIO: TYPICAL ADULT WORKER AND CONSTRUCTION WORKER

PERTINENT EQUATION: DEX = (C x SA x AF x ABS x EF x ED)/(BW x AT x CF)

WHERE:

C = CONCENTRATION IN SOIL (MG/KG)			
SA1 = ADULT SKIN SURFACE AREA (SQ CM/DAY)			3450
AF = ADHERENCE FACTOR (MG/SQ CM)			1
ABS = ABSORPTION FRACTION		VOCS	0.1
	(DECIMAL FRACTION)	SVAS/PESTICIDES	0.05
		PCBS	0.02
		METALS	0.001
EF = EXPOSURE FREQUENCY (DAYS/YEAR)			250
ED = ADULT EXPOSURE DURATION (YEARS)			25
BW = BODY WEIGHT ADULT (KG)			70
AT = AVERAGING TIME (DAYS), NONCARCINOGENS (ADULT)			9125
AT = AVERAGING TIME (DAYS), CARCINOGENS			25550

DETERMINE CONVERSION FACTORS

ADULT

CF (Noncancer)	1.38E-06 (AVERAGE ANNUAL DOSE)	CF(Cancer)	1.21E-05 (CANCER RISK)

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL (PAGE TWO)
Indian Head, Maryland
EXPOSURE SCENARIO: TYPICAL ADULT WORKER AND CONSTRUCTION WORKER
CALCULATE DOSES

CHEMICAL	C (MG/KG)	ABSORPTION FRACTION	ANNUAL ADULT DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)	HAZARD INDEX ADULT	INCREMENTAL CANCER RISK
Arsenic	4.7	0.001	1.56E-07	5.57E-08	2.94E-04	1.53E+00	5.40E-04	8.57E-08
Iron	5840	0.001	1.97E-04	7.04E-05	1.50E-02	0.00E+00	1.31E-02	0.00E+00
Lead	95.7	0.001	3.33E-06	1.19E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Manganese	359	0.001	8.95E-06	3.19E-06	4.20E-03	0.00E+00	2.13E-03	0.00E+00
Nickel	9.5	0.001	2.87E-07	1.02E-07	2.30E-03	0.00E+00	1.43E-04	0.00E+00
			0.00E+00	0.00E+00			0.00E+00	0.00E+00
			0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
TOTAL							1.58E-02	8.57E-08

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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL - RESIDENTIAL LAND USE

SITE NAME: Indian Head, Maryland
LOCATION: IED-French Drain
DATE: 2/8/98

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH PICA INGESTION ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW

EXPOSURE SCENARIO: RESIDENT ADULT AND CHILD

RELEVANT EQUATION: EX = (C x IR x Fi x EF x ED)/(BW x AT x CF)

WHERE
C = MEAN CONCENTRATION IN SOIL SAMPLE (MG/KG)
IR = SOIL INGESTION RATE (MG/EVENT)
EF = EXPOSURE FREQUENCY (EVENTS/YEAR)
Fi = FRACTION FROM CONTAMINATED SOURCE
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
AT = AVERAGING TIME (DAYS)

ENTER INPUT PARAMETERS

ADULT		YOUTH	
IR	100	IR	200
EF	350	EF	350
FI	1	FI	1
ED	24	ED	6
BW	70	BW	15
AT(CAR)	25550	AT(CAR)	25550
AT(NON)	8760	AT(NON)	2190

DETERMINE CONVERSION FACTORS

ADULT			YOUTH			ADULT/YOUTH (CANCER RISK)	
CF	1.37E-06	(AVG ANNUAL DOSE)	CF	1.28E-05	(AVG ANNUAL DOSE)	CF	1.57E-06

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)
Indian Head, Maryland
IED--French Drain
CALCULATE DOSES

CHEMICAL	C (MG/KG)	YOUTH ANNUAL DOSE (MG/KG/DAY)	ADULT ANNUAL DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Arsenic	4.7	6.01E-05	6.44E-06	7.36E-06	3.00E-04	1.50E+00
Iron	5840	7.47E-02	8.00E-03	9.14E-03	3.00E-01	0.00E+00
Lead	95.7	1.22E-03	1.31E-04	1.50E-04	0.00E+00	0.00E+00
Manganese	265	3.38E-03	3.63E-04	4.15E-04	1.40E-01	0.00E+00
Nickel	8.5	1.09E-04	1.16E-05	1.33E-05	2.00E-02	0.00E+00
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		

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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE THREE)
Indian Head, Maryland
IED - French Drain
DETERMINE HAZARD INDICES AND CANCER RISK

CHEMICAL	HAZARD INDEX YOUTH	HAZARD INDEX ADULT	INCREMENTAL CANCER RISK
Arsenic	2.00E-01	2.15E-02	1.10E-05
Iron	2.49E-01	2.67E-02	0.00E+00
Lead	0.00E+00	0.00E+00	0.00E+00
Manganese	2.42E-02	2.59E-03	0.00E+00
Nickel	5.43E-03	5.82E-04	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
TOTAL	4.79E-01	5.13E-02	1.10E-05

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RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL - RESIDENTIAL LAND USE

SITE NAME:	Indian Head, Maryland
LOCATION:	ES-French Drain
DATE:	2/8/99

EXPOSURE SCENARIO: RESIDENT ADULT AND CHILD

RELEVANT EQUATION: DFS = (C x SA x AF x ABS x EF x FD)/(BW x AT x 1E6)

WHERE

C = CONCENTRATION IN SOIL (MG/KG)			
SA1 = YOUTH SKIN SURFACE AREA (SQ CM/DAY)			1800
SA2 = ADULT SKIN SURFACE AREA (SQ CM/DAY)			5000
SAa = ADJUSTED SURFACE AREA (SQ CM/DAY)			2434
AF = ADHERENCE FACTOR (MG/SQ CM)			1
ABS = ABSORPTION FRACTION		VOCS	0.1
	(DECIMAL FRACTION)	SVOAS/PESTICIDES	0.05
		PCBS	0.03
		METALS	0.001
EF = EXPOSURE FREQUENCY (DAYS/YEAR)			350
ED1 = YOUTH EXPOSURE DURATION (YEARS)			6
ED2 = ADULT EXPOSURE DURATION (YEARS)			24
BW1 = BODY WEIGHT ADOLESCENT (KG)			15
BW2 = BODY WEIGHT ADULT (KG)			70
AT1 = AVERAGING TIME (DAYS) NONCARCINOGENS (YOUTH)			2190
AT2 = AVERAGING TIME (DAYS) NONCARCINOGENS (ADULT)			8760
AT3 = AVERAGING TIME (DAYS) CARCINOGENS			25550

DETERMINE CONVERSION FACTORS

ADULT/YOUTH

CF (ADULT)	6.85E-05 (AVERAGE ANNUAL DOSE)	CF(TIME)	1.15E-04 (AVERAGE ANNUAL DOSE)	CF	5.30E-05 (CANCER RISK)

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RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL (PAGE TWO)
Indian Head, Maryland
EXPOSURE SCENARIO: RESIDENT ADULT AND CHILD
CALCULATE DOSES

CHEMICAL	C (MG/KG)	ABSORPTION FRACTION	ANNUAL ADULT DOSE (MG/KG/DAY)	ANNUAL CHILD DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)	HAZARD INDEX ADULT	HAZARD INDEX CHILD	INCREMENTAL CANCER RISK
Arsenic	4.7	0.001	3.32E-07	5.41E-07	1.57E-07	2.34E-04	1.53E+00	1.29E-03	1.44E-03	2.40E-07
Iron	1910	0.001	4.00E-04	6.72E-04	1.95E-04	1.50E-02	0.00E+00	2.67E-02	4.48E-02	0.00E+00
Lead	92.7	0.001	6.10E-06	1.10E-05	3.18E-06	1.20E-0?	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Manganese	202	0.001	1.33E-05	3.09E-05	8.84E-06	4.30E-03	0.00E+00	4.12E-03	7.28E-03	0.00E+00
Nickel	5.5	0.001	5.02E-07	8.16E-07	2.83E-07	2.00E-03	1.70E+00	2.51E-04	4.08E-04	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
TOTAL								1.24E-02	9.44E-02	2.40E-07

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	A	B	D
1	Site Name	Indian Head, Maryland	
2	Location	IED-INCEND	
3	Date	2/9/96	
4			
5	**Chemical**	**Concentration (mg/Kg)**	
6			
7	Arsenic	15.9	
8	Iron	83,900	
9	Lead	33.8	
10	Manganese	1,240	
11	Nickel	49.7	
12			
13			
14			
15			

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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL - INDUSTRIAL LAND USE

SITE NAME:	Indian Head, Maryland
LOCATION:	IED–INCEND
DATE:	2/9/96
RECEPTOR:	

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET
ASSUMPTIONS ARE OUTLINED BELOW

EXPOSURE SCENARIO: TYPICAL ADULT WORKER AND CONSTRUCTION WORKER

RELEVANT EQUATION: CX = (C x IR x Fi x EF x ED)/(BW x AT x 1E6)

WHERE:

C = MEAN CONCENTRATION IN SOIL SAMPLES (MG/KG)
IR = SOIL INGESTION RATE (MG/EVENT)
EF = EXPOSURE FREQUENCY (EVENTS/YEAR)
Fi = FRACTION FROM CONTAMINATED SOURCE
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
AT = AVERAGING TIME (DAYS)

ENTER INPUT PARAMETERS

TYPICAL ADULT WORKER

IR	100
EF	250
Fi	0.5
ED	25
BW	70
AT(CAR)	25550
AT(NON)	9125

DETERMINE CONVERSION FACTORS
ADULT

CF: 4.89E-07 CF (Cancer): 1.75E-07

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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)
Indian Head, Maryland
IED-INCEND
CALCULATE DOSES

CHEMICAL	C (MG/KG)	ADULT ANNUAL DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Arsenic	15.9	7.73E-06	2.78E-06	3.00E-04	1.50E+00
Iron	83900	4.08E-02	1.47E-02	3.00E-01	0.00E+00
Lead	33.8	1.64E-05	5.91E-06	0.00E+00	0.00E+00
Manganese	1240	6.03E-04	2.17E-04	1.40E-01	0.00E+00
Nickel	49.7	2.42E-05	8.68E-06	2.00E-02	0.00E+00
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		

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RISK ASSESSEMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE THREE)
Indian Head, Maryland
IED - INCEND
DETERMINE HAZARD INDICES AND CANCER RISK

CHEMICAL	HAZARD INDEX ADULT	INCREMENTAL CANCER RISK
Arsenic	7.51E-02	4.17E-06
Iron	1.37E-01	0.00E+00
Lead	0.00E+00	0.00E+00
Manganese	4.33E-03	0.00E+00
Nickel	1.22E-03	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
TOTAL	1.48E-01	4.17E-06

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RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL - INDUSTRIAL LAND USE

SITE NAME:	Indian Head, Maryland
LOCATION:	IED--INCEND
DATE:	2/9/96
RECEPTOR:	

EXPOSURE SCENARIO: TYPICAL ADULT WORKER AND CONSTRUCTION WORKER

RELEVANT EQUATION: DCX = (C x SA x AF x ABS x EF x ED)/(BW x AT x 1E6)

WHERE:

C = CONCENTRATION IN SOIL (MG/KG)		
SA1 = ADULT SKIN SURFACE AREA (SQ CM/DAY)		3450
AF = ADHERENCE FACTOR (MG/SQ CM)		1
ABS = ABSORPTION FRACTION	VOCS	0.1
(DECIMAL FRACTION)	PNAS/PESTICIDES	0.05
	PCBS	0.03
	METALS	0.001
EF = EXPOSURE FREQUENCY (DAYS/YEAR)		250
ED = ADULT EXPOSURE DURATION (YEARS)		25
BW = BODY WEIGHT ADULT (KG)		70
AT = AVERAGING TIME (DAYS), NONCARCINOGENS (ADULT)		9125
AT = AVERAGING TIME (DAYS), CARCINOGENS		25550

DETERMINE CONVERSION FACTORS

ADULT

CF (Noncancer)	3.38E-05 (AVERAGE ANNUAL DOSE)	CF (Cancer)	1.21E-05	(CANCER RISK)

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RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL (PAGE TWO)
Indian Head, Maryland
EXPOSURE SCENARIO: TYPICAL ADULT WORKER AND CONSTRUCTION WORKER
CALCULATE DOSES

CHEMICAL	C (MG/KG)	ABSORPTION FRACTION	ANNUAL ADULT DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)	HAZARD INDEX ADULT	INCREMENTAL CANCER RISK
Arsenic	15.9	0.001	5.37E-07	1.92E-07	2.94E-04	1.53E+00	1.83E-03	2.93E-07
Iron	83900	0.001	2.83E-03	1.01E-03	1.50E-02	0.00E+00	1.89E-01	0.00E+00
Lead	33.8	0.001	1.14E-06	4.07E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Manganese	1240	0.001	4.19E-05	1.49E-05	4.20E-03	0.00E+00	9.97E-03	0.00E+00
Nickel	49.7	0.001	1.68E-06	5.99E-07	2.00E-03	0.00E+00	8.39E-04	0.00E+00
			0.00E+00	0.00E+00			0.00E+00	0.00E+00
			0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
TOTAL							2.01E-01	2.93E-07

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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL - RESIDENTIAL LAND USE

SITE NAME:	Indian Head, Maryland
LOCATION:	IED--INCEND
DATE:	2/8/95

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET
EXPOSURES THROUGH PICA INGESTION ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW

EXPOSURE SCENARIO: RESIDENT ADULT AND CHILD

RELEVANT EQUATION: IEX = (C x IR x FI x EF x ED)/(BW x AT x 1E6)

WHERE

C = MEAN CONCENTRATION IN SOIL SAMPLE (MG/KG)
IR = SOIL INGESTION RATE (MG/EVENT)
EF = EXPOSURE FREQUENCY (EVENTS/YEAR)
FI = FRACTION FROM CONTAMINATED SOURCE
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
AT = AVERAGING TIME (DAYS)

ENTER INPUT PARAMETERS

ADULT		YOUTH	
IR	100	IR	200
EF	350	EF	350
FI	1	FI	1
ED	24	ED	6
BW	70	BW	15
AT(CAR)	25550	AT(CAR)	25550
AT(NON)	8760	AT(NON)	2190

DETERMINE CONVERSION FACTORS

ADULT			YOUTH			ADULT/YOUTH (CANCER RISK)	
CF	1.37E-06	(AVG ANNUAL DOSE)	CF	1.28E-05	(AVG ANNUAL DOSE)	CF:	1.57E-06

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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)
Indian Head, Maryland
IFD--INCENO
CALCULATE DOSES

CHEMICAL	C (MG/KG)	YOUTH ANNUAL DOSE (MG/KG/DAY)	ADULT ANNUAL DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Arsenic	15.9	2.33E-04	2.18E-05	2.49E-05	3.00E-04	1.50E+00
Iron	83900	1.37E+00	1.16E-01	1.31E-01	3.00E-01	0.00E+00
Lead	33.8	4.93E-04	4.63E-05	5.29E-05	0.00E+00	0.00E+00
Manganese	1240	1.59E-02	1.70E-03	1.94E-03	1.40E-01	0.00E+00
Nickel	49.7	6.35E-04	6.81E-05	7.78E-05	2.00E-02	0.00E+00
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		

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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE THREE)
Indian Head, Maryland
IED-INCEND
DETERMINE HAZARD INDICES AND CANCER RISK

CHEMICAL	HAZARD INDEX YOUTH	HAZARD INDEX ADULT	INCREMENTAL CANCER RISK
Arsenic	6.78E-01	7.26E-02	3.73E-05
Iron	3.56E+00	3.83E-01	0.00E+00
Lead	0.00E+00	0.00E+00	0.00E+00
Manganese	1.13E-01	1.21E-02	0.00E+00
Nickel	3.18E-03	3.40E-03	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
TOTAL	4.40E+00	4.71E-01	3.73E-05

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RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL - RESIDENTIAL LAND USE

SITE NAME:	Indian Head, Maryland
LOCATION:	IED-INCEND
DATE:	2/99

EXPOSURE SCENARIO: RESIDENT ADULT AND CHILD

RELEVANT EQUATION: DCX = (C x SA x AF x ABS x EF x ED)/(BW x AT x 10^6)

WHERE:

C = CONCENTRATION IN SOIL (MG/KG)		
SA1 = YOUTH SKIN SURFACE AREA (SQ CM/DAY)		1800
SA2 = ADULT SKIN SURFACE AREA (SQ CM/DAY)		5000
SAa = ADJUSTED SURFACE AREA (SQ CM/DAY)		2836
AF = ADHERENCE FACTOR (MG/SQ CM)		1
ABS = ABSORPTION FRACTION	VOCS	0.1
(DECIMAL FRACTION)	SVOCS/PESTICIDES	0.05
	PCBS	0.13
	METALS	0.001
EF = EXPOSURE FREQUENCY (DAYS/YEAR)		350
ED1 = YOUTH EXPOSURE DURATION (YEARS)		6
ED2 = ADULT EXPOSURE DURATION (YEARS)		24
BW1 = BODY WEIGHT ADOLESCENT (KG)		15
BW2 = BODY WEIGHT ADULT (KG)		70
AT1 = AVERAGING TIME (DAYS), NONCARCINOGENS (YOUTH)		2190
AT2 = AVERAGING TIME (DAYS), NONCARCINOGENS (ADULT)		8760
AT3 = AVERAGING TIME (DAYS), CARCINOGENS		25550

DETERMINE CONVERSION FACTORS

ADULT/YOUTH

CF (ADULT)	6.85E-05 (AVERAGE ANNUAL DOSE)	CF(Youth)	1.11E-04 (AVERAGE ANNUAL DOSE)	CF	3.33E-05 (CANCER RISK)

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RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL (PAGE TWO)
Indian Head, Maryland
EXPOSURE SCENARIO: RESIDENT ADULT AND CHILD
CALCULATE DOSES

CHEMICAL	C (MG/KG)	ABSORPTION FRACTION	ANNUAL ADULT DOSE (MG/KG/DAY)	ANNUAL CHILD DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RfD (MG/KG/DAY)	CSF (KG DAY/MG)	HAZARD INDEX ADULT	HAZARD INDEX CHILD	INCREMENTAL CANCER RISK
Arsenic	15.3	[illegible]	1.09E-06	1.87E-06	6.30E-07	2.94E-04	1.53E+00	3.70E-03	6.72E-03	9.11E-07
Iron	83300	[illegible]	1.75E-01	9.85E-01	2.80E-03	1.50E-02	3.20E+00	1.83E-01	6.44E-01	3.20E+00
Lead	33.8	[illegible]	2.32E-06	3.89E-06	1.12E-08	3.30E+00	1.70E+00	0.00E+00	0.00E+00	8.50E+00
Manganese	1340	[illegible]	8.49E-05	1.47E-04	4.13E-05	4.20E-03	0.00E+00	2.23E-02	3.40E-02	1.30E+00
Nickel	40.7	[illegible]	2.40E-06	6.77E-06	1.85E-03	2.00E-03	0.00E+00	1.70E-03	7.86E-03	1.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
TOTAL								4.89E-01	4.67E-01	8.11E-07

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	A	B	D	E	F
1	Site Name	Indian Head, Maryland			
2	Location	IED–Detonation			
3	Date	2/9/96			
4					
5	**Chemical**	**Concentration (mg/L)**			
6					
7	Arsenic	4.5			
8	Iron	7,850			
9	Lead	9.8			
10	Manganese	100			
11	Nickel	55			
12					
13					
14					
15					

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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL - INDUSTRIAL LAND USE

SITE NAME:	Indian Head, Maryland
LOCATION:	IED-Detonation
DATE:	2/9/96
RECEPTOR:	

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET
ASSUMPTIONS ARE OUTLINED BELOW

EXPOSURE SCENARIO: TYPICAL ADULT WORKER AND CONSTRUCTION WORKER

RELEVANT EQUATION: EX = (C x IR x Fi x EF x ED)/(BW x AT x 1E6)

WHERE:

C = MEAN CONCENTRATION IN SOIL SAMPLE (MG/KG)
IR = SOIL INGESTION RATE (MG/EVENT)
EF = EXPOSURE FREQUENCY (EVENTS/YEAR)
Fi = FRACTION FROM CONTAMINATED SOURCE
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
AT = AVERAGING TIME (DAYS)

ENTER INPUT PARAMETERS

TYPICAL ADULT WORKER

IR:	100
EF:	250
Fi:	0.5
ED:	25
BW:	70
AT(CAR):	25550
AT(NON):	9125

DETERMINE CONVERSION FACTORS
ADULT:

CF:	4.89E-07	CF (Cancer):	1.75E-07

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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)
Indian Head, Maryland
IED- Ozonation
CALCULATE DOSES

CHEMICAL	C (MG/KG)	ADULT ANNUAL DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Arsenic	4.5	7.70E-06	7.88E-07	3.00E-04	1.50E+00
Iron	2050	3.84E-03	1.37E-03	3.00E-01	0.00E+00
Lead	9.1	4.79E-06	1.71E-06	0.00E+00	0.00E+00
Manganese	100	4.89E-05	1.75E-05	1.40E-01	0.00E+00
Nickel	56	2.69E-05	9.61E-06	2.00E-02	0.00E+00
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
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		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE THREE)
Indian Head, Maryland
EOD–Detonation
DETERMINE HAZARD INDICES AND CANCER RISK

CHEMICAL	HAZARD INDEX ADULT	INCREMENTAL CANCER RISK
Arsenic	7.34E-03	1.18E-06
Iron	1.28E-02	0.00E+00
Lead	0.00E+00	0.00E+00
Manganese	3.48E-04	0.00E+00
Nickel	1.35E-03	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
TOTAL	2.18E-02	1.18E-06

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RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL - INDUSTRIAL LAND USE

SITE NAME: Indian Head, Maryland
LOCATION: EO--Detonation
DATE: 2/9/96
RECEPTOR:

EXPOSURE SCENARIO: TYPICAL ADULT WORKER AND CONSTRUCTION WORKER

RELEVANT EQUATION: DEX = (C x SA x AF x ABS x EF x ED)/(BW x AT x 1E6)

WHERE:

C = CONCENTRATION IN SOIL (MG/KG)		
SA1 = ADULT SKIN SURFACE AREA (SQ CM/DAY)		3450
AF = ADHERENCE FACTOR (MG/SQ CM)		1
ABS = ABSORPTION FRACTION (DECIMAL FRACTION)	VOCS	0.1
	SVAS/PESTICIDES	0.05
	PCBS	0.03
	METALS	0.001
EF = EXPOSURE FREQUENCY (DAYS/YEAR)		250
ED = ADULT EXPOSURE DURATION (YEARS)		25
BW = BODY WEIGHT ADULT (KG)		70
AT = AVERAGING TIME (DAYS) NONCARCINOGENS (ADULT)		9125
AT = AVERAGING TIME (DAYS) CARCINOGENS		25550

DETERMINE CONVERSION FACTORS:

ADULT

CF (Noncancer) 3.35E-05 (AVERAGE ANNUAL DOSE) CF (Cancer) 1.21E-05 (CANCER RISK)

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RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL (PAGE TWO)
Indian Head, Maryland
EXPOSURE SCENARIO: TYPICAL ADULT WORKER AND CONSTRUCTION WORKER
CALCULATE DOSES

CHEMICAL	C (MG/KG)	ABSORPTION FRACTION	ANNUAL ADULT DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)	HAZARD INDEX ADULT	INCREMENTAL CANCER RISK
Arsenic	4.5	0.001	1.52E-07	5.43E-08	2.94E-04	1.53E+00	5.17E-04	8.30E-08
Iron	7850	0.001	2.80E-04	2.40E-05	1.50E-02	0.00E+00	1.87E-02	0.00E+00
Lead	9.5	0.001	3.31E-07	1.18E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Manganese	100	0.001	3.35E-06	1.21E-06	4.20E-03	0.00E+00	8.04E-04	0.00E+00
Nickel	55	0.001	1.96E-06	6.53E-07	2.00E-03	0.00E+00	9.28E-04	0.00E+00
			0.00E+00	0.00E+00			0.00E+00	0.00E+00
			0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
TOTAL							1.99E-02	8.30E-08

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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL - RESIDENTIAL LAND USE

SITE NAME: Indian Head, Maryland
LOCATION: IED--Detonation
DATE: 2/9/96

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET
EXPOSURES THROUGH PICA INGESTION ARE CONSIDERED
ASSUMPTIONS ARE OUTLINED BELOW

EXPOSURE SCENARIO: RESIDENT ADULT AND CHILD

RELEVANT EQUATION: $SX = (C \times IR \times FI \times EF \times ED)/(BW \times AT \times 1E6)$

WHERE:
C = MEAN CONCENTRATION IN SOIL SAMPLE (MG/KG)
IR = SOIL INGESTION RATE (MG/EVENT)
EF = EXPOSURE FREQUENCY (EVENTS/YEAR)
FI = FRACTION FROM CONTAMINATED SOURCE
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
AT = AVERAGING TIME (DAYS)

ENTER INPUT PARAMETERS:

ADULT		YOUTH	
IR	100	IR	200
EF	350	EF	350
FI	1	FI	1
ED	24	ED	6
BW	70	BW	15
AT(CAR)	25550	AT(CAR)	25550
AT(NON)	8760	AT(NON)	2190

DETERMINE CONVERSION FACTORS:

ADULT
CF 1.37E-06 (AVG ANNUAL DOSE)

YOUTH
CF 1.28E-05 (AVG ANNUAL DOSE)

ADULT/YOUTH (CANCER RISK)
CF 1.57E-06

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)
Indian Head, Maryland
IED-Detonation
CALCULATE DOSES

CHEMICAL	C (MG/KG)	YOUTH ANNUAL DOSE (MG/KG/DAY)	ADULT ANNUAL DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Arsenic	4.5	5.75E-05	6.16E-06	7.05E-06	3.00E-04	1.50E+00
Iron	7850	1.00E-01	1.08E-02	1.23E-02	3.00E-01	0.00E+00
Lead	9.8	1.25E-04	1.34E-05	1.53E-05	0.00E+00	0.00E+00
Manganese	100	1.28E-03	1.37E-04	1.57E-04	1.40E-01	0.00E+00
Nickel	55	7.03E-04	7.53E-05	8.61E-05	2.00E-02	0.00E+00
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		

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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE THREE)
Indian Head, Maryland
IEO- Detonation
DETERMINE HAZARD INDICES AND CANCER RISK

CHEMICAL	HAZARD INDEX YOUTH	HAZARD INDEX ADULT	INCREMENTAL CANCER RISK
Arsenic	1.92E-01	2.05E-02	1.06E-05
Iron	3.35E-01	3.52E-02	0.00E+00
Lead	0.00E+00	0.00E+00	0.00E+00
Manganese	9.13E-03	9.75E-04	0.00E+00
Nickel	3.52E-02	3.77E-03	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
TOTAL	5.71E-01	6.11E-02	1.06E-05

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RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL - RESIDENTIAL LAND USE

SITE NAME: Indian Head, Maryland
LOCATION: IED-Detonation
DATE: 2/3/99

EXPOSURE SCENARIO: RESIDENT ADULT AND CHILD

RELEVANT EQUATION: DEX = (C x SA x AF x ABS x EF x 10@BW x AT x 1E-6)

WHERE

C = CONCENTRATION IN SOIL (MG/KG)		
SA1 = YOUTH SKIN SURFACE AREA (SQ CM/DAY)		1800
SA2 = ADULT SKIN SURFACE AREA (SQ CM/DAY)		5000
SAa = ADJUSTED SURFACE AREA (SQ CM/DAY)		2936
AF = ADHERENCE FACTOR (MG/SQ CM)		1
ABS = ABSORPTION FRACTION	VOCS	0.1
(DECIMAL FRACTION)	SVOCS/PESTICIDES	0.05
	PCBS	0.03
	METALS	0.001
EF = EXPOSURE FREQUENCY (DAYS/YEAR)		350
ED1 = YOUTH EXPOSURE DURATION (YEARS)		6
ED2 = ADULT EXPOSURE DURATION (YEARS)		24
BW1 = BODY WEIGHT ADOLESCENT (KG)		15
BW2 = BODY WEIGHT ADULT (KG)		70
AT1 = AVERAGING TIME (DAYS) NONCARCINOGENS (YOUTH)		2190
AT2 = AVERAGING TIME (DAYS) NONCARCINOGENS (ADULT)		8760
AT3 = AVERAGING TIME (DAYS) CARCINOGENS		25550

DETERMINE CONVERSION FACTORS:

ADULT/YOUTH

CF (ADULT)	[illegible]	(AVERAGE ANNUAL DOSE)	CF (YOUTH)	[illegible]	(AVERAGE ANNUAL DOSE)	CF	[illegible] (CANCER RISK)

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RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL (PAGE TWO)
Indian Head, Maryland
EXPOSURE SCENARIO: RESIDENT ADULT AND CHILD
CALCULATE DOSES

CHEMICAL	C (MG/KG)	ABSORPTION FRACTION	ANNUAL ADULT DOSE (MG/KG/DAY)	ANNUAL CHILD DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG DAY/MG)	HAZARD INDEX ADULT	HAZARD INDEX CHILD	INCREMENTAL CANCER RISK
Arsenic	4.5	0.001	1.28E-07	5.18E-07	1.50E-07	2.94E-04	1.53E+00	1.25E-03	1.76E-03	2.30E-07
Iron	7950	0.001	1.38E-04	9.03E-04	2.63E-04	1.52E-02	0.00E+00	3.18E-02	5.52E-02	0.00E+00
Lead	8.6	0.001	4.71E-07	1.13E-06	3.77E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Manganese	130	0.001	4.85E-06	1.15E-05	3.33E-06	4.20E-03	0.00E+00	1.63E-03	2.74E-03	0.00E+00
Nickel	10	0.001	3.77E-09	8.23E-08	1.03E-08	1.00E-03	0.00E+00	1.88E-03	3.15E-03	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
TOTAL								4.44E-02	4.79E-02	2.30E-07

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	A	B	D	E	F
1	Site Name	Indian Head, Maryland			
2	Location	IED-BKg			
3	Date	2/9/96			
4					
5	Chemical	Concentration (mg/Kg)			
6					
7	Arsenic	3.3			
8	Iron	25,300			
9	Lead	9.9			
10	Manganese	882			
11	Nickel	10.5			
12					
13					
14					
15					

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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL - INDUSTRIAL LAND USE

SITE NAME: Indian Head, Maryland
LOCATION: IEO-8Kg
DATE: 2/8/96
RECEPTOR:

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET
ASSUMPTIONS ARE OUTLINED BELOW

EXPOSURE SCENARIO: TYPICAL ADULT WORKER AND CONSTRUCTION WORKER

RELEVANT EQUATION: EX = (C x IR x Fi x CF x FD)/(BW x AT x 365)

WHERE

C = MEAN CONCENTRATION IN SOIL SAMPLE (MG/KG)
IR = SOIL INGESTION RATE (MG/EVENT)
EF = EXPOSURE FREQUENCY (EVENTS/YEAR)
Fi = FRACTION FROM CONTAMINATED SOURCE
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
AT = AVERAGING TIME (DAYS)

ENTER INPUT PARAMETERS

TYPICAL ADULT WORKER

IR	100
EF	250
Fi	0.5
ED	25
BW	70
AT(CAR)	25550
AT(NON)	9125

DETERMINE CONVERSION FACTORS
ADULT

CF	4.89E-07	CF (Cancer)	1.75E-07

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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)
Indian Head, Maryland
IEO-BKg
CALCULATE DOSES

CHEMICAL	C (MG/KG)	ADULT ANNUAL DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG DAY/MG)
Arsenic	3.3	1.61E-06	5.77E-07	3.00E-04	1.50E+00
Iron	25300	1.24E-02	4.42E-03	3.00E-01	0.00E+00
Lead	9.9	4.84E-06	1.73E-06	0.00E+00	0.00E+00
Manganese	862	4.32E-04	1.54E-04	1.40E-01	0.00E+00
Nickel	10.5	5.14E-06	1.83E-06	2.00E-02	0.00E+00
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		

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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE THREE)
Indian Head, Maryland
IED-8Ng
DETERMINE HAZARD INDICES AND CANCER RISK

CHEMICAL	HAZARD INDEX ADULT	INCREMENTAL CANCER RISK
Arsenic	5.18E-02	8.65E-07
Iron	4.13E-03	0.00E+00
Lead	0.00E+00	0.00E+00
Manganese	3.08E-03	0.00E+00
Nickel	7.37E-04	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
TOTAL	5.98E-02	8.65E-07

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RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL - INDUSTRIAL LAND USE

SITE NAME:	Indian Head, Maryland
LOCATION:	ED-BKg
DATE:	2/9/98
RECEPTOR:	

EXPOSURE SCENARIO: TYPICAL ADULT WORKER AND CONSTRUCTION WORKER

RELEVANT EQUATION: DEX = (C x SA x AF x ABS x EF x ED)/(BW x AT x 1E6)

WHERE:	C = CONCENTRATION IN SOIL (MG/KG)		
	SA1 = ADULT SKIN SURFACE AREA (SQ CM/DAY)		3450
	AF = ADHERENCE FACTOR (MG/SQ CM)		1
	ABS = ABSORPTION FRACTION (DECIMAL FRACTION)	VOCS	0.1
		SVAS/PESTICIDES	0.05
		PCBS	0.03
		METALS	0.001
	EF = EXPOSURE FREQUENCY (DAYS/YEAR)		250
	ED = ADULT EXPOSURE DURATION (YEARS)		25
	BW = BODY WEIGHT ADULT (KG)		70
	AT = AVERAGING TIME (DAYS), NONCARCINOGENS (ADULT)		9125
	AT = AVERAGING TIME (DAYS), CARCINOGENS		25550

DETERMINE CONVERSION FACTORS

ADULT

CF (Noncancer)	9.35E-01 (AVERAGE ANNUAL DOSE)	CF (Cancer)	1.31E-05 (CANCER RISK)

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL (PAGE TWO)
Indian Head, Maryland
EXPOSURE SCENARIO: TYPICAL ADULT WORKER AND CONSTRUCTION WORKER
CALCULATE DOSES

CHEMICAL	C (MG/KG)	ABSORPTION FRACTION	ANNUAL ADULT DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)	HAZARD INDEX ADULT	INCREMENTAL CANCER RISK
Arsenic	3.3	0.001	1.11E-07	3.39E-08	2.94E-04	1.50E+00	3.79E-04	5.09E-08
Iron	25300	0.001	8.34E-05	3.05E-06	1.50E-02	0.00E+00	5.59E-03	0.00E+00
Lead	5.9	0.001	3.34E-07	1.19E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Manganese	382	0.001	2.88E-05	1.06E-05	4.70E-03	0.00E+00	7.05E-03	0.00E+00
Nickel	10.5	0.001	3.54E-07	1.37E-07	2.00E-03	0.00E+00	1.77E-04	0.00E+00
			0.00E+00	0.00E+00			0.00E+00	0.00E+00
			0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
TOTAL							6.46E-02	5.09E-08

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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL - RESIDENTIAL LAND USE

SITE NAME: Indian Head, Maryland
LOCATION: IEO-8Kg
DATE: 2/9/96

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET
EXPOSURES THROUGH PICA INGESTION ARE CONSIDERED
ASSUMPTIONS ARE OUTLINED BELOW

EXPOSURE SCENARIO: RESIDENT ADULT AND CHILD

RELEVANT EQUATION: ICK = (C x IR x Fi x EF x ED)/(BW x AT x 1E6)

WHERE:
C = MEAN CONCENTRATION IN SOIL SAMPLE (MG/KG)
IR = SOIL INGESTION RATE (MG/EVENT)
EF = EXPOSURE FREQUENCY (EVENTS/YEAR)
Fi = FRACTION FROM CONTAMINATED SOURCE
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
AT = AVERAGING TIME (DAYS)

ENTER INPUT PARAMETERS

ADULT		YOUTH	
IR	100	IR	200
EF	350	EF	350
Fi	1	Fi	1
ED	24	ED	6
BW	70	BW	15
AT(CAR)	25550	AT(CAR)	25550
AT(NON)	8760	AT(NON)	2190

DETERMINE CONVERSION FACTORS

ADULT			YOUTH			ADULT/YOUTH (CANCER RISK)	
CF	1.37E-06	(AVG ANNUAL DOSE)	CF	1.28E-05	(AVG ANNUAL DOSE)	CF	1.57E-06

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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)
Indian Head, Maryland
IED-6Kg
CALCULATE DOSES

CHEMICAL	C (MG/KG)	YOUTH ANNUAL DOSE (MG/KG/DAY)	ADULT ANNUAL DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Arsenic	3.3	4.22E-05	4.53E-06	5.17E-06	3.00E-04	1.50E+00
Iron	25300	3.23E-01	3.47E-02	3.96E-02	3.00E-01	0.00E+00
Lead	9.9	1.27E-04	1.38E-05	1.55E-05	0.00E+00	0.00E+00
Manganese	882	1.13E-02	1.21E-03	1.38E-03	1.40E-01	0.00E+00
Nickel	10.5	1.34E-04	1.44E-05	1.64E-05	2.00E-02	0.00E+00
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		

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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE THREE)
Indian Head, Maryland
ICD-BKg
DETERMINE HAZARD INDICES AND CANCER RISK

CHEMICAL	HAZARD INDEX YOUTH	HAZARD INDEX ADULT	INCREMENTAL CANCER RISK
Arsenic	1.41E-01	1.51E-02	7.75E-06
Iron	1.08E+00	1.16E-01	0.00E+00
Lead	0.00E+00	0.00E+00	0.00E+00
Manganese	8.05E-02	8.63E-03	0.00E+00
Nickel	6.71E-03	7.19E-04	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
TOTAL	1.31E+00	1.40E-01	7.75E-06

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RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL - RESIDENTIAL LAND USE

SITE NAME: Indian Head, Maryland
LOCATION: ED-BHg
DATE: 2/9/99

EXPOSURE SCENARIO: RESIDENT ADULT AND CHILD

RELEVANT EQUATION: DEX = (C x SA x AF x ABS x EF x FD)/(BW x AT x 1E6)

WHERE:	C = CONCENTRATION IN SOIL (MG/KG)			
	SA1 = YOUTH SKIN SURFACE AREA (SQ CM/DAY)			1800
	SA2 = ADULT SKIN SURFACE AREA (SQ CM/DAY)			5800
	SAA = ADJUSTED SURFACE AREA (SQ CM/DAY)			2434
	AF = ADHERENCE FACTOR (MG/SQ CM)			1
	ABS = ABSORPTION FRACTION	VOCS		0.1
	(DECIMAL FRACTION)	SVAS/PESTICIDES		0.05
		PCBS		0.03
		METALS		0.001
	EF = EXPOSURE FREQUENCY (DAYS/YEAR)			350
	ED1 = YOUTH EXPOSURE DURATION (YEARS)			6
	ED2 = ADULT EXPOSURE DURATION (YEARS)			24
	BW1 = BODY WEIGHT ADOLESCENT (KG)			15
	BW2 = BODY WEIGHT ADULT (KG)			70
	AT1 = AVERAGING TIME (DAYS), NONCARCINOGENS (YOUTH)			2190
	AT2 = AVERAGING TIME (DAYS), NONCARCINOGENS (ADULT)			8760
	AT3 = AVERAGING TIME (DAYS), CARCINOGENS			25550

DETERMINE CONVERSION FACTORS:

ADULT/YOUTH:

CF (ADULT) 1.85E-05 (AVERAGE ANNUAL DOSE) CF(Youth) 1.15E-04 (AVERAGE ANNUAL DOSE) CF 1.33E-05 (CANCER RISK)

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RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL (PAGE TWO)
Indian Head, Maryland
EXPOSURE SCENARIO : RESIDENT ADULT AND CHILD
CALCULATE DOSES

CHEMICAL	C (MG/KG)	ABSORPTION FRACTION	ANNUAL ADULT DOSE (MG/KG/DAY)	ANNUAL CHILD DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)	HAZARD INDEX ADULT	HAZARD INDEX CHILD	INCREMENTAL CANCER RISK
Arsenic	3.2	0.032	3.29E-07	7.60E-07	1.13E-07	3.00E-04	1.50E+00	1.10E-03	1.36E-03	1.69E-07
Iron	21,400	0.001	1.73E-04	2.01E-03	8.44E-04	1.50E-02	0.00E+00	1.15E-02	1.44E-01	0.00E+00
Lead	6.9	0.006	6.78E-07	1.14E-06	2.30E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Manganese	802	0.001	8.04E-05	1.01E-04	2.44E-05	8.30E-03	0.00E+00	1.44E-02	2.43E-02	0.00E+00
Nickel	12.5	0.001	2.14E-07	1.21E-06	2.50E-07	1.00E-02	0.00E+00	2.80E-04	8.06E-04	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
TOTAL								1.21E-01	2.38E-01	1.69E-07

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	A	B	D	E	F	G	H	I	J	K	L
1	Site Name	INDIAN HEAD									
2	Location	IED									
3	Date	2/9/96									
4											
5	**Chemical**	**Concentration (mg/L)**									
6											
7	Arsenic	0.0021									
8	Manganese	1.09									
9											
10											
11											
12											
13		These are the respresentative concentrations. They are the maximum concentrations detected in this media at this site.									

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RISK ASSESSMENT SPREADSHEET - EXPOSURES THROUGH HOUSEHOLD USE OF GROUNDWATER

SITE NAME	INDIAN HEAD
LOCATION	IFD
DATE	2/9/96

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY ON THE FOLLOWING SPREADSHEETS. THREE EXPOSURE ROUTES ARE CONSIDERED: INGESTION OF GROUNDWATER, INHALATION OF VOLATILES DURING SHOWERING/BATHING, AND DERMAL CONTACT WHILE SHOWERING/BATHING. ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO: RESIDENTIAL LAND USE (RESIDENT ADULT AND CHILD)

REFERENCES: EPA, DECEMBER 1989; FOSTER AND CHROSTOWSKI 1987

INGESTION: EX = (C x IR x EF x ED)/(BW x AT)

WHER: C = GROUNDWATER CONCENTRATION (MG/L)
IR = INGESTION RATE (LITERS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
AT = AVERAGING TIME (DAYS)

DERMAL CONTACT: DEX = (C x PC x SA x ET x EF x ED)/(BW x AT)

WHER: C = GROUNDWATER CONCENTRATION (MG/L)
PC = THE PERMEABILITY CONSTANT OF CHEMICAL (L/M^2)
SA = THE SKIN SURFACE AREA AVAILABLE FOR CONTACT (M^2)
ET = EXPOSURE TIME (HRS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
AT = AVERAGING TIME (DAYS)

INPUT PARAMETERS

INGESTION — EXPOSURE

IRwa	2	CONVERSION FACTOR (NONCA	2.74E-02
EF	350		
EDwa	30		
BWa	70	CONVERSION FACTOR (CARCIN	1.49E-02
AT(NO	10950		
AT(CA	25550		
IFWadj	1.09		
KCr	4		

DERMAL CONTAC — ADULT EXPOSURE

SAadj	0.9321	CONVERSION FACTOR (NONCAR) =	2.59E-02
SAa	1.94		
ET	0.2		
EF	350	CONVERSION FACTOR (CARCIN) =	1.31E-02
EDa	30		
BW	70		
AT (NON)	10950		
AT (CAR)	25550		

INHALATION — EXPOSURE

IRa	20	CONVERSION FACTOR (NONCA	1.37E-01
K	0.5		
IFAadj	11.4	CONVERSION FACTOR (CARCIN	1.95E-02

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RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE TWO)
INDIAN HEAD
IEB
CALCULATE DOSES

CHEMICAL	GW CONC (MG/L)	MOLECULAR WEIGHT	HENRYS LAW CONSTANT	DERMAL PERM CONSTANT	AIR CONCENTRATION (MG-MIN/L/SHOWER)
[illegible]	0.9021	1	1.30E+00	7.00E-03	0.00E+00
Manganese	1.00	1	1.40E+00	2.00E-03	0.00E+00
		1	1.00E+00		0.00E+00
		1	1.00E+00		[illegible]
		1	1.10E-02		[illegible]
		1	1.20E+00		0.00E+00
					0.00E+00
					0.00E+00
					[illegible]
					[illegible]
					0.00E+00
					0.00E+00
					0.00E+00
					[illegible]
					[illegible]
					0.00E+00
					0.00E+00
					0.00E+00
					[illegible]
					[illegible]
					[illegible]
					0.00E+00
					0.00E+00
					0.00E+00
					0.00E+00
					[illegible]
					[illegible]
					[illegible]
					0.00E+00
					0.00E+00
					0.00E+00
					0.00E+00
					[illegible]
					[illegible]
					[illegible]
					0.00E+00
					0.00E+00
					0.00E+00
					0.00E+00
					[illegible]

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RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE THREE)
INDIAN HEAD
ICO
CALCULATE HAZARD INDICES

CHEMICAL	ANNUAL INGESTION DOSE	ANNUAL DERMAL DOSE	ANNUAL INHALATION DOSE	INGESTION RfD	DERMAL RfD	INHALATION RfD	HAZARD INDEX INGESTION	HAZARD INDEX DERMAL	HAZARD INDEX INHALATION	TOTAL HAZARD INDEX
Arsenic	5.75E-05	1.12E-07	2.00E-04	3.00E-04	3.00E-03	0.00E+00	1.92E-01	3.00E-03	0.00E+00	1.92E-01
Manganese	2.79E-02	3.79E-05	1.49E-01	5.10E-03	1.10E-04	1.00E-36	6.97E+00	3.86E-01	0.00E+00	8.16E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL HAZARD INDEX							[illegible]	[illegible]	[illegible]	[illegible]

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RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE FOUR)

CALCULATE INCREMENTAL CANCER RISK

CHEMICAL	LIFETIME AVG INGESTION DOSE	LIFETIME AVG DERMAL DOSE	LIFETIME AVG INHALATION DOSE	CSF INGESTION	CSF DERMAL	CSF INHALATION	CANCER RISK INGESTION	CANCER RISK DERMAL	CANCER RISK INHALATION	TOTAL CANCER RISK
Arsenic	3.14E-05	5.48E-08	1.47E-04	1.50E+00	1.53E+00	0.00E+00	4.71E-05	3.39E-08	0.00E+00	4.71E-05
Manganese	1.03E-03	2.05E-05	8.46E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL RISK							4.71E-05	3.39E-08	0.00E+00	4.71E-05

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	A	B	D	E	F	G	H	I	J	K
1	Site Name	INDIAN HEAD								
2	Location	IED								
3	Date	2/9/96								
4										
5	**Chemical**	**Concentration (mg/L)**								
6										
7	Arsenic (filtered)	0.002								
8	Manganese (filtered)	1.16								
9										
10										
11										
12										
13		These are the representative concentrations. They are the maximum concentrations detected in this media at this site.								

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RISK ASSESSMENT SPREADSHEET - EXPOSURES THROUGH HOUSEHOLD USE OF GROUNDWATER

SITE NAME: INDIAN HEAD
LOCATION: IEO
DATE: 2/9/96

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY ON THE FOLLOWING SPREADSHEETS. THREE EXPOSURE ROUTES ARE CONSIDERED: INGESTION OF GROUNDWATER, INHALATION OF VOLATILES DURING SHOWERING/BATHING, AND DERMAL CONTACT WHILE SHOWERING/BATHING. ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO: RESIDENTIAL LAND USE (RESIDENT ADULT AND CHILD)

REFERENCES: EPA, DECEMBER 1989
FOSTER AND CHROSTOWSKI, 1987

INGESTION: IEX = (C x IR x EF x ED)/(BW x AT)

WHERE C = GROUNDWATER CONCENTRATION (MG/L)
IR = INGESTION RATE (LITERS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
AT = AVERAGING TIME (DAYS)

DERMAL CONTACT: DEX = (C x PC x AV x ET x EF x ED)/(BW x AT)

WHERE C = GROUNDWATER CONCENTRATION (MG/L)
PC = THE PERMEABILITY CONSTANT OF CHEMICAL (L/M**2)
SA = THE SKIN SURFACE AREA AVAILABLE FOR CONTACT (M**2)
ET = EXPOSURE TIME (HRS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
AT = AVERAGING TIME (DAYS)

INPUT PARAMETERS

INGESTION — EXPOSURE

IRa	2	CONVERSION FACTOR (NONCA	2.7?E-02
EF	350		
EDa	30	CONVERSION FACTOR (CARCIN	1.4?E-02
BWa	70		
ATNO	10950		
ATCA	25550		
IFWadj	1.09		
EDc	6		

DERMAL CONTAC — ADULT EXPOSURE

SAadj	0.9531	CONVERSION FACTOR (NONCAR) =	2.68E-02
SAa	1.94		
ET	0.2	CONVERSION FACTOR (CARCIN) =	1.31E-02
EF	350		
EDa	30		
BW	70		
AT (NON)	10950		
AT (CAR)	25550		

INHALATION — EXPOSURE

IRAa	15	CONVERSION FACTOR (NONCA	1.37E-01
K	0.5		
IFAadj	11.6	CONVERSION FACTOR (CARCIN	7.?E-02

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RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE TWO)
INDIAN HEAD
IFD
CALCULATE DOSE

CHEMICAL	GW CONC. (MG/L)	MOLECULAR WEIGHT	HENRYS LAW CONSTANT	DERMAL PERM CONSTANT	AIR CONCENTRATION (MG-MIN/L/SHOWER)
Arsenic (filtered)	[illegible]	1	[illegible]	2.00E-03	0.00E+00
Manganese (filtered)	1.16	1	[illegible]	2.00E-03	0.00E+00
		1	[illegible]		0.00E+00
		1	[illegible]		0.00E+00
		1	[illegible]		[illegible]
		1	[illegible]		0.00E+00
					0.00E+00
					0.00E+00
					0.00E+00
					0.00E+00
					[illegible]
					[illegible]
					0.00E+00
					0.00E+00
					0.00E+00
					0.00E+00
					0.00E+00
					0.00E+00
					0.00E+00
					[illegible]
					[illegible]
					[illegible]
					[illegible]
					0.00E+00
					0.00E+00
					0.00E+00
					0.00E+00
					0.00E+00
					0.00E+00
					0.00E+00
					0.00E+00
					0.00E+00
					[illegible]
					[illegible]
					[illegible]
					0.00E+00
					0.00E+00
					0.00E+00
					0.00E+00

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RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE THREE)
INDIAN HEAD
RD
CALCULATE HAZARD INDICES

CHEMICAL	ANNUAL INGESTION DOSE	ANNUAL DERMAL DOSE	ANNUAL INHALATION DOSE	INGESTION RfD	DERMAL RfD	INHALATION RfC	HAZARD INDEX INGESTION	HAZARD INDEX DERMAL	HAZARD INDEX INHALATION	TOTAL HAZARD INDEX
Arsenic (Mercl)	5.49E-05	1.34E-07	3.71E-04	3.00E-04	2.94E-03	0.00E+00	1.83E-01	4.58E-05	0.00E+00	1.83E-01
Manganese (Mercl)	3.18E-02	6.17E-05	1.34E-07	5.00E-03	1.50E-04	0.00E+00	6.36E+00	4.11E-01	0.00E+00	6.77E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL HAZARD INDEX							6.54E+00	4.11E-01	0.00E+00	6.95E+00

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RISK ASSESSMENT SPREADSHEET : HOUSEHOLD USE OF GROUNDWATER (PAGE FOUR)

CALCULATE INCREMENTAL CANCER RISK

CHEMICAL	LIFETIME AVG INGESTION DOSE	LIFETIME AVG DERMAL DOSE	LIFETIME AVG INHALATION DOSE	CSF INGESTION	CSF DERMAL	CSF INHALATION	CANCER RISK INGESTION	CANCER RISK DERMAL	CANCER RISK INHALATION	TOTAL CANCER RISK
Arsenic (filtered)	2.93E-05	5.22E-08	1.50E-04	1.50E+00	1.50E+00	0.00E+00	4.40E-05	7.90E-08	0.00E+00	4.40E-05
Manganese (filtered)	1.73E-07	3.03E-05	8.22E-07	0.00E+00	2.20E+00	0.00E+00	[illegible]	[illegible]	[illegible]	0.00E+00
	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]
TOTAL RISK							4.40E-05	7.90E-08	0.00E+00	4.40E-05

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Risk Assessment Spreadsheets

for Range 6

	A	B	D	E	F	G	H	I	J	K	L
1	Site Name	INDIAN HEAD									
2	Location	Range 6									
3	Date	2/9/98									
4											
5	Chemical	Concentration (mg/L)									
6											
7	1,3-Dinitrobenzene	0.0045									
8	2,4-Dinitrotoluene	0.0173									
9	2,4,6-Trinitrotoluene	0.242									
10	RDX	0.658									
11	Iron	29									
12	Lead	27.3									
13	Manganese	1.4									
14	Thallium										
15	Aluminum	12.6									
16	Ammonia	1.9									
17											
18		These are the respresentative concentrations. They are the maximum concentrations detected in this media for this site.									

RISK ASSESSMENT SPREADSHEET - EXPOSURES THROUGH HOUSEHOLD USE OF GROUNDWATER

SITE NAME: INDIAN HEAD
LOCATION: Range 6
DATE: 2/6/96

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY ON THE FOLLOWING SPREADSHEETS. THREE EXPOSURE ROUTES ARE CONSIDERED: INGESTION OF GROUNDWATER, INHALATION OF VOLATILES DURING SHOWERING/BATHING, AND DERMAL CONTACT WHILE SHOWERING/BATHING. ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO: RESIDENTIAL LAND USE (RESIDENT ADULT AND CHILD)

REFERENCES: EPA, DECEMBER 1989
FOSTER AND CHROSTOWSKI, 1987

INGESTION: EX = (C x IR x EF x ED)/(BW x AT)

WHERE: C = GROUNDWATER CONCENTRATION (MG/L)
IR = INGESTION RATE (LITERS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
AT = AVERAGING TIME (DAYS)

DERMAL CONTACT: DEX = (C x PC x AV x ET x EF x ED)/(BW x AT)

WHERE: C = GROUNDWATER CONCENTRATION (MG/L)
PC = THE PERMEABILITY CONSTANT OF CHEMICAL (L/M^2)
SA = THE SKIN SURFACE AREA AVAILABLE FOR CONTACT (M^2)
ET = EXPOSURE TIME (HRS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
AT = AVERAGING TIME (DAYS)

INPUT PARAMETERS

INGESTION — EXPOSURE

IRwa	2	CONVERSION	
EF	350	FACTOR (NONCA	2.74E-02
EDtot	30		
BWa	70	CONVERSION	
AT(NC)	10950	FACTOR (CARCIN	1.40E-02
AT(CA	25550		
FWadj	1.09		
EDc	6		

DERMAL CONTACT — ADULT EXPOSURE

SAadj	0.9531	CONVERSION	
SAa	1.94	FACTOR (NONCAR) =	2.68E-02
ET	0.2		
EF	350	CONVERSION	
EDtot	30	FACTOR (CARCIN) =	1.31E-02
BW	70		
AT (NON)	10950		
AT (CAR)	25550		

INHALATION — EXPOSURE

IRAa	20	CONVERSION	
K	0.5	FACTOR (NONCA	1.37E-01
IFAadj	11.8	CONVERSION	
		FACTOR (CARCIN	7.05E-02

2

RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE TWO)
INDIAN HEAD
Range 8
CALCULATE DOSES

CHEMICAL	GW CONC (MG/L)	MOLECULAR WEIGHT	HENRYS LAW CONSTANT	DERMAL PERM CONSTANT	AIR CONCENTRATION (MG-M/M^3/SHOWER)
1,3-Dinitrobenzene	0.0045	1	1.00E+00	3.13E-22	0.00E+00
2,4-Dinitrotoluene	0.0173	1	1.00E+00	4.83E-03	0.00E+00
2,4,6-Trinitrotoluene	0.242	1	1.00E+00	3.11E-02	0.00E+00
RDX	0.658	1	1.00E+00	3.11E-01	1.30E+00
Iron	29	1	1.00E+00	2.00E-03	0.00E+00
Lead	27.3	1	1.00E+00	8.50E-06	0.00E+00
Manganese	1.6			2.00E-03	0.00E+00
Thallium				2.00E-03	0.00E+00
Aluminum	12.9			2.00E-03	1.30E-02
Ammonia	1.3			2.00E-03	0.00E+00
					0.00E+00
					0.00E+00
					1.50E-02
					2.20E-02
					0.00E+00
					0.00E+00
					0.00E+00
					0.00E+00
					0.00E+00
					0.00E+00
					0.00E+00
					0.00E+00
					0.00E+00
					0.00E+00
					0.00E+00
					0.00E+00
					0.00E+00
					1.30E+00
					0.00E+00
					0.00E+00
					0.00E+00
					0.00E+00
					0.00E+00
					0.00E+00
					1.50E+00
					0.00E+00
					0.00E+00
					0.00E+00
					0.00E+00
					0.00E+00

3

RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE THREE)
INDIAN HEAD
Range 6
CALCULATE HAZARD INDICES

CHEMICAL	ANNUAL INGESTION DOSE	ANNUAL DERMAL DOSE	ANNUAL INHALATION DOSE	INGESTION R/D	DERMAL R/D	INHALATION R/D	HAZARD INDEX INGESTION	HAZARD INDEX DERMAL	HAZARD INDEX INHALATION	TOTAL HAZARD INDEX
1,3-Dinitrobenzene	1.23E-04	3.10E-08	4.18E-04	1.00E-04	1.00E-04	0.00E+00	1.23E+00	3.82E-12	0.00E+00	1.27E+00
2,4-Dinitrotoluene	4.74E-04	2.27E-06	2.37E-03	2.00E-03	2.00E-03	0.00E+00	2.37E-01	1.13E-03	3.20E+00	2.48E-01
2,4,6-Trinitrotoluene	6.63E-03	7.00E-04	3.27E-02	5.00E-04	5.00E-04	0.00E+00	1.33E+01	4.00E-01	0.00E+00	1.37E+01
RDX	1.80E-02	5.47E-03	4.41E-02	3.00E-03	3.00E-03	2.50E+00	4.01E+00	1.82E+00	0.00E+00	7.83E+00
Iron	7.95E-01	1.54E-03	5.97E+00	3.00E-01	1.50E-02	3.30E+00	2.65E+00	1.03E-01	0.00E+00	2.75E+00
Lead	7.48E-01	5.86E-08	2.74E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Manganese	3.84E-02	7.44E-05	1.92E-01	5.20E-03	1.50E-04	0.00E+00	7.61E+00	4.96E-01	1.30E+00	8.17E+00
Thallium	0.00E+00	3.30E-08	0.00E+00	7.20E-05	7.00E-05	0.00E+00	0.00E+00	3.50E+00	0.00E+00	0.00E+00
Aluminum	3.40E-01	8.76E-04	1.73E+00	1.00E+00	1.00E-02	3.20E+00	2.43E-01	1.24E-02	0.00E+00	3.38E-01
Antimony	5.21E-03	1.10E-04	2.60E-01	2.90E-02	3.50E+00	0.00E+00	1.90E+00	0.00E+00	0.00E+00	1.90E+00
	1.20E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	3.30E+00	3.20E+00	3.20E+00				2.30E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	3.00E+00	0.00E+00				0.20E+00	3.20E+00	3.20E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	3.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	3.00E+00	1.00E+00	1.30E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	3.30E+00	3.00E+00				3.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.30E+00	3.30E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	1.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	8.50E+00
	2.20E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	3.30E+00	1.00E+00	1.30E+00				1.00E+00	0.00E+00	0.00E+00	0.00E+00
	3.00E+00	1.20E+00	3.30E+00				1.00E+00	1.00E+00	0.30E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				3.20E+00	0.30E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	2.00E+00	0.00E+00	1.00E+00				0.00E+00	0.00E+00	0.00E+00	1.00E+00
	3.20E+00	1.00E+00	1.00E+00				0.00E+00	0.00E+00	0.00E+00	0.30E+00
	0.00E+00	1.30E+00	1.20E+00				0.00E+00	0.00E+00	1.00E+00	0.00E+00
	0.00E+00	1.00E+00	1.00E+00				1.00E+00	1.00E+00	1.30E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				1.30E+00	1.30E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	1.20E+00	1.00E+00	1.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	3.20E+00	3.00E+00				1.00E+00	0.00E+00	1.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				1.20E+00	1.30E+00	3.50E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.30E+00	0.30E+00	0.00E+00	0.00E+00
	1.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	1.00E+00
	3.00E+00	1.50E+00	1.20E+00				0.00E+00	0.00E+00	1.00E+00	0.30E+00
	0.00E+00	0.30E+00	0.00E+00				1.00E+00	1.00E+00	1.20E+00	0.00E+00
							0.00E+00	3.30E+00	0.00E+00	0.00E+00
TOTAL HAZARD INDEX							2.12E+01	2.94E+00	8.00E+00	3.41E+01

4

5

RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE FOUR)

CALCULATE INCREMENTAL CANCER RISK

CHEMICAL	LIFETIME AVG INGESTION DOSE	LIFETIME AVG DERMAL DOSE	LIFETIME AVG INHALATION DOSE	CSF INGESTION	CSF DERMAL	CSF INHALATION	CANCER RISK INGESTION	CANCER RISK DERMAL	CANCER RISK INHALATION	TOTAL CANCER RISK
1,3-Dinitrobenzene	8.72E-08	1.78E-08	3.58E-04	0.00E+00	3.50E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,4-Dinitrotoluene	7.58E-04	1.11E-25	1.17E-03	6.80E-01	8.90E-01	0.00E+00	1.78E-04	7.31E-08	0.00E+00	1.83E-04
2,4,6-Trinitrotoluene	3.81E-03	8.83E-08	1.92E-02	3.00E-02	3.00E-03	0.00E+00	1.08E-04	7.35E-08	0.00E+00	1.11E-04
PCBs	9.82E-03	3.60E-03	5.23E-02	1.10E-01	1.10E-01	0.00E+00	1.08E-03	3.96E-04	0.00E+00	1.38E-03
Iron	4.33E-01	7.57E-08	2.30E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lead	4.08E-01	2.85E-08	2.17E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Manganese	2.59E-02	3.88E-25	1.11E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum	1.85E-01	3.29E-04	1.30E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonia	2.84E-02	4.08E-05	1.51E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL RISK							1.34E-03	3.44E-04	0.00E+00	1.67E-03

	A	B	D	E	F	G	H	I	J	K	L
1	Site Name	INDIAN HEAD									
2	Location	Range 6									
3	Date	2/9/96									
4											
5	**Chemical**	**Concentration (mg/L)**									
6											
7	1,3-Dinitrobenzene	0.0045									
8	2,4-Dinitrotoluene	0.0173									
9	2,4,6-Trinitrotoluene	0.242									
10	RDX	0.658									
11	Iron (filtered)	6.9									
12	Manganese (filtered)	1.61									
13	Thallium (filtered)	0.0026									
14	Ammonia	1.9									
15											
16		These are the respresentative concentrations. They are the maximum concentrations detected in this medium at this site.									

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RISK ASSESSMENT SPREADSHEET - EXPOSURES THROUGH HOUSEHOLD USE OF GROUNDWATER

SITE NAME: INDIAN HEAD
LOCATION: Range 6
DATE: 3/8/98

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY ON THE FOLLOWING SPREADSHEETS. THREE EXPOSURE ROUTES ARE CONSIDERED:
INGESTION OF GROUNDWATER, INHALATION OF VOLATILES DURING SHOWERING/BATHING, AND DERMAL CONTACT WHILE SHOWERING/BATHING.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO: RESIDENTIAL LAND USE (RESIDENT ADULT AND CHILD)

REFERENCES: EPA, DECEMBER 1989
FOSTER AND CHROSTOWSKI, 1987

INGESTION: IEX = (C x IR x EF x ED)/(BW x AT)

WHERE C = GROUNDWATER CONCENTRATION (MG/L)
IR = INGESTION RATE (LITERS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
AT = AVERAGING TIME (DAYS)

DERMAL CONTACT: DEX = (C x PC x AV x ET x EF x ED)/(BW x AT)

WHERE C = GROUNDWATER CONCENTRATION (MG/L)
PC = THE PERMEABILITY CONSTANT OF CHEMICAL (L/M^2)
SA = THE SKIN SURFACE AREA AVAILABLE FOR CONTACT (M^2)
ET = EXPOSURE TIME (HRS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
AT = AVERAGING TIME (DAYS)

INPUT PARAMETERS

INGESTION — EXPOSURE

IRa	2	CONVERSION FACTOR (NONCA	2.74E-02
EF	350		
EDat	30	CONVERSION FACTOR (CARCIN	1.44E-02
BWa	70		
AT(NO	10950		
AT(CA	25550		
#Wat)	1.78		
EDs	8		

DERMAL CONTAC — ADULT EXPOSURE

SAa(b)	0.853	CONVERSION FACTOR (NONCAR) =	2.66E-02
SAa	1.94		
ET	0.2		
EF	350	CONVERSION FACTOR (CARCIN) =	1.31E-02
EDa	30		
BW	70		
AT (NON)	10950		
AT (CAR)	25550		

INHALATION — EXPOSURE

IRAa	20	CONVERSION FACTOR (NONCA	1.31E-01
k	0.5		
FAdj	11.6	CONVERSION FACTOR (CARCIN	1.95E-02

RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE TWO)
INDIAN HEAD
Range 4
CALCULATE DOSE

CHEMICAL	GW CONC (MG/L)	MOLECULAR WEIGHT	HENRYS LAW CONSTANT	DERMAL PERM CONSTANT	AIR CONCENTRATION (MG-M3_SHOWER)
1,3-Dinitrobenzene	3.3040	1	1.00E+00	3.33E-02	0.00E+00
2,4-Dinitrotoluene	0.3173	1	1.00E+00	4.83E-03	0.00E+00
2,4,6-Trinitrotoluene	2.142	1	1.00E+00	3.11E-02	0.00E+00
RDX	3.358	1	1.00E+00	3.13E-01	0.00E+00
Iron (filtered)	6.9	1	1.00E+00	7.00E-03	2.50E+00
Manganese (filtered)	1.51	1	1.00E+00	2.00E-03	2.30E+00
Thallium (filtered)	2.3078			1.00E-03	0.30E+00
Ammonia	1.8			2.50E-13	0.00E+00
					0.00E+00
					0.00E+00
					0.00E+00
					0.00E+00
					0.00E+00
					2.30E+00
					0.30E+00
					0.30E+00
					0.00E+00
					0.00E+00
					0.00E+00
					0.00E+00
					0.00E+00
					0.00E+00
					0.00E+00
					0.00E+00
					0.00E+00
					0.00E+00
					0.00E+00
					2.00E+00
					2.30E+00
					3.30E+00
					0.30E+00
					0.00E+00
					0.00E+00
					0.00E+00
					0.00E+00
					0.00E+00
					0.00E+00
					2.50E+00
					2.30E+00
					0.30E+00

8

RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE THREE)
INDIAN HEAD
Range II
CALCULATE HAZARD INDICES

CHEMICAL	ANNUAL INGESTION DOSE	ANNUAL DERMAL DOSE	ANNUAL INHALATION DOSE	INGESTION RfD	DERMAL RfD	INHALATION RfD	HAZARD INDEX INGESTION	HAZARD INDEX DERMAL	HAZARD INDEX INHALATION	TOTAL HAZARD INDEX
1,3-Dinitrobenzene	1.23E-04	3.67E-06	6.15E-04	1.00E-04	1.30E-04	0.00E+00	1.23E+00	3.62E-02	0.00E+00	1.27E+00
2,4-Dinitrotoluene	4.74E-04	2.27E-05	3.37E-03	2.00E-03	2.00E-03	0.00E+00	2.37E-01	1.13E-02	0.00E+00	2.48E-01
2,4,6-Trinitrotoluene	6.83E-03	2.00E-04	3.32E-02	5.00E-04	5.30E-04	0.00E+00	1.37E+01	4.00E-01	0.00E+00	1.37E+01
RDX	1.80E-03	5.47E-05	9.01E-03	3.00E-03	3.00E-03	0.00E+00	6.01E-01	1.82E-02	0.00E+00	6.19E-01
Iron (filtered)	1.89E-01	2.67E-04	9.45E-01	3.00E-01	1.50E-02	0.00E+00	6.30E-01	2.44E-02	0.00E+00	6.55E-01
Manganese (filtered)	4.41E-02	8.34E-05	2.21E-01	5.00E-03	1.40E-04	0.00E+00	8.82E+00	5.70E-01	0.00E+00	9.39E+00
Thallium (filtered)	7.12E-05	1.38E-07	7.56E-04	1.00E-05	7.00E-05	0.00E+00	1.12E+00	1.97E-03	0.00E+00	1.12E+00
Ammonia	3.21E-02	1.11E-04	2.50E-01	2.86E-02	0.00E+00	0.00E+00	1.12E+00	0.00E+00	0.00E+00	1.12E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL HAZARD INDEX							[illegible]	[illegible]	0.00E+00	[illegible]

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RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE FOUR)

CALCULATE INCREMENTAL CANCER RISK

CHEMICAL	LIFETIME AVG INGESTION DOSE	LIFETIME AVG DERMAL DOSE	LIFETIME AVG INHALATION DOSE	CSF INGESTION	CSF DERMAL	CSF INHALATION	CANCER RISK INGESTION	CANCER RISK DERMAL	CANCER RISK INHALATION	TOTAL CANCER RISK
1,3 Dinitrobenzene	3.72E-05	1.78E-08	3.18E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,4 Dinitrotoluene	2.54E-04	1.11E-05	1.37E-03	6.80E-01	6.80E-01	0.00E+00	1.73E-04	7.57E-06	0.00E+00	1.80E-04
2,4,6-Trinitrotoluene	3.61E-03	9.02E-05	1.82E-02	3.00E-02	3.00E-02	0.00E+00	1.08E-04	2.85E-06	0.00E+00	1.11E-04
RDX	9.92E-03	3.68E-03	5.73E-02	1.10E-01	1.10E-01	0.00E+00	1.09E-03	3.84E-04	0.00E+00	1.38E-03
Iron (filtered)	1.03E-01	1.80E-04	5.40E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Manganese (filtered)	2.40E-02	4.20E-05	1.25E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Thallium (filtered)	3.68E-05	8.36E-08	2.07E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonia	2.84E-02	4.96E-05	1.51E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL RISK							1.36E-03	3.94E-04	0.00E+00	1.67E-03

	A	B	D	E	F	G	H	I	J	K	L
1	Site Name	Indian Head, Maryland									
2	Location	Range 6									
3	Date	2/9/96									
4											
5	**Chemical**	**Concentration (mg/Kg)**									
6											
7	2,4,6-Trinitrotoluene	28.4									
8											
9											
10											
11											
12											
13											
14		These are the representative concentrations. They are the maximum concentrations detected in the medium at this site.									

//

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL - INDUSTRIAL LAND USE

SITE NAME:	Indian Head, Maryland
LOCATION:	Range 4
DATE:	[illegible]
RECEPTOR:	

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET
ASSUMPTIONS ARE OUTLINED BELOW

EXPOSURE SCENARIO: TYPICAL ADULT WORKER AND CONSTRUCTION WORKER

RELEVANT EQUATION: $IFS = (C \times IR \times Fi \times EF \times ED)/(BW \times AT \times 1E6)$

WHERE:

C = MEAN CONCENTRATION IN SOIL SAMPLE (MG/KG)
IR = SOIL INGESTION RATE (MG/EVENT);
EF = EXPOSURE FREQUENCY (EVENTS/YEAR)
Fi = FRACTION FROM CONTAMINATED SOURCE
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
AT = AVERAGING TIME (DAYS)

ENTER INPUT PARAMETERS

TYPICAL ADULT WORKER

IR	100
EF	250
Fi	0.5
ED	25
BW	70
AT(CAR)	25550
AT(NON)	9125

DETERMINE CONVERSION FACTORS
ADULT

CF	4.49E-07	CF (Cancer)	?.75E-07

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)
Indian Head, Maryland
Range II
CALCULATE DOSES

CHEMICAL	C (MG/KG)	ADULT ANNUAL DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
2,4,6-Trinitrotoluene	21.4	1.79E-05	4.96E-06	5.00E-04	3.00E-02
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		

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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE THREE)
Indian Head, Maryland
Range 8
DETERMINE HAZARD INDICES AND CANCER RISK

CHEMICAL	HAZARD INDEX ADULT	INCREMENTAL CANCER RISK
2,4,5 Trinitrotoluene	2.78E-02	1.49E-07
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
TOTAL	2.78E-02	1.49E-07

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL - INDUSTRIAL LAND USE

SITE NAME: Indian Head, Maryland
LOCATION: Range 8
DATE: 3/9/94
RECEPTOR:

EXPOSURE SCENARIO: TYPICAL ADULT WORKER AND CONSTRUCTION WORKER

RELEVANT EQUATION: DEX = (C x SA x AF x ABS x EF x ED)/(BW x AT x 1E6)

WHERE:	C = CONCENTRATION IN SOIL (MG/KG)		
	SAT = ADULT SKIN SURFACE AREA (SQ CM/DAY)		3450
	AF = ADHERENCE FACTOR (MG/SQ CM)		1
	ABS = ABSORPTION FRACTION	VOCS	0.1
	(DECIMAL FRACTION)	BNAS/PESTICIDES	0.05
		PCBS	0.07
		METALS	0.001
	EF = EXPOSURE FREQUENCY (DAYS/YEAR)		250
	ED = ADULT EXPOSURE DURATION (YEARS)		25
	BW = BODY WEIGHT ADULT (KG)		70
	AT = AVERAGING TIME (DAYS), NONCARCINOGENS (ADULT)		9125
	AT = AVERAGING TIME (DAYS), CARCINOGENS		25550

DETERMINE CONVERSION FACTORS:

ADULT

CF (Noncancer)	3.38E-05 (AVERAGE ANNUAL DOSE)	CF (Cancer)	1.21E-05 (CANCER RISK)

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RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL (PAGE TWO)
Indian Head, Maryland
EXPOSURE SCENARIO: TYPICAL ADULT WORKER AND CONSTRUCTION WORKER
CALCULATE DOSES

CHEMICAL	C (MG/KG)	ABSORPTION FRACTION	ANNUAL ADULT DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)	HAZARD INDEX ADULT	INCREMENTAL CANCER RISK
2,4,6-Trinitrotoluene	28.4	0.05	4.79E-05	1.71E-05	5.00E-04	3.00E-02	9.59E-02	5.14E-07
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
TOTAL							**9.59E-02**	**5.14E-07**

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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL - RESIDENTIAL LAND USE

SITE NAME: Indian Head, Maryland
LOCATION: Range 6
DATE: 2/9/98

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET
EXPOSURES THROUGH PICA INGESTION ARE CONSIDERED
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO: RESIDENT ADULT AND CHILD

RELEVANT EQUATION: IEX = (C x IR x Fi x EF x ED)/(BW x AT x 1E6)

WHERE:
C = MEAN CONCENTRATION IN SOIL SAMPLE (MG/KG)
IR = SOIL INGESTION RATE (MG/EVENT)
EF = EXPOSURE FREQUENCY (EVENTS/YEAR)
Fi = FRACTION FROM CONTAMINATED SOURCE
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
AT = AVERAGING TIME (DAYS)

ENTER INPUT PARAMETERS

ADULT		YOUTH	
IR	100	IR	200
EF	350	EF	350
Fi	1	Fi	1
ED	24	ED	6
BW	70	BW	15
AT(CAR)	25550	AT(CAR)	25550
AT(NON)	8760	AT(NON)	2190

DETERMINE CONVERSION FACTORS

ADULT			YOUTH			ADULT/YOUTH (CANCER RISK)	
CF	1.37E-06	(AVG ANNUAL DOSE)	CF	1.29E-05	(AVG ANNUAL DOSE)	CF	1.57E-06

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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)
Indian Head, Maryland
Range 5
CALCULATE DOSES

CHEMICAL	C (MG/KG)	YOUTH ANNUAL DOSE (MG/KG/DAY)	ADULT ANNUAL DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
2,4,6-Trinitrotoluene	25.4	3.63E-04	3.59E-05	4.45E-05	5.00E-04	3.00E-02
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
	These are the representative con	0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		

RISK ASSESSMENT SPRE[illegible]SHEET - INCIDENTAL INGESTION OF SOIL (PAGE THREE)
Indian Head, Maryland
Range 6
DETERMINE HAZARD INDICES AND CANCER RISK

CHEMICAL	HAZARD INDEX YOUTH	HAZARD INDEX ADULT	INCREMENTAL CANCER RISK
2,4,6-Trinitrotoluene	7.26E-01	7.78E-02	1.33E-06
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
TOTAL	7.26E-01	7.78E-02	1.33E-06

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RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL - RESIDENTIAL LAND USE

SITE NAME:	Indian Head, Maryland
LOCATION:	Range 8
DATE:	3/9/98

EXPOSURE SCENARIO: RESIDENT ADULT AND CHILD

RELEVANT EQUATION: DEX = (C x SA x AF x ABS x EF x ED)/(BW x AT x 10^6)

WHERE:

C = CONCENTRATION IN SOIL (MG/KG)		
SA1 = YOUTH SKIN SURFACE AREA (SQ CM/DAY)		1800
SA2 = ADULT SKIN SURFACE AREA (SQ CM/DAY)		5000
SAa = ADJUSTED SURFACE AREA (SQ CM/DAY)		3434
AF = ADHERENCE FACTOR (MG/SQ CM)		1
ABS = ABSORPTION FRACTION (DECIMAL FRACTION)	VOCS	0.1
	PHAS/PESTICIDES	0.05
	PCBS	0.03
	METALS	0.001
EF = EXPOSURE FREQUENCY (DAYS/YEAR)		350
ED1 = YOUTH EXPOSURE DURATION (YEARS)		6
ED2 = ADULT EXPOSURE DURATION (YEARS)		24
BW1 = BODY WEIGHT ADOLESCENT (KG)		15
BW2 = BODY WEIGHT ADULT (KG)		70
AT1 = AVERAGING TIME (DAYS), NONCARCINOGENS (YOUTH)		2190
AT2 = AVERAGING TIME (DAYS), NONCARCINOGENS (ADULT)		8760
AT3 = AVERAGING TIME (DAYS), CARCINOGENS		25550

DETERMINE CONVERSION FACTORS

ADULT/YOUTH

CF (ADULT) [illegible] (AVERAGE ANNUAL DOSE) [illegible] [illegible] (AVERAGE ANNUAL DOSE) CF [illegible] (CANCER RISK)

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RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL (PAGE TWO)
Indian Head, Maryland
EXPOSURE SCENARIO: RESIDENT ADULT AND CHILD
CALCULATE DOSES

CHEMICAL	C (MG/KG)	ABSORPTION FRACTION	ANNUAL ADULT DOSE (MG/KG/DAY)	ANNUAL CHILD DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)	HAZARD INDEX ADULT	HAZARD INDEX CHILD	INCREMENTAL CANCER RISK
								0.00E+00	0.00E+00	0.00E+00
2,4,6-Trinitrotoluene	28.4	0.05	9.73E-05	1.63E-04	4.73E-05	5.00E-04	3.20E-02	1.95E-01	3.27E-01	1.42E-06
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
TOTAL								1.95E-01		1.42E-06

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Risk Assessment Spreadsheets

for the IOD

	A	B	D	E	F	G	H	I	J	K
1	Site Name	Indian Head, Maryland								
2	Location	IOD								
3	Date	2/5/96								
4										
5	**Chemical**	**Concentration (mg/Kg)**								
6										
7	Cadmium	14.6								
8	Iron	20,600								
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19		These are representative concentrations. They are the maximum concentrations detected in the medium at this site.								

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL - INDUSTRIAL LAND USE

SITE NAME: Indian Head, Maryland
LOCATION: IDD
DATE: 2/5/96
RECEPTOR:

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET
ASSUMPTIONS ARE OUTLINED BELOW

EXPOSURE SCENARIO: TYPICAL ADULT WORKER AND CONSTRUCTION WORKER

RELEVANT EQUATION: IEX = (C x IR x Fi x EF x ED)/(BW x AT x 1E6)

WHERE:
C = MEAN CONCENTRATION IN SOIL SAMPLE (MG/KG)
IR = SOIL INGESTION RATE (MG/EVENT)
EF = EXPOSURE FREQUENCY (EVENTS/YEAR)
FI = FRACTION FROM CONTAMINATED SOURCE
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
AT = AVERAGING TIME (DAYS)

ENTER INPUT PARAMETERS

TYPICAL ADULT WORKER

IR	100
EF	250
FI	0.5
ED	25
BW	70
AT(CAR)	25550
AT(NON)	9125

DETERMINE CONVERSION FACTORS
ADULT

CF 4.89E-07 CF (Cancer) 1.75E-07

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RISK ASSESSMENT SPR HEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)
Indian Head, Maryland
100
CALCULATE DOSES

CHEMICAL	C (MG/KG)	ADULT ANNUAL DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Cadmium	14.8	7.14E-06	2.55E-06	1.00E-03	0.00E+00
Iron	20600	1.01E-02	3.60E-03	3.00E-01	
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		

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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE THREE)
Indian Head, Maryland
IOD
DETERMINE HAZARD INDICES AND CANCER RISK

CHEMICAL	HAZARD INDEX ADULT	INCREMENTAL CANCER RISK
Cadmium	7.14E-03	0.00E+00
Iron	3.35E-02	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
TOTAL	4.07E-02	0.00E+00

4

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL - INDUSTRIAL LAND USE

SITE NAME:	Indian Head, Maryland
LOCATION:	IOD
DATE:	1/6/94
RECEPTOR:	

EXPOSURE SCENARIO: TYPICAL ADULT WORKER AND CONSTRUCTION WORKER

RELEVANT EQUATION: DER = (C x SA x AF x ABS x EF x ED)/(BW x AT x 1E6)

WHERE:	C = CONCENTRATION IN SOIL (MG/KG)		
	SA1 = ADULT SKIN SURFACE AREA (SQ CM/DAY)		3450
	AF = ADHERENCE FACTOR (MG/SQ CM)		1
	ABS = ABSORPTION FRACTION (DECIMAL FRACTION)	VOCS	0.1
		SVAS/PESTICIDES	0.05
		PCBS	0.03
		METALS	0.001
	EF = EXPOSURE FREQUENCY (DAYS/YEAR)		250
	ED = ADULT EXPOSURE DURATION (YEARS)		25
	BW = BODY WEIGHT ADULT (KG)		[illegible]
	AT = AVERAGING TIME (DAYS), NONCARCINOGENS (ADULT)		9125
	AT = AVERAGING TIME (DAYS), CARCINOGENS		25550

DETERMINE CONVERSION FACTORS:

ADULT

CF (Noncancer)	3.39E-05 (AVERAGE ANNUAL DOSE)	CF (Cancer)	1.21E-05 (CANCER RISK)

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RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL (PAGE TWO)
Indian Head, Maryland
EXPOSURE SCENARIO: TYPICAL ADULT WORKER AND CONSTRUCTION WORKER
CALCULATE DOSES

CHEMICAL	C (MG/KG)	ABSORPTION FRACTION	ANNUAL ADULT DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)	HAZARD INDEX ADULT	INCREMENTAL CANCER RISK
Cadmium	14.6	0.001	4.93E-07	1.76E-07	1.00E-05	0.00E+00	3.88E-03	0.00E+00
Iron	20600	0.001	6.95E-04	2.48E-04	1.50E-02	0.00E+00	4.64E-02	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
TOTAL							1.13E-01	0.00E+00

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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL - RESIDENTIAL LAND USE

SITE NAME: Indian Head, Maryland
LOCATION: IOD
DATE: 2/6/96

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH PICA INGESTION ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO: RESIDENT ADULT AND CHILD

RELEVANT EQUATION: IEX = (C x IR x Fi x EF x ED)/(BW x AT x 1E6)

WHERE:
C = MEAN CONCENTRATION IN SOIL SAMPLE (MG/KG)
IR = SOIL INGESTION RATE (MG/EVENT)
EF = EXPOSURE FREQUENCY (EVENTS/YEAR)
Fi = FRACTION FROM CONTAMINATED SOURCE
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
AT = AVERAGING TIME (DAYS)

ENTER INPUT PARAMETERS

ADULT		YOUTH	
IR	100	IR	200
EF	350	EF	350
Fi	1	Fi	1
ED	24	ED	6
BW	70	BW	15
AT(CAR)	25550	AT(CAR)	25550
AT(NON)	8760	AT(NON)	2190

DETERMINE CONVERSION FACTORS

ADULT			YOUTH			ADULT/YOUTH (CANCER RISK)	
CF	1.37E-06	(AVG ANNUAL DOSE)	CF	1.28E-05	(AVG ANNUAL DOSE)	CF	1.57E-06

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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)
Indian Head, Maryland
IOD
CALCULATE DOSES

CHEMICAL	C (MG/KG)	YOUTH ANNUAL DOSE (MG/KG/DAY)	ADULT ANNUAL DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Cadmium	14.6	1.87E-04	2.08E-05	2.29E-05	1.00E-03	0.00E+00
Iron	20600	2.63E-01	2.87E-02	3.23E-02	3.00E-01	
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		

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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE THREE)
Indian Head, Maryland
IOD
DETERMINE HAZARD INDICES AND CANCER RISK

CHEMICAL	HAZARD INDEX YOUTH	HAZARD INDEX ADULT	INCREMENTAL CANCER RISK
Cadmium	1.67E-01	2.00E-02	0.00E+00
Iron	8.73E-01	9.41E-02	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
TOTAL	1.04E+00	1.14E-01	0.00E+00

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RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL - RESIDENTIAL LAND USE

SITE NAME: Indian Head, Maryland
LOCATION: IOG
DATE: 3/5/04

EXPOSURE SCENARIO: RESIDENT ADULT AND CHILD

RELEVANT EQUATION: DEX = (C x SA x AF x ABS x EF x FD)/(BW x AT x EF)

WHERE:

C = CONCENTRATION IN SOIL (MG/KG)			
SA1 = YOUTH SKIN SURFACE AREA (SQ CM/DAY)			1500
SA2 = ADULT SKIN SURFACE AREA (SQ CM/DAY)			5000
SA4 = ADJUSTED SURFACE AREA (SQ CM/DAY)			2634
AF = ADHERENCE FACTOR (MG/SQ CM)			1
ABS = ABSORPTION FRACTION	VOCS		0.1
(DECIMAL FRACTION)	SVOCS/PESTICIDES		0.05
	PCBS		0.06
	METALS		0.001
EF = EXPOSURE FREQUENCY (DAYS/YEAR)			350
ED1 = YOUTH EXPOSURE DURATION (YEARS)			6
ED2 = ADULT EXPOSURE DURATION (YEARS)			24
BW1 = BODY WEIGHT ADOLESCENT (KG)			15
BW2 = BODY WEIGHT ADULT (KG)			70
AT1 = AVERAGING TIME (DAYS), NONCARCINOGENS (YOUTH)			2190
AT2 = AVERAGING TIME (DAYS), NONCARCINOGENS (ADULT)			8760
AT3 = AVERAGING TIME (DAYS), CARCINOGENS			25550

DETERMINE CONVERSION FACTORS

ADULT/YOUTH:

CF (ADULT) 6.85E-05 (AVERAGE ANNUAL DOSE) CF (Youth) 1.15E-04 (AVERAGE ANNUAL DOSE) CF: 3.23E-05 (CANCER RISK)

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RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL (PAGE TWO)
Indian Head, Maryland
EXPOSURE SCENARIO: RESIDENT ADULT AND CHILD
CALCULATE DOSES

CHEMICAL	C (MG/KG)	ABSORPTION FRACTION	ANNUAL ADULT DOSE (MG/KG/DAY)	ANNUAL CHILD DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)	HAZARD INDEX ADULT	HAZARD INDEX CHILD	INCREMENTAL CANCER RISK
								0.00E+00	0.00E+00	0.00E+00
Cadmium	14.8	0.001	1.30E-06	1.88E-06	4.87E-07	5.00E-05	0	2.60E-02	3.76E-02	0.00E+00
Iron	20600	0.001	1.41E-03	3.37E-03	6.67E-04	1.50E-02		9.41E-02	1.58E-01	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
TOTAL								1.14E-01	1.95E-01	0.00E+00

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Risk Assessment Spreadsheets

for Area 8

	A	B	D	E	F	G	H	I	J	K	L
1	Site Name	INDIAN HEAD									
2	Location	Area 6									
3	Date	2/9/96									
4											
5	**Chemical**	**Concentration (mg/L)**									
6											
7	Bis(2-ethylhexyl)phthalate	0.0108									
8	Iron (filtered)	0.987									
9	Lead (filtered)	0.0042									
10	Manganese (filtered)	0.64									
11	Ammonia	9.3									
12											
13											
14											
15											
16											
17											
18		These are the representative concentrations. They are the maximum concentrations detected in the medium at this site.									

RISK ASSESSMENT SPREADSHEET - SURFACE WATER EXPOSURES - INDUSTRIAL LAND USE

SITE NAME: INDIAN HEAD
LOCATION: Area 8
DATE: 2/9/96

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
TWO EXPOSURE SCENARIOS ARE POSSIBLE: DERMAL CONTACT WITH WATER AND ACCIDENTAL INGESTION. ONLY THE DERMAL CONTACT ROUTE IS EVALUATED FOR THE WORKER AND THE RESIDENT ADOLESCENT BECAUSE THE WORKER IS UNLIKELY TO INGEST THE SURFACE WATER DURING THE PERFORMANCE OF HIS DUTIES AND THE RESIDENT IS UNLIKELY TO INGEST SURFACE WATER WHILE WADING.

EXPOSURE SCENARIO: TYPICAL ADULT WORKER AND CONSTRUCTION WORKER

REFERENCE: EPA, DECEMBER 1989

INGESTION IEX = (C x CR x ET x EF x ED)/(BW x AT)

WHERE
C = SURFACE WATER CONCENTRATION (MG/L)
CR = CONTACT RATE (LITERS/HOUR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
AT = AVERAGING TIME (DAYS)

DERMAL CONTACT DEX = (C x SA x PC x ET x EF)/(BW x AT)

WHERE
C = SURFACE WATER CONCENTRATION (MG/L)
SA = SURFACE AREA AVAILABLE FOR CONTACT (Square Meters)
PC = DERMAL PERMEABILITY CONSTANT (L/M**2)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)

INPUT PARAMETERS

INGESTION

CR	[illegible]	AVERAGE ANNUAL DOSE	
ET	0	CONVERSION FACT	0.00E+00
EF	0		
ED	0	LIFETIME ANNUAL DOSE	
BW	70	CONVERSION FACT	0.00E+00
AT(NONCAR)	[illegible]		
AT(CAR)	25550		

DERMAL

SA	0.22	AVERAGE ANNUAL DOSE	
ET	[illegible]	CONVERSION FACT	2.07E-04
EF	24		
ED	25	LIFETIME ANNUAL DOSE	
BW	70	CONVERSION FACT	7.38E-05
AT(NONCAR)	9125		
AT(CAR)	25550		

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RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE TWO)

CALCULATE HAZARD INDICES (DERMAL)

CHEMICAL	CONCENTRATION (MG/L)	DERMAL PERMEABILITY CONSTANT	AVERAGE ANNUAL DOSE (MG/KG/DAY)	DERMAL REFERENCE DOSE (MG/KG/DAY)	HAZARD INDEX-DERMAL	TOTAL HAZARD INDEX
Bis(2-ethylhexyl)phthalate	0.0108	5.51E+00	1.32E-05	2.00E-03	6.60E-03	6.60E-03
Iron (filtered)	0.987	2.00E-02	4.08E-06	1.50E-02	2.72E-04	2.72E-04
Lead (filtered)	0.0042	6.00E-05	6.94E-11	0.00E+00	0.00E+00	0.00E+00
Manganese (filtered)	0.54	2.00E-02	2.65E-06	1.50E-04	1.76E-02	1.76E-02
Ammonia	9.3	2.00E-02	3.60E-05	0.00E+00	0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
TOTAL HAZARD INDEX					2.45E-02	2.45E-02

3

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE THREE)

CALCULATE INCREMENTAL CANCER RISK

CHEMICAL	LIFETIME AVERAGE DERMAL DOSE (MG/KG/DAY)	CSF - INGESTION (KG-DAY/MG)	CSF - DERMAL (KG-DAY/MG)	INCREMENTAL CANCER RISK DERMAL	TOTAL INCREMENTAL CANCER RISK
bis(2-ethylhexyl)phthalate	4.71E-06	1.40E-02	1.40E-02	6.60E-08	6.60E-08
Iron (filtered)	1.45E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lead (filtered)	2.48E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Manganese (filtered)	9.45E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonia	1.37E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
TOTAL RISK				6.60E-08	6.60E-08

H

	A	B	D	E	F	G	H	I	J	K
1	Site Name	INDIAN HEAD								
2	Location	Area B								
3	Date	2/9/96								
4										
5	Chemical	Concentration (mg/L)								
6										
7	Bis(2-ethylhexyl)phthalate	0.0108								
8	Beryllium	0.0011								
9	Iron	52								
10	Lead	0.0576								
11	Manganese	1.23								
12	Cyanide	0.47								
13	Ammonia	9.3								
14										
15										
16										
17		These are respresentative concentration. They are the maximum concentrations detected in the medium at this site.								

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RISK ASSESSMENT SPREADSHEET - SURFACE WATER EXPOSURES - INDUSTRIAL LAND USE

SITE NAME	INDIAN HEAD
LOCATION	Area 8
DATE	2/8/96

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET
TWO EXPOSURE SCENARIOS ARE POSSIBLE: DERMAL CONTACT WITH WATER AND ACCIDENTAL INGESTION. ONLY THE DERMAL CONTACT ROUTE IS EVALUATED FOR THE WORKER AND THE RESIDENT ADOLESCENT BECAUSE THE WORKER IS UNLIKELY TO INGEST THE SURFACE WATER DURING THE PERFORMANCE OF HIS DUTIES AND THE RESIDENT IS UNLIKELY TO INGEST SURFACE WATER WHILE WADING

EXPOSURE SCENARIO: TYPICAL ADULT WORKER AND CONSTRUCTION WORKER

REFERENCE: EPA, DECEMBER 1989

INGESTION: IEX = (C x CR x ET x EF x ED)/(BW x AT)

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
CR = CONTACT RATE (LITERS/HOUR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
AT = AVERAGING TIME (DAYS)

DERMAL CONTACT: DEX = (C x SA x PC x ET x EF)/(BW x AT)

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
SA = SURFACE AREA AVAILABLE FOR CONTACT (Square Meters)
PC = DERMAL PERMEABILITY CONSTANT (L/M**2)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)

INPUT PARAMETERS

INGESTION

CR	0	AVERAGE ANNUAL DOSE	
ET	0	CONVERSION FACT	0.00E+00
EF	0		
ED	0	LIFETIME ANNUAL DOSE	
BW	70	CONVERSION FACT	0.00E+00
AT(NONCAR)	0		
AT(CAR)	25550		

DERMAL

SA	2.27	AVERAGE ANNUAL DOSE	
ET	1	CONVERSION FACT	2.27E-04
EF	24		
ED	25	LIFETIME ANNUAL DOSE	
BW	70	CONVERSION FACT	7.38E-05
AT(NONCAR)	9125		
AT(CAR)	25550		

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RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE TWO)

CALCULATE HAZARD INDICES (DERMAL)

CHEMICAL	CONCENTRATION (MG/L)	DERMAL PERMEABILITY CONSTANT	AVERAGE ANNUAL DOSE (MG/KG/DAY)	DERMAL REFERENCE DOSE (MG/KG/DAY)	HAZARD INDEX-DERMAL	TOTAL HAZARD INDEX
Bis(2-ethylhexyl)phthalate	0.3108	5.91E+00	1.32E-05	2.20E-02	6.60E-04	6.60E-04
Beryllium	0.0011	2.00E-02	4.55E-09	5.00E-05	9.09E-05	9.09E-05
Iron	52	2.00E-02	2.15E-04	1.50E-02	1.43E-02	1.43E-02
Lead	0.0576	4.00E-06	9.52E-10	0.00E+00	0.00E+00	0.00E+00
Manganese	1.23	2.00E-02	5.08E-06	1.50E-04	3.39E-02	3.39E-02
Cyanide	0.47	5.21E-02	5.06E-06	2.00E-02	2.53E-04	2.53E-04
Ammonia	9.3	2.50E-02	3.84E-05	0.00E+00	0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
			0.00E+00		0.00E+00	0.00E+00
TOTAL HAZARD INDEX					4.92E-02	4.92E-02

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RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE THREE)

CALCULATE INCREMENTAL CANCER RISK

CHEMICAL	LIFETIME AVERAGE DERMAL DOSE (MG/KG/DAY)	CSF - INGESTION (KG-DAY/MG)	CSF - DERMAL (KG-DAY/MG)	INCREMENTAL CANCER RISK DERMAL	TOTAL INCREMENTAL CANCER RISK
Bis(2-ethylhexyl)phthalate	4.71E-06	1.40E-02	1.43E-02	5.60E-08	5.60E-08
Beryllium	1.92E-09	4.30E+00	4.30E+07	6.38E-07	6.38E-07
Iron	7.68E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lead	3.40E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Manganese	1.82E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cyanide	1.91E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Antimony	1.32E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
	0.00E+00			0.00E+00	0.00E+00
TOTAL RISK				7.64E-07	7.64E-07

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	A	B	D	E	F	G	H	I	J	K
1	Site Name	Indian Head, Maryland								
2	Location	Area 8								
3	Date	2/9/96								
4										
5	Chemical	Concentration (mg/Kg)								
6										
7	Benzo(a)pyrene	0.17								
8	Arsenic	5.50								
9										
10										
11										
12										
13										
14										
15										
16										
17		These are the representative concentrations. They are the maximum concentrations detected in this medium at this site.								

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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SEDIMENT - INDUSTRIAL LAND USE

SITE NAME:	Indian Head, Maryland
LOCATION:	Area 8
DATE:	2/9/94
RECEPTOR:	

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET
ASSUMPTIONS ARE OUTLINED BELOW

EXPOSURE SCENARIO: TYPICAL ADULT WORKER AND CONSTRUCTION WORKER

RELEVANT EQUATION: CR = (C x IR x FI x EF x ED)/(BW x AT x 1E6)

WHERE:

C = MEAN CONCENTRATION IN SEDIMENT SAMPLE (MG/KG)
IR = SEDIMENT INGESTION RATE (MG/EVENT)
EF = EXPOSURE FREQUENCY (EVENTS/YEAR)
FI = FRACTION FROM CONTAMINATED SOURCE
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
AT = AVERAGING TIME (DAYS)

ENTER INPUT PARAMETERS

TYPICAL ADULT WORKER

IR	50
EF	24
FI	1
ED	25
BW	70
AT(CAR)	25550
AT(NON)	9125

DETERMINE CONVERSION FACTORS:
ADULT

CF	4.70E-08	CF (Cancer)	1.68E-08

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SEDIMENT (PAGE TWO)
Indian Head, Maryland
Area 8
CALCULATE DOSES

CHEMICAL	C (MG/KG)	ADULT ANNUAL DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Benzo(a)pyrene	0.17	7.98E-09	2.85E-09	4.00E-02	7.30E+00
Arsenic	5.5	2.58E-07	9.23E-08	3.00E-04	1.50E+00
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		

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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SEDIMENT (PAGE THREE)
Indian Head, Maryland
Area 8
DETERMINING HAZARD INDICES AND CANCER RISK

CHEMICAL	HAZARD INDEX ADULT	INCREMENTAL CANCER RISK
Benzo(a)pyrene	2.00E-07	2.94E-08
Arsenic	8.61E-04	1.30E-07
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
TOTAL	8.61E-04	1.59E-07

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RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SEDIMENT - INDUSTRIAL LAND USE

SITE NAME: Indian Head, Maryland
LOCATION: Area II
DATE: 2/9/94
RECEPTOR:

EXPOSURE SCENARIO: TYPICAL ADULT WORKER AND CONSTRUCTION WORKER

RELEVANT EQUATION: DEX = (C x SA x AF x ABS x CF x ED)/(BW x AT x 1E6)

WHERE

C = CONCENTRATION IN SEDIMENT (MG/KG)			
SA1 = ADULT SKIN SURFACE AREA (SQ CM/DAY)			2300
AF = ADHERENCE FACTOR (MG/SQ CM)			1
ABS = ABSORPTION FRACTION	VOCS		0.1
(DECIMAL FRACTION)	SVAS/PESTICIDES		0.25
	PCBS		0.06
	METALS		0.001
EF = EXPOSURE FREQUENCY (DAYS/YEAR)			24
ED = ADULT EXPOSURE DURATION (YEARS)			25
BW = BODY WEIGHT ADULT (KG)			70
AT = AVERAGING TIME (DAYS), NONCARCINOGENS (ADULT)			9125
AT = AVERAGING TIME (DAYS), CARCINOGENS			25550

DETERMINE CONVERSION FACTORS

ADULT

CF (Noncancer)	2.07E-06 (AVERAGE ANNUAL DOSE)	CF (Cancer)	7.38E-07 (CANCER RISK)

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RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SEDIMENT (PAGE TWO)
Indian Head, Maryland
EXPOSURE SCENARIO: TYPICAL ADULT WORKER AND CONSTRUCTION WORKER
CALCULATE DOSES

CHEMICAL	C (MG/KG)	ABSORPTION FRACTION	ANNUAL ADULT DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)	HAZARD INDEX ADULT	INCREMENTAL CANCER RISK
Benzo(a)pyrene	0.17	0.35	1.75E-08	6.27E-09	3.64E-02	8.07E+00	4.83E-07	5.03E-08
Arsenic	5.5	0.001	1.14E-09	4.07E-10	2.94E-04	1.53E+00	3.87E-05	6.21E-09
			0.00E+00	0.00E+00			0.00E+00	0.00E+00
			0.00E+00	0.00E+00			0.00E+00	0.00E+00
			0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
							0.00E+00	0.00E+00
TOTAL							3.91E-05	5.65E-08

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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SEDIMENT - RESIDENTIAL LAND USE

SITE NAME:	Indian Head, Maryland
LOCATION:	Area II
DATE:	2/5/96

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH PICA INGESTION ARE CONSIDERED
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO: RESIDENT ADULT AND CHILD

RELEVANT EQUATION: IEX = (C x IR x Fi x EF x ED)/(BW x AT x 1E6)

WHERE:
C = MEAN CONCENTRATION IN SEDIMENT SAMPLE (MG/KG)
IR = SEDIMENT INGESTION RATE (MG/EVENT)
EF = EXPOSURE FREQUENCY (EVENTS/YEAR)
Fi = FRACTION FROM CONTAMINATED SOURCE
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
AT = AVERAGING TIME (DAYS)

ENTER INPUT PARAMETERS

ADULT		YOUTH	
IR	50	IR	200
EF	24	EF	24
Fi	1	Fi	1
ED	25	ED	6
BW	70	BW	15
AT(CAR)	25550	AT(CAR)	25550
AT(NON)	9125	AT(NON)	2190

DETERMINE CONVERSION FACTORS:

ADULT:
CF 4.70E-08 (AVG ANNUAL DOSE)

YOUTH
CF 4.77E-07 (AVG ANNUAL DOSE)

ADULT/YOUTH (CANCER RISK)
CF 9.19E-08

RISK ASSESSMENT SPREADSHEET : INCIDENTAL INGESTION OF SEDIMENT (PAGE TWO)
Indian Head, Maryland
Area F
CALCULATE DOSES

CHEMICAL	C (MG/KG)	YOUTH ANNUAL DOSE (MG/KG/DAY)	ADULT ANNUAL DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG DAY/MG)
Benzo(a)pyrene	0.17	1.49E-07	7.95E-08	1.56E-08	4.00E-02	7.30E+00
Arsenic	5.5	4.82E-06	2.58E-07	5.06E-07	3.00E-04	1.50E+00
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		

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RISK ASSESSMENT SP... ...DSHEET - INCIDENTAL INGESTION OF SEDIMENT (PAGE THREE)
Indian Head, Maryland
Area 8
DETERMINE HAZARD INDICES AND CANCER RISK

CHEMICAL	HAZARD INDEX YOUTH	HAZARD INDEX ADULT	INCREMENTAL CANCER RISK
Benzo(a)pyrene	3.73E-06	2.00E-07	1.14E-07
Arsenic	1.51E-02	5.51E-04	7.58E-07
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
TOTAL	1.51E-02	5.51E-04	8.72E-07

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RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SEDIMENT - RESIDENTIAL LAND USE

SITE NAME: Indian Head, Maryland
LOCATION: Area I
DATE: 2/99

EXPOSURE SCENARIO: RESIDENT ADULT AND CHILD

RELEVANT EQUATION: DEI = (C x SA x AF x ABS x EF x ED)/(BW x AT x 1E6)

WHERE:

C = CONCENTRATION IN SEDIMENT (MG/KG)			
SA1 = YOUTH SKIN SURFACE AREA (SQ CM/DAY)			1800
SA2 = ADULT SKIN SURFACE AREA (SQ CM/DAY)			5000
SAi = ADJUSTED SURFACE AREA (SQ CM/DAY)			2350
AF = ADHERENCE FACTOR (MG/SQ CM)			1
ABS = ABSORPTION FRACTION	(DECIMAL FRACTION)	VOCS	0.1
		SVOCS/PESTICIDES	0.05
		PCBS	0.03
		METALS	0.001
EF = EXPOSURE FREQUENCY (DAYS/YEAR)			24
ED1 = YOUTH EXPOSURE DURATION (YEARS)			8
ED2 = ADULT EXPOSURE DURATION (YEARS)			24
BW1 = BODY WEIGHT ADOLESCENT (KG)			15
BW2 = BODY WEIGHT ADULT (KG)			70
AT1 = AVERAGING TIME (DAYS), NONCARCINOGENS (YOUTH)			2190
AT2 = AVERAGING TIME (DAYS), NONCARCINOGENS (ADULT)			8760
AT3 = AVERAGING TIME (DAYS), CARCINOGENS			25550

DETERMINE CONVERSION FACTORS

ADULT/YOUTH

CF (ADULT) 4.73E-08 (AVERAGE ANNUAL DOSE) CF(Youth) 7.39E-08 (AVERAGE ANNUAL DOSE) CF 2.91E-08 (CANCER RISK)

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RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL (PAGE TWO)
Indian Head, Maryland
EXPOSURE SCENARIO: RESIDENT ADULT AND CHILD
CALCULATE DOSES

CHEMICAL	C (MG/KG)	ABSORPTION FRACTION	ANNUAL ADULT DOSE (MG/KG/DAY)	ANNUAL CHILD DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)	HAZARD INDEX ADULT	HAZARD INDEX CHILD	INCREMENTAL CANCER RISK
Benzo(a)pyrene	3.17	0.001	7.88E-10	1.34E-09	3.51E-10	[illegible]	1.53E+00	7.77E-08	4.96E-08	5.38E-10
Arsenic	3.3	0.001	2.58E-08	4.34E-08	1.14E-08	3.00E-04	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[illegible]
		[illegible]	0.00E+00	0.00E+00	0.00E+00	4.20E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		[illegible]	[illegible]	[illegible]	[illegible]	7.00E-21	[illegible]	[illegible]	[illegible]	[illegible]
			[illegible]	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]
			0.00E+00	[illegible]	[illegible]			0.00E+00	[illegible]	[illegible]
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	[illegible]
			0.00E+00	0.00E+00	[illegible]			0.00E+00	0.00E+00	0.00E+00
			[illegible]	[illegible]	[illegible]			[illegible]	[illegible]	0.00E+00
			[illegible]	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	[illegible]
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	[illegible]
			[illegible]	0.00E+00	[illegible]			0.00E+00	0.00E+00	[illegible]
			[illegible]	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]
			[illegible]	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]
			0.00E+00	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]
TOTAL								[illegible]	[illegible]	[illegible]

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	A	B	D	E	F	G	H	I	J	K
1	Site Name	Indian Head, Maryland								
2	Location	Area 8 (SWMU 25)								
3	Date	2/9/95								
4										
5	**Chemical**	**Concentration (mg/Kg)**								
6										
7	Arsenic	9.6								
8	Beryllium	0.84								
9	Iron	34900.00								
10										
11										
12										
13										
14										
15										
16										
17										
18		These are the respresentative concentrations. They are the 95% upper confidence limit of the mean soil concentrations.								

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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL - INDUSTRIAL LAND USE

SITE NAME:	Indian Head, Maryland
LOCATION:	Area 8 (SWMU 25)
DATE:	2/8/99
RECEPTOR:	

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET
ASSUMPTIONS ARE OUTLINED BELOW

EXPOSURE SCENARIO: TYPICAL ADULT WORKER AND CONSTRUCTION WORKER

RELEVANT EQUATION: IEX = (C x IR x FI x EF x ED)/(BW x AT x 10^6)

WHERE:
C = MEAN CONCENTRATION IN SOIL SAMPLE (MG/KG)
IR = SOIL INGESTION RATE (MG/EVENT)
EF = EXPOSURE FREQUENCY (EVENTS/YEAR)
FI = FRACTION FROM CONTAMINATED SOURCE
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
AT = AVERAGING TIME (DAYS)

ENTER INPUT PARAMETERS

TYPICAL ADULT WORKER

IR	100
EF	250
FI	0.5
ED	25
BW	70
AT(CAR)	25550
AT(NON)	9125

DETERMINE CONVERSION FACTORS
ADULT
CF 4.89E-07 CF (Cancer) 1.75E-07

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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)
Indian Head, Maryland
Area I (SWMU 25)
CALCULATE DOSES

CHEMICAL	C (MG/KG)	ADULT ANNUAL DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Arsenic	9.5	4.70E-06	1.68E-06	3.00E-04	1.50E+00
Beryllium	0.84	4.11E-07	1.47E-07	5.00E-03	4.30E+00
Iron	14900	4.71E-02	[illegible]	1.00E-01	0.00E+00
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		
		0.00E+00	0.00E+00		

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RISK ASSESSMENT SPR[illegible]EET - INCIDENTAL INGESTION OF SOIL (PAGE THREE)
Indian Head, Maryland
Area # (SWMU 25)
DETERMINE HAZARD INDICES AND CANCER RISK

CHEMICAL	HAZARD INDEX ADULT	INCREMENTAL CANCER RISK
Arsenic	1.57E-02	2.52E-06
Beryllium	8.22E-05	6.31E-07
Iron	5.98E-02	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
	0.00E+00	0.00E+00
TOTAL	7.57E-02	3.15E-06

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RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL - INDUSTRIAL LAND USE

SITE NAME:	Indian Head, Maryland
LOCATION:	Area II (SWMU 29)
DATE:	[illegible]
RECEPTOR:	

EXPOSURE SCENARIO: TYPICAL ADULT WORKER AND CONSTRUCTION WORKER

RELEVANT EQUATION: DEA = (C x SA x AF x ABS x EF x ED)/(BW x AT) x 1E-6

WHERE

C = CONCENTRATION IN SOIL (MG/KG)		
SA1 = ADULT SKIN SURFACE AREA (SQ CM/DAY)		3450
AF = ADHERENCE FACTOR (MG/SQ CM)		1
ABS = ABSORPTION FRACTION (DECIMAL FRACTION)	VOCS	0.1
	SVOCS/PESTICIDES	0.05
	PCBS	0.03
	METALS	0.001
EF = EXPOSURE FREQUENCY (DAYS/YEAR)		250
ED = ADULT EXPOSURE DURATION (YEARS)		25
BW = BODY WEIGHT ADULT (KG)		70
AT = AVERAGING TIME (DAYS), NONCARCINOGENS (ADULT)		9125
AT = AVERAGING TIME (DAYS), CARCINOGENS		25550

DETERMINE CONVERSION FACTORS

ADULT

CF (Noncancer) 3.38E-05 (AVERAGE ANNUAL DOSE) CF (Cancer) 1.21E-05 (CANCER RISK)

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RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL (PAGE TWO)
Indian Head, Maryland
EXPOSURE SCENARIO: TYPICAL ADULT WORKER AND CONSTRUCTION WORKER
CALCULATE DOSES

CHEMICAL	C (MG/KG)	ABSORPTION FRACTION	ANNUAL ADULT DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)	HAZARD INDEX ADULT	INCREMENTAL CANCER RISK
Arsenic	2.6	0.001	3.24E-07	1.16E-07	2.94E-04	1.53E+00	1.10E-03	1.77E-07
Beryllium	0.84	0.001	2.84E-08	1.01E-08	5.00E-03	4.30E+02	5.67E-06	4.35E-06
Iron	34500	0.001	1.18E-03	4.21E-04	1.50E-02	0.00E+00	7.85E-02	0.00E+00
		0.001	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		0.001	0.00E+00	0.00E+00			0.00E+00	0.00E+00
			0.00E+00	0.00E+00			0.00E+00	0.00E+00
			0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
		1	0.00E+00	0.00E+00			0.00E+00	0.00E+00
TOTAL							7.97E-02	4.53E-06

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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL - RESIDENTIAL LAND USE

SITE NAME:	Indian Head, Maryland
LOCATION:	Area 8 (SWMU 25)
DATE:	2/9/96

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET
EXPOSURES THROUGH PICA INGESTION ARE CONSIDERED
ASSUMPTIONS ARE OUTLINED BELOW

EXPOSURE SCENARIO: RESIDENT ADULT AND CHILD

RELEVANT EQUATION: IEX = (C x IR x FI x EF x ED)/(BW x AT x 1E6)

WHERE:
C = MEAN CONCENTRATION IN SOIL SAMPLE (MG/KG)
IR = SOIL INGESTION RATE (MG/EVENT)
EF = EXPOSURE FREQUENCY (EVENTS/YEAR)
FI = FRACTION FROM CONTAMINATED SOURCE
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
AT = AVERAGING TIME (DAYS)

ENTER INPUT PARAMETERS

ADULT		YOUTH	
IR	100	IR	200
EF	350	EF	350
FI	1	FI	1
ED	24	ED	6
BW	70	BW	15
AT(CAR)	25550	AT(CAR)	25550
AT(NON)	8760	AT(NON)	2190

DETERMINE CONVERSION FACTORS

ADULT			YOUTH			ADULT/YOUTH (CANCER RISK)	
CF	1.37E-06	(AVG ANNUAL DOSE)	CF	#######	(AVG ANNUAL DOSE)	CF	1.57E-06

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RISK ASSESSMENT SHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)
Indian Head, Maryland
Area I (SWMU 25)
CALCULATE DOSES

CHEMICAL	C (MG/KG)	YOUTH ANNUAL DOSE (MG/KG/DAY)	ADULT ANNUAL DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Arsenic	9.6	1.23E-04	1.32E-05	1.50E-05	3.00E-04	1.50E+00
Beryllium	0.24	1.07E-05	1.15E-06	1.32E-06	5.00E-03	4.30E+00
Iron	34900	4.46E-01	4.79E-02	5.46E-02	3.00E-01	0.00E+00
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		
		0.00E+00	0.00E+00	0.00E+00		

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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE THREE)
Indian Head, Maryland
Area 8 (SWMU 25)
DETERMINE HAZARD INDICES AND CANCER RISK

CHEMICAL	HAZARD INDEX YOUTH	HAZARD INDEX ADULT	INCREMENTAL CANCER RISK
Arsenic	4.09E-01	4.35E-02	2.25E-05
Beryllium	2.15E-03	2.30E-04	5.65E-06
Iron	1.42E+00	1.52E-01	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00
TOTAL	1.98E+00	2.03E-01	2.82E-05

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RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL - RESIDENTIAL LAND USE

SITE NAME: Indian Head, Maryland
LOCATION: Area E (SWMU 25)
DATE: 2/9/94

EXPOSURE SCENARIO : RESIDENT ADULT AND CHILD

RELEVANT EQUATION: DE = (C x SA x AF x ABS x EF x ED)/(BW x AT x 1E6)

WHERE:

C = CONCENTRATION IN SOIL (MG/KG)			
SA1 = YOUTH SKIN SURFACE AREA (SQ CM/DAY)			1800
SA2 = ADULT SKIN SURFACE AREA (SQ CM/DAY)			5000
SAa = ADJUSTED SURFACE AREA (SQ CM/DAY)			3434
AF = ADHERENCE FACTOR (MG/SQ CM)			1
ABS = ABSORPTION FRACTION		VOCS	0.1
(DERMAL FRACTION)		SVOCS/PESTICIDES	0.25
		PCBS	0.03
		METALS	0.001
EF = EXPOSURE FREQUENCY (DAYS/YEAR)			350
ED1 = YOUTH EXPOSURE DURATION (YEARS)			6
ED2 = ADULT EXPOSURE DURATION (YEARS)			24
BW1 = BODY WEIGHT ADOLESCENT (KG)			15
BW2 = BODY WEIGHT ADULT (KG)			70
AT1 = AVERAGING TIME (DAYS), NONCARCINOGENS (YOUTH)			2190
AT2 = AVERAGING TIME (DAYS), NONCARCINOGENS (ADULT)			8760
AT3 = AVERAGING TIME (DAYS), CARCINOGENS			25550

DETERMINE CONVERSION FACTORS

ADULT/YOUTH
CF (ADULT) [illegible]E-05 (AVERAGE ANNUAL DOSE) CF (Youth) 1.15E-04 (AVERAGE ANNUAL DOSE) CF 3.78E-05 (CANCER RISK)

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RISK ASSESSMENT SPREADSHEET : DIRECT DERMAL CONTACT WITH SOIL (PAGE TWO)
Indian Head, Maryland
EXPOSURE SCENARIO: RESIDENT ADULT AND CHILD
CALCULATE DOSES

CHEMICAL	C (MG/KG)	ABSORPTION FRACTION	ANNUAL ADULT DOSE (MG/KG/DAY)	ANNUAL CHILD DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)	HAZARD INDEX ADULT	HAZARD INDEX CHILD	INCREMENTAL CANCER RISK
Arsenic	4.8	0.001	4.58E-07	1.10E-06	3.20E-07	2.44E-04	1.13E+00	2.74E-03	3.79E-03	4.90E-07
Beryllium	0.64	0.001	5.75E-08	8.87E-08	3.86E-08	3.00E-05	4.30E+02	1.15E-03	1.63E-03	1.27E-06
Iron	34600	0.001	2.38E-03	4.03E-03	1.15E-03	1.10E-02	0.00E+00	1.59E-01	2.68E-01	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
			0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00
TOTAL								1.63E-01	2.73E-01	1.25E-06

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