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PROJECT SPECIFIC REMEDIAL INVESTIGATION WORK PLAN FOR INSTALLATION RESTORATION PROGRAM NSWC INDIAN HEAD MD

4/1/1997

BROWN AND ROOT ENVIRONMENTAL

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PROJECT SPECIFIC
REMEDIAL INVESTIGATION (RI)
WORK PLAN
FOR
INSTALLATION RESTORATION PROGRAM
INDIAN HEAD DIVISION, NAVAL SURFACE WARFARE CENTER
INDIAN HEAD, MARYLAND

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Submitted to:
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Environmental Branch Code 181
Naval Facilities Engineering Command
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LIST OF ACRONYMS

ACM	Asbestos Containing Material
ARARs	Applicable and Relevant or Appropriate Requirements
ASTM	American Society for Testing and Materials
CAP	Corrective Action Permit
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act of 1980
CLEAN	Comprehensive Long-Term Environmental Action Navy
COC	Chain of Custody
CRQL	Contract Required Quantitation Limits
CTO	Contract Task Order
DERA	Defense Environmental Restoration Account
DOD	Department of Defense
EE/CA	Engineering Evaluation/Cost Analysis
EOD	Explosive Ordnance Disposal
EODS	Explosive Ordnance Disposal School
EPTox	Extraction Procedure Toxicity
FDWS	Federal Drinking Water Standards
FFA	Federal Facilities Agreement
FOL	Field Operations Leader
FSAP	Field Sampling and Analysis Plan
ft AMSL	Feet above mean sea level
GC/FID	Gas Chromatograph/flame ionization detection
HASP	Health and Safety Plan
IAS	Initial Assessment Study
IDW	Investigative Derived Wastes
IED	Improvised Explosive Devices
IHDIV-NSWC	Indian Head Division, Naval Surface Warfare Center
IOD	Inert Ordnance Disposal
IR	Installation Restoration
IW	Industrial Waste water
IWTP	Industrial Wastewater Treatment Plant
MCL	Maximum Contaminant Levels
NAVEODTECHDIV	Naval Explosive Ordnance Disposal Technology Division

NAVSCOLEOD	Naval School Explosive Ordnance Disposal
NC	Nitrocellulose
NEESA	Naval Energy and Environmental Support Activity
NG	Nitroglycerin
NPL	National Priorities List
NQ	Nitroquanidine
OVA	Organic vapor analyzer
PA	Preliminary Assessment
PA/SI	Preliminary Assessment/Site Inspection
PBX	Plastic Bonded Explosives
PCBs	Polychlorinated biphenyls
PCE	Tetrachloroethene
PETN	Pentaerythritol tetranitrate
PID	Photo-ionization detector
PSPAS	Point Source Pollution Abatement Study
PVC	Polyvinyl chloride
PW	Public Works
QA/QC	Quality Assurance/Quality Control
RAC	Removal Action Contractor
RBCs	Risk-Based Concentrations
RCRA	Resource Conservation and Recovery Act
RD/RA	Remedial Design/Remedial Action
RDX	Cyclonite; trimethylenetrinitramine
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
Semi-VOCs	Semivolatile organic compounds
SMP	Site Management Plan
SOP	Standard operating procedure
SSP	Site Screening Process
STP	Sewage Treatment Plant
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	United Soil Classification System
USEPA	United States Environmental Protection Agency
VI/RFI	Verification Investigation/RCRA Facility Investigation
VOCs	Volatile Organic Compounds

ORGANIC QUALIFIERS

U - The flag identifies compounds that were analyzed but not detected.

J - This flag indicates an estimated value. It is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed, or when the mass spectral data indicate the presence of a compound that meets the identification criteria but the result is less than the sample quantitation limit but greater than zero.

N - This flag indicates presumptive evidence of a compound. It is only used for tentatively identified compounds, where the identification is based on a mass spectral library search. it is applied to all TIC results.

P - This flag is used for pesticide/Arochlor target analyte when there is greater than 25% difference for detected concentrations between the two GC columns. The lower of the two values is reported on Form I and flagged with a "P".

C - This flag applies to pesticide results where the identification has been confirmed by GC/MS.

B - This flag is used when the analyte is found in the associated blank as well as in the sample. it indicates possible/probably blank contamination and warns the data user to take appropriate action. The flag is used for a TIC as well as for a positively identified target compound.

E - This flag identifies compounds whose concentrations exceed the calibration range of the instrument for that specific analysis. If one or more compounds have a response greater than full scale, then the sample or extract will be diluted and reanalyzed. All such compounds with a response greater than full scale will have the concentration flagged with an "E" on the Form I for the original analysis. If the dilution of the extract causes any compounds identified in the first analysis to be below the calibration range in the second analysis, the results of both analyses will be reported on separate Form I's. The Form I for the diluted sample will have the "DL" or "REDL" suffix appended to the sample number.

D - This flag identifies all compounds in an analysis at a secondary dilution factor. If a sample or extract is reanalyzed at a higher dilution factor, the "DL" or "REDL" suffix is appended to the sample number on the Form I for the diluted sample, and at concentration values reported on the Form I are flagged with a "D".

A - This flag indicates that a TIC is a suspected alder-condensation product.

X - This flag indicates a laboratory-defined flag which will be fully described in the SDG Narrative and attached to the Sample Data Summary Package.

INORGANIC QUALIFIERS

C (CONCENTRATION) QUALIFIERS

U - The analyte was analyzed for but not detected at or above the IDL.

B - The reported value is less than the Contract Required Detection Limit (CRDL) but greater than or equal to the Instrument Detection Limit (IDL).

Q QUALIFIERS

E - The reported value is estimated because of the presence of interference.

M - Duplicate injection precision not met.

N - Pre-digestion spike recovery not within control limits.

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

W - Post-digestion spike is out of control limits (85-115%), while sample absorbance is less than 50% of spike absorbance.

* - Pre-digestion duplicate analysis not within control limits.

+ - Correlation coefficient for the MSA is less than 0.995.

M (METHOD) QUALIFIERS

P - ICP analysis

F - Graphite Furnace AA analysis

CV - Manual Cold Vapor AA analysis

AS - Semi-Automated Spectrophotometric (Technicon)

EXECUTIVE SUMMARY

This Project Specific Remedial Investigation Work Plan (Project Specific Work Plan) for the Indian Head Division, Naval Surface Warfare Center (Station), Indian Head, Maryland, was prepared in response to Contract Task Order (CTO) 0245, under the Comprehensive Long-term Environmental Action Navy (CLEAN), contract number N62472-90-D-1298. The purpose of this Work Plan is to present site-specific information regarding 16 Installation Restoration (IR) sites on the Station.

The specific sites covered by this Work Plan are listed in Table ES-1. The table includes a brief indication of the work planned for each site including the quantities of the various types of samples to be collected.

Based in the results of previous sampling, no further sampling is proposed for Sites 46 and 48. Samples of various types are planned for all of the other 14 sites. Overall, the planned field investigations include the installation of 5 monitoring wells and the collection of 58 groundwater samples. In total, 41 surface soil samples and 9 subsurface soil samples will be collected from 11 of the 16 sites. Eighteen surface water samples, and 36 sediment samples are planned for collection from 9 of the 16 sites. Plans for Site 54 (Building 101) and Site 55 (Building 102) call for the collection of a total of 48 samples of building materials including samples of bulk building materials and wipe samples of building surfaces.

TABLE ES-1

EXECUTIVE SUMMARY
INDIAN HEAD, MARYLAND
PAGE 1 OF 2

Site Name	Work Plan Summary	Surface Soil Samples	Subsurface Soil Boring Samples	New Wells	Ground water Sample	Surface Water Samples	Sediment Samples	Other Samples[1]	Ecological Risk Assessment
Site 12 - Town Gut Landfill	Limited past investigation adjacent to site. Conduct a through investigaton of surface soils, sediments, subsurface soils, surface water,a nd groundwater.	5	—	—	6	6	10		Yes
Site 39 - Organics Plant	Further evaluate the outfall and Mattawoman Creek Sediments.	—	—	—	—	—	8		Yes
Site 41 - Scrap Yard	Extensively investigated in the past. Evaluate potential contaminant transport to Mattawoman Creek.	9	—	—	13	6	*		Yes
Site 42 - Olson Road Landfill	Extensively investigated in the past. Evaluate surface water and sediment contact pathway and transport off site. Conduct additional round of groundwater sampling.	3	—	1	24	4	6		Yes
Site 43 - Toluene Disposal Site	Soil and soil gas sampling did not indicate contamination above the screening levels. Evaluate groundwater.	—	—	—	3	—	—		No
Site 44 - Soak Out Area	Soil contamination concentrations do not exceed the screening levels. Evaluate groundwater.	4	—	—	3	1	—		No
Site 45 - Abandoned Drums	Soil contamination concentrations do not exceed the screening levels. Evaluate groundwater.	2	—	—	3	1	—		Yes[3]
Site 46 - Cadmium Sandblast Grit Area	No sampling is proposed.	—	—	—	—	—	—		No
Site 47 - Mecuric Nitrate Disposal Area	Additional surface soil sampling is proposed to determine the horizontal extent on contamination and groundwater will be evaluated.	10	—	4	4	—	4		Yes
Site 48 - NG Plant Disposal Area	No sampling is proposed.	—	3	—	2	—	—		No
Site 49 - Chemical Disposal Pit	Additional soil samples proposed to evaluate extent of contamination. Evaluate groundwater.	1	—	—	—	—	3		No
Site 50 - Bldg. 103 Crawl Space	Evaluate surface soils and groundwater.	—	6	—	—	—	—		No

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TABLE ES-1

EXECUTIVE SUMMARY
INDIAN HEAD, MARYLAND
PAGE 2 OF 2

Site Name	Work Plan Summary	Surface Soil Samples	Subsurface Soil Boring Samples	New Wells	Ground water Sample	Surface Water Samples	Sediment Samples	Other Samples[1]	Ecological Risk Assessment
Site 53 - Mercury Contaminated Sewer System	The sewer system will be evaluated to determine layout and condition. Soils samples will be collected and groundwater will be evaluated.	—	—	—	—	—	—		No
Site 54-Building 101	Sample building materials to further evaluate the area.	3	—	—	—	—	—	19	No
Site 55-Building 102	Sample building materials to further evaluate the area.	4	—	—	—	—	—	29	No
Site 56 - IW87 - Lead Pipe Outfall	The post removal action conditions will be evaluated by collecting sediment samples downgradient of the outfall.	—	—	—	3	—	5		Yes

* Included with Site 39 samples.
1 Includes bulk material, wipe, concrete core samples.

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1.0 INTRODUCTION

This Project Specific Remedial Investigation Work Plan (Project Specific Work Plan) for the Indian Head Division, Naval Surface Warfare Center (Station), Indian Head, Maryland, was prepared in response to Contract Task Order (CTO) 0245, under the Comprehensive Long-term Environmental Action Navy (CLEAN), contract number N62472-90-D-1298. The purpose of this work plan is to present site-specific information regarding 16 Installation Restoration (IR) sites.

This Project Specific Work Plan is a supplement to the following master planning documents:

- Master Work Plan (Master WP)
- Standard Operating Procedures (SOPs)
- Master Quality Assurance Project Plan (Master QAPP)
- Health and Safety Guidance Document

The master planning documents provide the methods and procedures that will be used to perform environmental investigation work proposed at the 16 sites in this Project Specific Work Plan. The objective of this Work Plan is to present historical information regarding each site, evaluate that information, determine the need for further investigation, and propose a plan for further investigation where needed. The specific objective for an individual site is dependent on the work previously conducted at that site. Depending on the results of previous investigations, the site-specific objective in this document may be limited to verifying the presence or absence of contamination, or it may be to define the extent of contamination and evaluate the need for remediation.

1.1 STATION DESCRIPTION

The station is a military facility consisting of the main area on the Cornwallis Neck Peninsula and the Stump Neck Annex. The main area of the facility contains approximately 2,500 acres. Slightly less than 1,000 additional acres are located across Mattawoman Creek at the Stump Neck Annex. The station is located in northwestern Charles County, Maryland, approximately 25 miles southwest of Washington, D.C. The main area is bounded by the Potomac River to the northwest, west, and south, Mattawoman Creek to the south and east, and the town of Indian Head to the northeast (Figure 1-1). Master Work Plan Section 2.0, Background Information, provides a more complete description of the Station.

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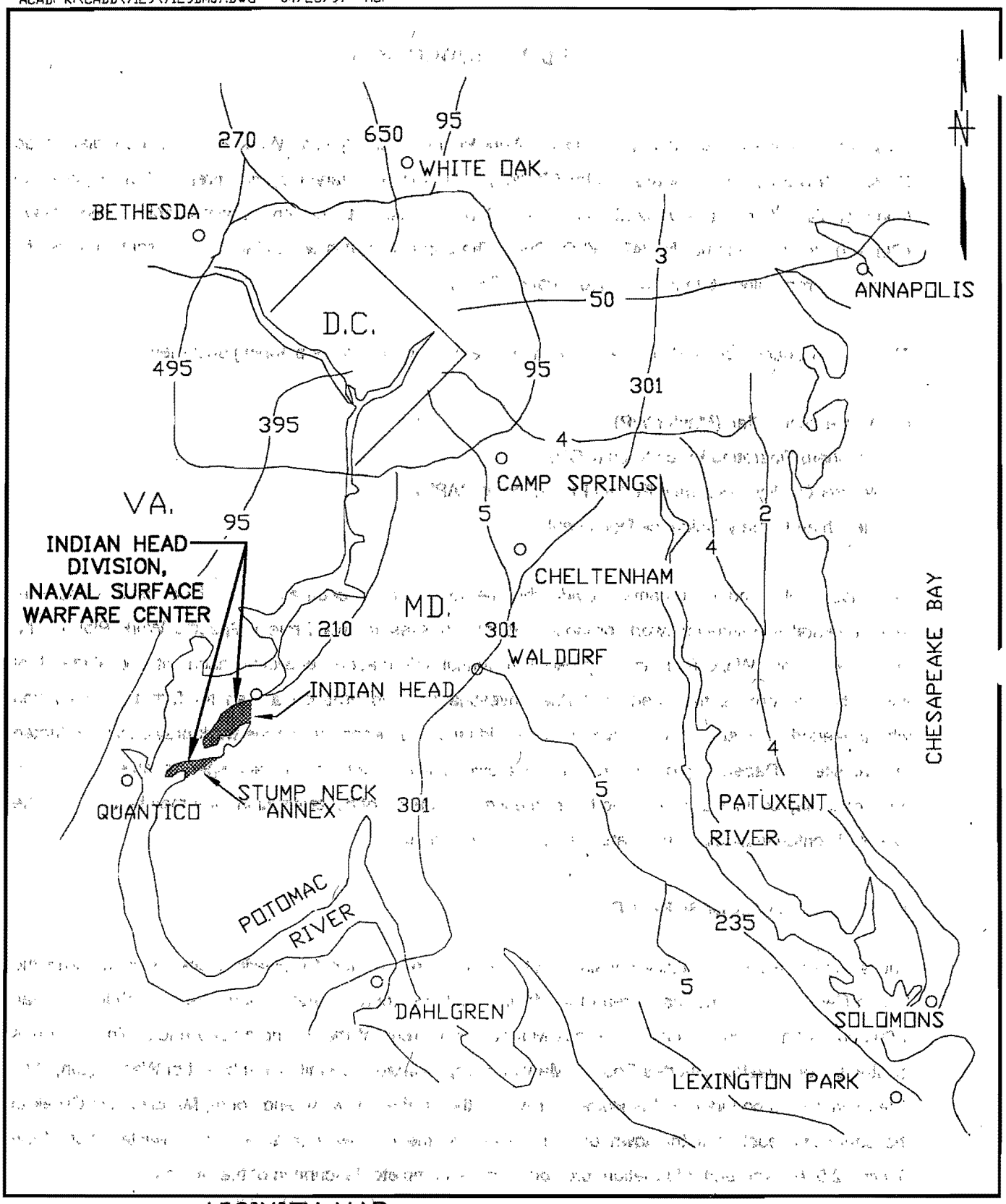

VICINITY MAP
INDIAN HEAD DIVISION NSWC
INDIAN HEAD, MARYLAND

FIGURE 1-1

Brown & Root Environmental

Only the mainside (Cornwallis Neck Peninsula) is on the National Priorities List (NPL). The two tracts of land are separated by the Mattawoman Creek (noncontiguous), have separate United States Environmental Protection Agency (USEPA) identification numbers and perform dissimilar operations. Therefore, only the mainside will be covered by this document. Investigation of the Stump Neck Annex is being conducted through a Resource Conservation and Recovery Act (RCRA) Corrective Action.

1.2 DOCUMENT ORGANIZATION

Sixteen sites are addressed in this Project Specific Work Plan. Sections 3 through 18 contain site-specific information on the 16 specific sites addressed in this work plan. Each site is contained in a separate section and consists of background information and a site description; a summary of previous environmental investigations performed at the site; data assessment and investigative scoping and a site-specific work plan summary.

1.3 PREVIOUS INVESTIGATION AND EVALUATION

In June 1982, Naval Energy and Environment Support Activity (NEESA) conducted an Initial Assessment Study (IAS). Submitted in May of 1983, the report evaluated the various sites at the Station to determine if a potential threat to human health or the environment existed. The report identified five sites (Sites 5, 6, 8, 12, and 25) as exhibiting a potential threat. A NACIP Confirmation Study was conducted at three of these sites (Sites 5, 8, and 12) and was published in September 1985 by CH2M Hill. Removal Actions were subsequently conducted at Sites 5 and 8. Site 12 is in need of further investigation.

A supplemental Preliminary Assessment (PA) Report was prepared by NEESA in January 1992. The report evaluated an additional 17 sites (Sites 39 to 55). All but two sites (Sites 51 and 52) were recommended for further work. As a follow-up to the supplemental PA, a Site Inspection (SI) was conducted on Sites 39 through 50, and Sites 53, 54, and 55 in two phases. Phase I focused in Site 42, Olson Landfill. Phase II focused on the remainder of the sites. Based on the results of the SI all the sites were recommended for further study.

A Hazardous Ranking System (HRS) Final Scoring report was conducted and submitted by Ensafe/Allen & Hoshall on April 1, 1994. The HRS Report identified the Activity as scoring 64.41, which is above the 28.5 cut-off score. As a result, the facility became a candidate for the NPL.

The data from the Site Inspection Report were entered into the Brown & Root Environmental (B&R Environmental) GIS database and compared to USEPA Region III screening levels. The screening levels

consist of Risk Based Concentrations (RBCs) and Soil Screening Levels (SSLs) published by USEPA Region III (USEPA, 1995a). Five of the sixteen sites were qualitatively determined to be potentially ecologically sensitive and the data for those sites were additionally evaluated against the USEPA Region III BTAG (USEPA, 1995b) screening levels for ecological risk evaluation. Table 1-1 shows the USEPA screening concentrations for all analytes analyzed for during the conduct of the Site Inspection. Contaminant concentrations that exceeded these screening levels during previous sampling activities have been indicated on a figure in each of the respective sites.

1.4 STATION WATER SHEDS

Within a given watershed, upgradient sites will sometimes contribute contamination to a downgradient site. It is therefore important to know which sites are located within a given watershed. Figure 1-2 provides a map depicting the various water sheds on the Station and the location of the sites addressed within this document. Sites 39, 41, 42, and 43 are all in their own water shed and receive no contaminant contributions from upgradient sites. Sites 44 and 45 are located together with Site 44 being downgradient of Site 45. The largest water shed on the Station contains five sites which are all addressed in this work plan. All five of those sites flow to the pond known as the Site 8 Pond. Sites 46 and 47 are located on a topographically high location and drain past Site 48 (through Site 8, which was previously remediated) through Site 56 to the Pond which is adjacent to Site 12. The remediary sites (49, 50, 53, 54, and 55) are all located close together in the same water shed area.

1.5 WORK PLAN SUMMARY

The location of 16 sites addressed by this Work Plan are shown on Figure 1-2 and the proposed activities are summarized on Table 1-2. A summary of previous investigations performed at the sites is also included on the table. As shown on the table, additional environmental investigative work is proposed for 14 sites.

1.6 DATA QUALITY LEVEL

Data will be analyzed in accordance with the specifications identified in the Master Quality Assurance Project Plan (Master QAPP).

TABLE 1-1

SCREENING LEVELS
INDIAN HEAD, MARYLAND
PAGE 1 OF 6

PARAMETER	FRACTION	USEPA REGION III			
		RISK-BASED CONCENTRATIONS (RBCs) (1)		BTAG SCREENING LEVELS (2)	
		SOIL INGESTION		SEDIMENTS	AQUATIC
		INDUSTRIAL SCREENING LEVEL	TAP WATER SCREENING LEVEL	FAUNA SCREENING LEVELS	FRESHWATER FAUNA SCREENING LEVEL
ALUMINUM	M	1000000 MG/KG	37000 UG/L		25 UG/L
ANTIMONY	M	820 MG/KG	15 UG/L	150 MG/KG	30 UG/L
ARSENIC	M	3.8 MG/KG	0.045 UG/L	8.2 MG/KG	874 UG/L
BARIUM	M	140000 MG/KG	2600 UG/L		10000 UG/L
BERYLLIUM	M	1.3 MG/KG	0.016 UG/L		5.3 UG/L
CADMIUM	M	1000 MG/KG	18 UG/L	1.2 MG/KG	0.53 UG/L
CALCIUM	M				
CHROMIUM	M	10000 MG/KG	180 UG/L	260 MG/KG	
COBALT	M	120000 MG/KG	2200 UG/L		35000 UG/L
COPPER	M	82000 MG/KG	1500 UG/L	34 MG/KG	6.5 UG/L
CYANIDE	M	41000 MG/KG	730 UG/L		5.2 UG/L
IRON	M	610000 MG/KG	11000 UG/L		320 UG/L
LEAD	M	2000 MG/KG	15 UG/L	46.7 MG/KG	3.2 UG/L
MAGNESIUM	M				
MANGANESE	M	47000 MG/KG	840 UG/L		14500 UG/L
MERCURY	M	610 MG/KG	11 UG/L	0.15 MG/KG	0.012 UG/L
NICKEL	M	41000 MG/KG	730 UG/L	20.9 MG/KG	160 UG/L
POTASSIUM	M				
SELENIUM	M	10000 MG/KG	180 UG/L		5 UG/L
SILVER	M	10000 MG/KG	180 UG/L	1 MG/KG	0.0001 UG/L
SODIUM	M				
THALLIUM	M	160 MG/KG	2.9 UG/L		40 UG/L
VANADIUM	M	14000 MG/KG	260 UG/L		10000 UG/L
ZINC	M	610000 MG/KG	11000 UG/L	150 MG/KG	110 UG/L
1,1-DIMETHYLHYDRAZINE	OS	2.2 MG/KG	0.26 UG/L		
1,2,4-TRICHLOROBENZENE	OS	20000000 UG/KG	190 UG/L		
1,2-DICHLOROBENZENE	OS	180000000 UG/KG	270 UG/L	35 UG/KG	763 UG/L
1,3,5-TRINITROBENZENE	OS	100000 UG/KG	1.8 UG/L		
1,3-DICHLOROBENZENE	OS	180000000 UG/KG	540 UG/L		763 UG/L
1,3-DINITROBENZENE	OS	200000 UG/KG	3.7 UG/L		
1,4-DICHLOROBENZENE	OS	240000 UG/KG	0.44 UG/L	110 UG/KG	763 UG/L
2,2-OXYBIS(1-CHLOROPROPANE)	OS				
2,4,5-TRICHLOROPHENOL	OS	200000000 UG/KG	3700 UG/L		63 UG/L
2,4,6-TRICHLOROPHENOL	OS	520000 UG/KG	6.1 UG/L		970 UG/L
2,4-DICHLOROPHENOL	OS	6100000 UG/KG	110 UG/L		365 UG/L

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TABLE 1-1

SCREENING LEVELS
INDIAN HEAD, MARYLAND
PAGE 2 OF 6

PARAMETER	FRACTION	USEPA REGION III			
		RISK-BASED CONCENTRATIONS (RBCs) (1)		BTAG SCREENING LEVELS (2)	
		SOIL INGESTION		SEDIMENTS	AQUATIC
		INDUSTRIAL SCREENING LEVEL	TAP WATER SCREENING LEVEL	FAUNA SCREENING LEVELS	FRESHWATER FAUNA SCREENING LEVEL
2,4-DIMETHYLPHENOL	OS	41000000 UG/KG	730 UG/L	29 UG/KG	2120 UG/L
2,4-DINITROPHENOL	OS	4100000 UG/KG	73 UG/L		
2,4-DINITROTOLUENE	OS	4100000 UG/KG	73 UG/L		230 UG/L
2,6-DINITROTOLUENE	OS	2000000 UG/KG	37 UG/L		
2-CHLORONAPHTHALENE	OS	160000000 UG/KG	2900 UG/L		620 UG/L
2-CHLOROPHENOL	OS	10000000 UG/KG	180 UG/L		970 UG/L
2-METHYLNAPHTHALENE	OS			70 UG/KG	
2-METHYLPHENOL	OS	100000000 UG/KG	1800 UG/L	63 UG/KG	
2-NITROANILINE	OS	120000 UG/KG	2.2 UG/L		
2-NITROPHENOL	OS				
3,3-DICHLOROBENZIDINE	OS	13000 UG/KG	0.15 UG/L		
3-NITROANILINE	OS	6100000 UG/KG	110 UG/L		
4,6-DINITRO-2-METHYLPHENOL	OS				
4-BROMOPHENYL PHENYL ETHER	OS	120000000 UG/KG	2100 UG/L		
4-CHLORO-3-METHYLPHENOL	OS				
4-CHLOROANILINE	OS	8200000 UG/KG	150 UG/L		
4-CHLOROPHENYL PHENYL ETHER	OS				
4-METHYLPHENOL	OS	10000000 UG/KG	180 UG/L	670 UG/KG	
4-NITROANILINE	OS	6100000 UG/KG	110 UG/L		
4-NITROPHENOL	OS	130000000 UG/KG	2300 UG/L		150 UG/L
ACENAPHTHENE	OS	120000000 UG/KG	2200 UG/L	16 UG/KG	520 UG/L
ACENAPHTHYLENE	OS			44 UG/KG	
ANTHRACENE	OS	610000000 UG/KG	11000 UG/L	85.3 UG/KG	0.1 UG/L
BENZO(A)ANTHRACENE	OS	7800 UG/KG	0.092 UG/L	261 UG/KG	
BENZO(A)PYRENE	OS	780 UG/KG	0.0092 UG/L	430 UG/KG	
BENZO(B)FLUORANTHENE	OS	7800 UG/KG	0.092 UG/L	3200 UG/KG	
BENZO(G,H,I)PERYLENE	OS			670 UG/KG	
BENZO(K)FLUORANTHENE	OS	78000 UG/KG	0.92 UG/L		
BIS(2-CHLOROETHOXY)METHANE	OS				11000 UG/L
BIS(2-CHLOROETHYL)ETHER	OS	5200 UG/KG	0.0092 UG/L		
BIS(2-ETHYLHEXYL)PHTHALATE	OS	410000 UG/KG	4.8 UG/L	1300 UG/KG	30 UG/L
BUTYL BENZYL PHTHALATE	OS	410000000 UG/KG	7300 UG/L	63 UG/KG	3 UG/L
CARBAZOLE	OS	290000 UG/KG	3.4 UG/L		
CHRYSENE	OS	780000 UG/KG	9.2 UG/L	384 UG/KG	
DI-N-BUTYL PHTHALATE	OS	200000000 UG/KG	3700 UG/L	6200 UG/KG	0.3 UG/L

TABLE 1-1

SCREENING LEVELS
INDIAN HEAD, MARYLAND
PAGE 3 OF 6

PARAMETER	FRACTION	USEPA REGION III			
		RISK-BASED CONCENTRATIONS (RBCs) (1)		BTAG SCREENING LEVELS (2)	
		SOIL INGESTION		SEDIMENTS	AQUATIC
		INDUSTRIAL SCREENING LEVEL	TAP WATER SCREENING LEVEL	FAUNA SCREENING LEVELS	FRESHWATER FAUNA SCREENING LEVEL
DI-N-OCTYL PHTHALATE	OS	41000000 UG/KG	730 UG/L	1400 UG/KG	0.3 UG/L
DIBENZO(A,H)ANTHRACENE	OS	780 UG/KG	0.0092 UG/L	63.4 UG/KG	
DIBENZOFURAN	OS	8200000 UG/KG	150 UG/L	540 UG/KG	
DIETHYL PHTHALATE	OS	1000000000 UG/KG	29000 UG/L	200 UG/KG	3 UG/L
DIMETHYL PHTHALATE	OS	1000000000 UG/KG	370000 UG/L	71 UG/KG	3 UG/L
FLUORANTHENE	OS	82000000 UG/KG	1500 UG/L	600 UG/KG	3980 UG/L
FLUORENE	OS	82000000 UG/KG	1500 UG/L	19 UG/KG	430 UG/L
HEXACHLOROBENZENE	OS	3600 UG/KG	0.0066 UG/L	22 UG/KG	3.68 UG/L
HEXACHLOROBUTADIENE	OS	73000 UG/KG	0.14 UG/L	11 UG/KG	9.3 UG/L
HEXACHLOROCYCLOPENTADIENE	OS	14000000 UG/KG	0.15 UG/L		5.2 UG/L
HEXACHLOROETHANE	OS	410000 UG/KG	0.75 UG/L		540 UG/L
INDENO(1,2,3-CD)PYRENE	OS	7800 UG/KG	0.092 UG/L	600 UG/KG	
ISOPHORONE	OS	6000000 UG/KG	71 UG/L		117000 UG/L
N-NITROSO-DI-N-PROPYLAMINE	OS	820 UG/KG	0.0096 UG/L		
N-NITROSODIPHENYLAMINE	OS	1200000 UG/KG	14 UG/L	28 UG/KG	5850 UG/L
NAPHTHALENE	OS	82000000 UG/KG	1500 UG/L	160 UG/KG	100 UG/L
NITROBENZENE	OS	1000000 UG/KG	3.4 UG/L		27000 UG/L
PENTACHLOROPHENOL	OS	48000 UG/KG	0.56 UG/L	360 UG/KG	13 UG/L
PHENANTHRENE	OS			240 UG/KG	6.3 UG/L
PHENOL	OS	1000000000 UG/KG	22000 UG/L	420 UG/KG	79 UG/L
PYRENE	OS	61000000 UG/KG	1100 UG/L	665 UG/KG	
1,1,1-TRICHLOROETHANE	OV	72000000 UG/KG	790 UG/L		
1,1,2,2-TETRACHLOROETHANE	OV	29000 UG/KG	0.052 UG/L		
1,1,2-TRICHLOROETHANE	OV	100000 UG/KG	0.19 UG/L		
1,1-DICHLOROETHANE	OV	200000000 UG/KG	810 UG/L		160000 UG/L
1,1-DICHLOROETHENE	OV	9500 UG/KG	0.044 UG/L		11600 UG/L
1,1-DIETHOXYETHANE (ACETAL)	OV				
1,2-DICHLOROETHANE	OV	63000 UG/KG	0.12 UG/L		20000 UG/L
1,2-DICHLOROETHENE (TOTAL)	OV	18000000 UG/KG	55 UG/L		11600 UG/L
1,2-DICHLOROPROPANE	OV	84000 UG/KG	0.16 UG/L		
2-BUTANONE	OV	1000000000 UG/KG	1900 UG/L		3220000 UG/L
2-HEXANONE	OV				428000 UG/L
4-METHYL-2-PENTANONE	OV	160000000 UG/KG	2900 UG/L		460000 UG/L
ACETONE	OV	200000000 UG/KG	3700 UG/L		9000000 UG/L
BENZENE	OV	200000 UG/KG	0.36 UG/L		5300 UG/L

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TABLE 1-1

SCREENING LEVELS
INDIAN HEAD, MARYLAND
PAGE 4 OF 6

PARAMETER	FRACTION	USEPA REGION III			
		RISK-BASED CONCENTRATIONS (RBCs) (1)		BTAG SCREENING LEVELS (2)	
		SOIL INGESTION		SEDIMENTS	AQUATIC
		INDUSTRIAL SCREENING LEVEL	TAP WATER SCREENING LEVEL	FAUNA SCREENING LEVELS	FRESHWATER FAUNA SCREENING LEVEL
BROMODICHLOROMETHANE	OV	92000 UG/KG	0.17 UG/L		11000 UG/L
BROMOFORM	OV	720000 UG/KG	2.4 UG/L		
BROMOMETHANE	OV	2900000 UG/KG	8.7 UG/L		
CARBON DISULFIDE	OV	200000000 UG/KG	1000 UG/L		2 UG/L
CARBON TETRACHLORIDE	OV	44000 UG/KG	0.16 UG/L		35200 UG/L
CHLOROBENZENE	OV	41000000 UG/KG	39 UG/L		50 UG/L
CHLOROETHANE	OV	820000000 UG/KG	8600 UG/L		
CHLOROFORM	OV	940000 UG/KG	0.15 UG/L		1240 UG/L
CHLOROMETHANE	OV	440000 UG/KG	1.4 UG/L		
CIS-1,3-DICHLOROPROPENE	OV	33000 UG/KG	0.077 UG/L		
DIBROMOCHLOROMETHANE	OV	68000 UG/KG	0.13 UG/L		11000 UG/L
DIMETHOXYMETHANE (FORMAL)	OV				
ETHYLBENZENE	OV	200000000 UG/KG	1300 UG/L	10 UG/KG	32000 UG/L
METHYLENE CHLORIDE	OV	760000 UG/KG	4.1 UG/L		11000 UG/L
STYRENE	OV	410000000 UG/KG	1600 UG/L		
TETRACHLOROETHENE	OV	110000 UG/KG	1.1 UG/L	57 UG/KG	840 UG/L
TOLUENE	OV	410000000 UG/KG	750 UG/L		17000 UG/L
TRANS-1,3-DICHLOROPROPENE	OV	33000 UG/KG	0.077 UG/L		
TRICHLOROETHENE	OV	520000 UG/KG	1.6 UG/L		21900 UG/L
VINYL CHLORIDE	OV	3000 UG/KG	0.019 UG/L		11600 UG/L
XYLENES, TOTAL	OV	1000000000 UG/KG	12000 UG/L	40 UG/KG	13000 UG/L
4,4-DDD	PEST	24000 UG/KG	0.28 UG/L	16 UG/KG	0.6 UG/L
4,4-DDE	PEST	17000 UG/KG	0.2 UG/L	2.2 UG/KG	1050 UG/L
4,4-DDT	PEST	17000 UG/KG	0.2 UG/L	1.58 UG/KG	0.001 UG/L
ALDRIN	PEST	340 UG/KG	0.004 UG/L		3 UG/L
ALPHA-BHC	PEST	910 UG/KG	0.011 UG/L		
ALPHA-CHLORDANE	PEST	4400 UG/KG	0.052 UG/L		
AROCLOR-1016	PEST	140000 UG/KG	2.6 UG/L	22.7 UG/KG	0.014 UG/L
AROCLOR-1221	PEST	740 UG/KG	0.0087 UG/L	22.7 UG/KG	0.014 UG/L
AROCLOR-1232	PEST	740 UG/KG	0.0087 UG/L	22.7 UG/KG	0.014 UG/L
AROCLOR-1242	PEST	740 UG/KG	0.0087 UG/L	22.7 UG/KG	0.014 UG/L
AROCLOR-1248	PEST	740 UG/KG	0.0087 UG/L	22.7 UG/KG	0.014 UG/L
AROCLOR-1254	PEST	41000 UG/KG	0.73 UG/L	22.7 UG/KG	0.014 UG/L
AROCLOR-1260	PEST	740 UG/KG	0.0087 UG/L	22.7 UG/KG	0.014 UG/L
BETA-BHC	PEST	3200 UG/KG	0.037 UG/L		

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TABLE 1-1

SCREENING LEVELS
INDIAN HEAD, MARYLAND
PAGE 5 OF 6

PARAMETER	FRACTION	USEPA REGION III			
		RISK-BASED CONCENTRATIONS (RBCs) (1)		BTAG SCREENING LEVELS (2)	
		SOIL INGESTION		SEDIMENTS	AQUATIC
		INDUSTRIAL SCREENING LEVEL	TAP WATER SCREENING LEVEL	FAUNA SCREENING LEVELS	FRESHWATER FAUNA SCREENING LEVEL
DELTA-BHC	PEST				
DIELDRIN	PEST	360 UG/KG	0.0042 UG/L		0.0019 UG/L
ENDOSULFAN II	PEST	12000000 UG/KG	220 UG/L		0.056 UG/L
ENDOSULFAN SULFATE	PEST				
ENDOSULFAN-I	PEST	12000000 UG/KG	220 UG/L		0.056 UG/L
ENDRIN	PEST	610000 UG/KG	11 UG/L		0.0023 UG/L
ENDRIN ALDEHYDE	PEST				
ENDRIN KETONE	PEST				
GAMMA-BHC (LINDANE)	PEST	4400 UG/KG	0.052 UG/L		0.08
GAMMA-CHLORDANE	PEST	4400 UG/KG	0.052 UG/L		
HEPTACHLOR	PEST	1300 UG/KG	0.0023 UG/L		0.0038 UG/L
HEPTACHLOR EPOXIDE	PEST	630 UG/KG	0.0012 UG/L		0.0038 UG/L
METHOXYCHLOR	PEST	10000000 UG/KG	180 UG/L		0.03 UG/L
TOXAPHENE	PEST	5200 UG/KG	0.061 UG/L		0.0002 UG/L
4,4-DDD	PEST/PCB	24000 UG/KG	0.28 UG/L	16 UG/KG	0.6 UG/L
4,4-DDE	PEST/PCB	17000 UG/KG	0.2 UG/L	2.2 UG/KG	1050 UG/L
4,4-DDT	PEST/PCB	17000 UG/KG	0.2 UG/L	1.58 UG/KG	0.001 UG/L
ALDRIN	PEST/PCB	340 UG/KG	0.004 UG/L		3 UG/L
ALPHA-BHC	PEST/PCB	910 UG/KG	0.011 UG/L		
ALPHA-CHLORDANE	PEST/PCB	4400 UG/KG	0.052 UG/L		
AROCLOR-1016	PEST/PCB	140000 UG/KG	2.6 UG/L	22.7 UG/KG	0.014 UG/L
AROCLOR-1221	PEST/PCB	740 UG/KG	0.0087 UG/L	22.7 UG/KG	0.014 UG/L
AROCLOR-1232	PEST/PCB	740 UG/KG	0.0087 UG/L	22.7 UG/KG	0.014 UG/L
AROCLOR-1242	PEST/PCB	740 UG/KG	0.0087 UG/L	22.7 UG/KG	0.014 UG/L
AROCLOR-1248	PEST/PCB	740 UG/KG	0.0087 UG/L	22.7 UG/KG	0.014 UG/L
AROCLOR-1254	PEST/PCB	41000 UG/KG	0.73 UG/L	22.7 UG/KG	0.014 UG/L
AROCLOR-1260	PEST/PCB	740 UG/KG	0.0087 UG/L	22.7 UG/KG	0.014 UG/L
BETA-BHC	PEST/PCB	3200 UG/KG	0.037 UG/L		
DELTA-BHC	PEST/PCB				
DIELDRIN	PEST/PCB	360 UG/KG	0.0042 UG/L		
ENDOSULFAN II	PEST/PCB	12000000 UG/KG	220 UG/L		
ENDOSULFAN SULFATE	PEST/PCB				
ENDOSULFAN-I	PEST/PCB	12000000 UG/KG	220 UG/L		
ENDRIN	PEST/PCB	610000 UG/KG	11 UG/L		
ENDRIN ALDEHYDE	PEST/PCB				

TABLE 1-1

SCREENING LEVELS
INDIAN HEAD, MARYLAND
PAGE 6 OF 6

PARAMETER	FRACTION	USEPA REGION III			
		RISK-BASED CONCENTRATIONS (RBCs) (1)		BTAG SCREENING LEVELS (2)	
		SOIL INGESTION		SEDIMENTS	AQUATIC
		INDUSTRIAL SCREENING LEVEL	TAP WATER SCREENING LEVEL	FAUNA SCREENING LEVELS	FRESHWATER FAUNA SCREENING LEVEL
ENDRIN KETONE	PEST/PCB				
GAMMA-BHC (LINDANE)	PEST/PCB	4400 UG/KG	0.052 UG/L		0.08
GAMMA-CHLORDANE	PEST/PCB	4400 UG/KG	0.052 UG/L		
HEPTACHLOR	PEST/PCB	1300 UG/KG	0.0023 UG/L		
HEPTACHLOR EPOXIDE	PEST/PCB	630 UG/KG	0.0012 UG/L		
METHOXYCHLOR	PEST/PCB	10000000 UG/KG	180 UG/L		
TOXAPHENE	PEST/PCB	5200 UG/KG	0.061 UG/L		
1,3,5-TRINITROTOLUENE	EXP	0 MG/KG			0
2,4,6-TRINITROTOLUENE	EXP	190 MG/KG	2.2 UG/L		0
2-NITROTOLUENE	EXP	20000 MG/KG	61 UG/L		0
3-NITROTOLUENE	EXP	20000 MG/KG	61 UG/L		0
4-NITROTOLUENE	EXP	20000 MG/KG	61 UG/L		0
HMX	EXP	100000 MG/KG	1800 UG/L		0
NITROCELLULOSE	EXP				0
NITROGLYCERIN	EXP				0
NITROGUANIDINE	EXP	200000 MG/KG	3700 UG/L		0
PENTAERYTHRITOL TETRANITRATE	EXP				0
RDX	EXP	52 MG/KG	0.61 UG/L		0
TETRYL	EXP				0
TPH	TPH				

(1) USEPA Region III, 1996; January-June, Communication from Roy L. Smith to RBC Table Marking List.
(2) USEPA Region III, Revised Region III BTAG Screening Levels, 8/9/95; Communiction from Robert S. Davis (3HW13).
ug/L - microgram/Liter
ug/kg - microgram/kilogram
OV - organic volatile compound
OS - organic semivolatile compound
PEST/PCB - Pesticide/PCB
EXP - Explosive
TPH - Total Petroleum Hydrocarbon

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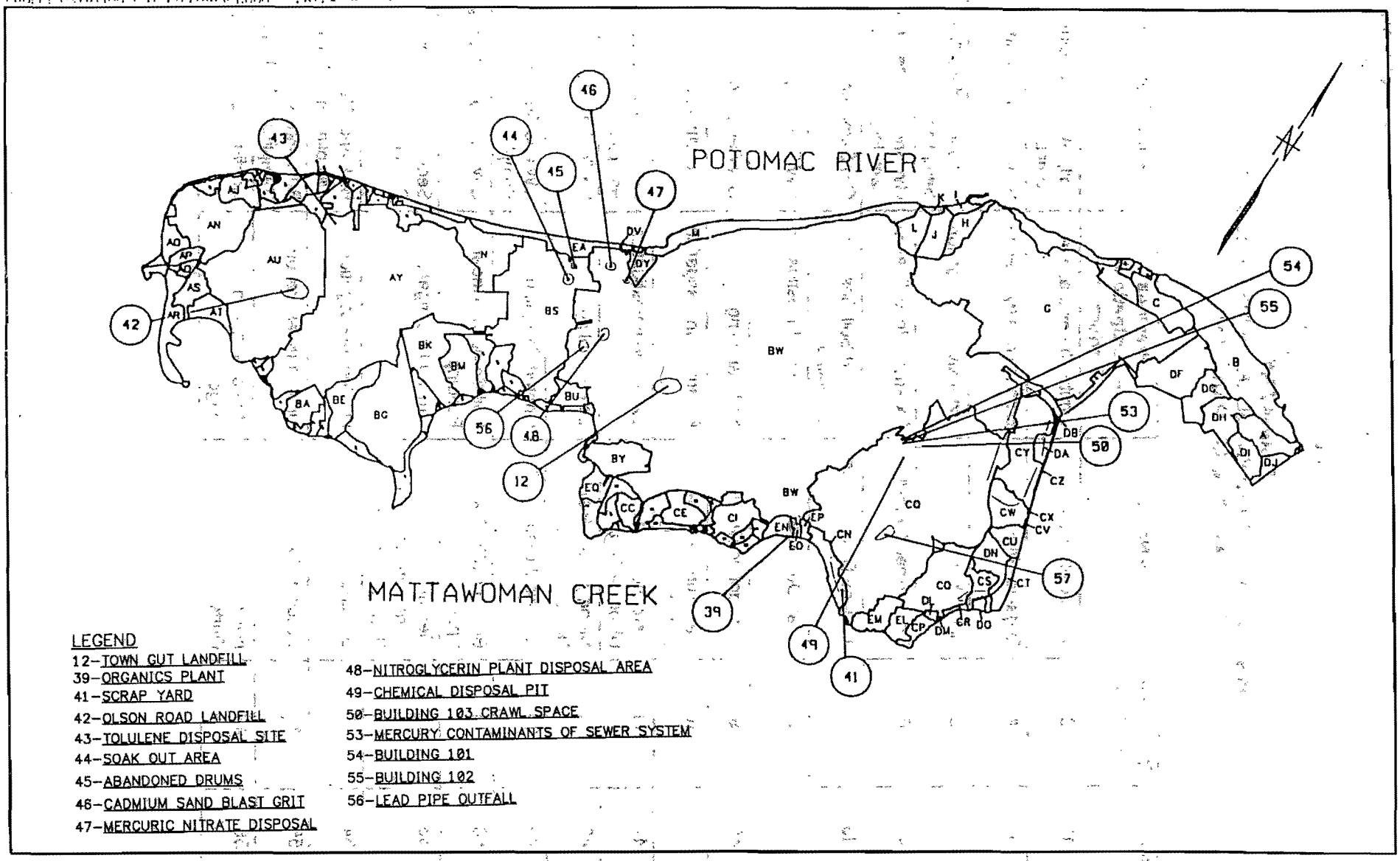

WATER SHED MAP
INDIAN HEAD DIVISION NSWC
INDIAN HEAD, MARYLAND

FIGURE 1-2

NOT TO SCALE

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TABLE 1-2

SITE SUMMARY
INDIAN HEAD DIVISION, NAVAL SURFACE WARFARE CENTER
INDIAN HEAD, MARYLAND

Site No.	Work Plan Section	Site Name	Previous Investigations Performed	Work Proposed
12	3	Town Gut Landfill	Limited Investigations	Soil, GW and Sediment Sampling
39	4	Organics Plant	Extensive Investigation	Sediment Sampling
41	5	Scrap Yard	Extensive Investigation	GW and Surface Soil Sampling
42	6	Olson Road Landfill	Extensive Investigation	GW and Surface Water Sampling
43	7	Toluene Disposal Site	Soil and Soil Gas Sampling	GW Sampling
44	8	Soak Out Area	Extensive Investigation	GW Sampling
45	9	Abandoned Drums	Soil Sampling	GW Sampling
46	10	Cadmium Sandblast Grit Area	Extensive Investigation	No Further Action
47	11	Mercuric Nitrate Disposal Area	Extensive Investigation	GW and Surface Soil Sampling
48	12	Nitroglycerine Plant Disposal Area	Soil Sampling	No Further Action
49	13	Chemical Disposal Pit	Limited Sampling	GW and Sediment Sampling
50	14	Building 103, Crawl Space	Soil Sampling Under Building	GW and Soil Sampling
53	15	Mercury Contamination of the Sewage System	Limited Investigation	Sediment and GW Sampling
54	16	Building 101	Limited Investigation	Bulk and Wipe Sampling in Building
55	17	Building 102	Limited Investigation	Bulk and Wipe Sampling in Building
56	18	IW87 - Lead Pipe Outfall	Removal Action Ongoing	Confirmation Sampling

1.7 PROJECT ORGANIZATION

This RI phase of the project will be performed by Brown & Root Environmental with support from the Navy. The Navy RPM will be Mr. Shawn Phillips, PE.

Mr. Rob Sadorra, Code 1811
Department of the Navy
Engineering Field Activity Chesapeake
Naval Facilities Engineering Command
901 M Street SE, Building 212
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Mr. Shawn Jorgensen will be the primary contact at the Station.

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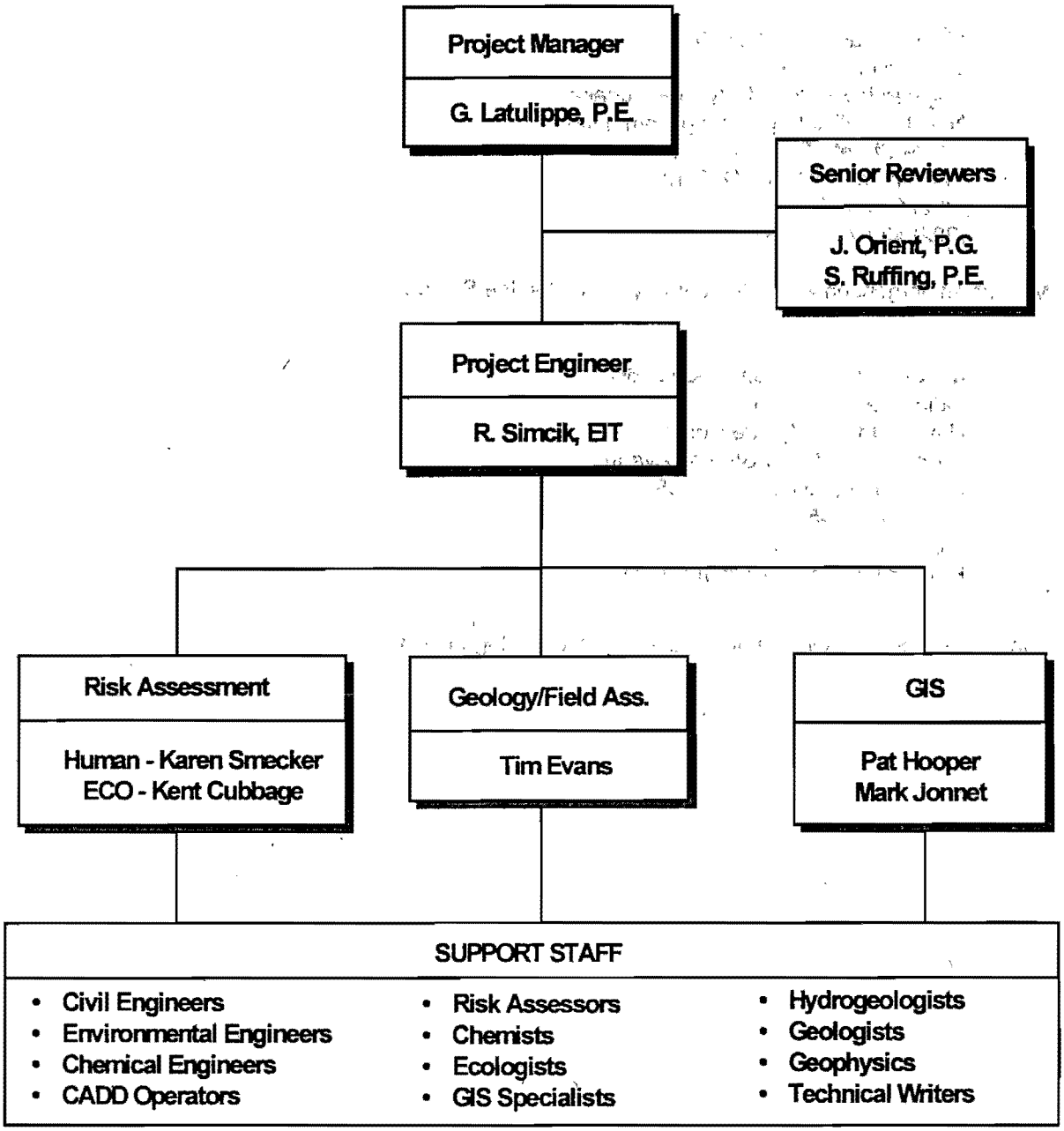
(302) 743-4180 (FAX)
E-mail: 046C@safety.ih.navy.mil

The Brown & Root Project Organization is shown on Figure 1-3.

FIGURE 1-3

PROJECT ORGANIZATION CHART



2.0 FIELD OPERATIONS

2.1 WORK PLAN SUMMARY

The proposed environmental sampling to be conducted at the subject sites are summarized in Table 2-1. The specific locations and analysis to be performed at each site is discussed in detail in the site specific sections (sections 3.0 through 18.0).

The environmental investigative work shall be performed in accordance with the Indian Head (Station) SOPs and the Master QAPP. Depending on the site requirements, a wide range of site evaluation techniques will be used to perform the required tasks. The Station SOPs describe the techniques to be used to acquire the environmental samples, the field data to be assembled, and the field documentation required. Information pertaining to the required sample handling and analytical requirements are provided in the Master QAPP.

2.2 GENERAL FIELD OPERATIONS

This section provides information on the general field operations and the basis for selection of the location of the environmental sampling to be conducted.

2.2.1 Mobilization/Demobilization

The field crew will consist of a Field Operations Leader (FOL), qualified technicians, and specialized subcontractors. Depending on the tasks to be conducted, the size and make up of the field team will vary. Prior to mobilization, all field team members will review the project documents including the site specific Health and Safety Plan provided in Appendix A.

The equipment required for field operations will be brought to the site by the Brown and Root field team. All required bottle ware will be shipped directly to the site by the laboratory. Demobilization will entail following proper decontamination procedures for all site personnel and equipment. All sampling equipment used for collecting samples will be decontaminated prior to beginning field sampling, between collection of each sample, and at the end of the sampling event. Decontamination procedures are discussed in Station SOP SA-13. Handling of the investigation derived waste (IDW) is handle in accordance with Station SOP SA-13, and field records will be kept as directed in Station SOP SA-12.

TABLE 2-1

WORK PLAN SUMMARY TABLE
INDIAN HEAD, MARYLAND
PAGE 1 OF 3

Site Name	Work Plan Summary	Soil Sampling			Groundwater Sampling		Surface Water Samples	Sediment Samples	Comments/ Other Work
		Number of Near Surface Soil Samples	Number of Soil Borings	Number of Soil Boring Samples	Number of New Wells	Number of Wells to Sample			
Site 12 - Town Gut Landfill	Limited investigation performed adjacent to the site. Will conduct a thorough investigation of surface soils, sediments, subsurface soils, surface water, and groundwater, possibly in a phased approach.	5	(1)	4	4	4	6	10	
Site 39 - Organics Plant	The outfall will be further evaluated and the sediments of Mattawoman Creek will be evaluated with this site.	---	---	---	---	---	---	8	
Site 41 - Scrap Yard	Extensive investigation of this site has been conducted. Will evaluate the possibility of transport of contamination off site to Mattawoman Creek.	6	---	---	---	4	---	---	
Site 42 - Olson Road Landfill	Extensive investigation of this site has been conducted. Will evaluate surface water and sediments concerning contact pathway and transport off site. Conduct additional round of groundwater sampling.	-	---	---	---	4	4	2	
Site 43 - Toluene Disposal Site	Soil and soil gas sampling did not indicate contamination above the screening levels. Groundwater will be sampled to verify that toluene did not migrate to the groundwater.	---	---	---	1	1	---	---	

TABLE 2-1

WORK PLAN SUMMARY TABLE
INDIAN HEAD, MARYLAND
PAGE 2 OF 3

Site Name	Work Plan Summary	Soil Sampling			Groundwater Sampling		Surface Water Samples	Sediment Samples	Comments/ Other Work
		Number of Near Surface Soil Samples	Number of Soil Borings	Number of Soil Boring Samples	Number of New Wells	Number of Wells to Sample			
Site 44 - Soak Out Area	The groundwater in this area will be resampled.	---	---	---	---	3	---	---	
Site 45 - Abandoned Drums	Soil does not exceed the screening levels. Groundwater will be sampled to verify the absence of contamination.	---	---	---	1	1	---	---	
Site 46 - Cadmium Sandblast Grit Area	No sampling is proposed, based on the results of the Site Investigation Report.	---	---	---	---	---	---	---	
Site 47 - Mecuric Nitrate Disposal Area	Additional surface soil sampling is proposed to determine the horizontal extent of contamination and groundwater will be sampled to verify the absence of contamination.	8	---	---	1	1	0	---	
Site 48 - NG Plant Disposal Area	No sampling is proposed, based on the results of the Site Investigation Report.	---	---	---	---	---	---	---	
Site 49 - Chemical Disposal Pit	Additional sampling to determine the extent of contamination will be conducted and groundwater sampled to verify the absence of contamination.	3	---	---	1	1	---	2	
Site 50 - Bldg. 103 Crawl Space	Surface soils will be sampled. The need for groundwater sampling will be determined based on the presence of soil contamination.	6	---	---	---	---	---	---	

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WORK PLAN SUMMARY TABLE
INDIAN HEAD, MARYLAND

Site Name	Work Plan Summary	Soil Sampling			Groundwater Sampling		Surface Water Samples	Sediment Samples	Comments/ Other Work
		Number of Near Surface Soil Samples	Number of Soil Borings	Number of Soil Boring Samples	Number of New Wells	Number of Wells to Sample			
Site 53 - Mercury Contaminated Sewer System	The sewer system will be evaluated to determine layout and condition. Based on that evaluation, the need for soil and groundwater sampling will be determined.	---	---	---	---	---	---	8	
Site 54 - Building 101	Building materials will be sampled to determine the extent of contamination.	3	---	---	---	---	---	19(2)	
Site 55 - Building 102	Building materials will be sampled to determine the extent of contamination.	4	---	---	---	---	---	29(2)	
Site 56 - IW87 - Lead Pipe Outfall	The post removal action conditions will be evaluated by collecting sediment samples downgradient of the outfall.	---	---	---	---	---	---	5	

1 Samples collected during the installation of monitoring well.
2 Building material samples.

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2.2.2 Field Sampling

The proposed locations of samples to be collected is provided in the site specific sections of this document, however it should be noted that field judgment should be used to fine tune the location of the sample collection to include observations made in the field. The field team shall consider topography, stressed vegetation, erosion and seeps, changes in type of vegetation, discolorations, accessibility, and past sampling experiences.

The specific locations of all field sampling points is based on the evaluation of historical site data. Duplication of previous sampling activities conducted at the various site was limited to data verification in an attempt to minimize duplication of efforts. The following criteria were considered in selecting sample locations.

- Historical use/cause of potential contamination
- Site layout, topography, and drainage characteristics
- Type of contamination
- Mobility contamination
- Potential off site transport pathways of contaminates

The equipment required to perform a given type of sampling is common among the sites where that type of sampling will be performed. The majority of the sampling to be performed includes:

- Surface Soil Sampling; Station SOP SA-03
- Sediment Sampling; Station SOP SA-02
- Subsurface Soil Sampling; Station SOP SA-03
- Hydraulic Push Sampling; Station SOP SA-06
- Groundwater Sampling; Station SOP SA-01
- Headspace Sampling; Station SOP SA-05
- Surface Water Sampling; Station SOP SA-02

The SOPs listed above discuss the equipment and procedures required to perform each type of sampling.

2.3 SAMPLE HANDLING

Sample handling includes the field-related considerations regarding the selection of sample containers and preservatives, allowable holding times, and the analyses required. These topics are discussed in the

site specific sections. The sample identification system to be applied to the samples and the shipping requirements are discussed below.

2.3.1 Sample Identification System

Each sample collected will be assigned a unique sample tracking number. The sample tracking number will consist of an alpha-numeric code that identifies that the sample was taken for the remedial investigation, the site from which it was collected, the type of sample (medium), a numerical count, and quality assurance (QA) designation, if required. Any other pertinent information regarding sample identification will be recorded in the field logbooks.

The alpha-numeric code to be used in the sample system is explained in the diagram blow and subsequent definitions:

(AA)	-	(NN)	-	(AA)	(NN)	-	(A)
Project phase		RI site number		Type of sample	Numerical count		QA

Where:

A = Alpha

N= Numeric

Project Phase:

RI = Remedial Investigation

RI Site Number:

12 through 56 - Specific and unique numeric identifier assigned to each particular site

Type of Sample:

SS = surface / soil sample

SB = soil boring sample

SD = sediment sample

SW = surface water sample

GW = monitoring well groundwater sample

WS = wipe sample

BM = bulk material sample

CO = concrete core sample

Numerical Count:

01 through 99 = Specific and unique sample identifier number. The numerical count for each type of sample collected at a particular site will begin with 01 and continue in sequential order until all samples have been labeled.

QA Sample Designations:

D = Duplicate sample

E = Equipment rinsate blank

F = Field blank

R = Rinsate blank

T = Trip blank

For example, the third sediment sample collected at the Town Gut Landfill (Site 12) would be identified as:

RI12SD03

The location where each sample was collected will be identified in the logbook. Measured distances from permanent fixed reference points will be noted. To maintain blinded identity of the duplicate samples, a unique identification number will be given to duplicate samples and noted in the logbook. All samples will be completely documented with the location and depth (if applicable), sample time, date and description in the field book.

All installed monitoring wells will be surveyed for location. Station benchmarks can be used for this effort.

2.3.2 Sample Packaging and Shipping

Samples will be package in accordance with Station SOP SA-11 "Non-Radiological Sample Handling". The samples will be either picked up at the site by the analytical laboratory or sent Federal Express. The sample shall be tightly packed in a cooler with Vermiculite packaging material and ice as a preservative. The FOL is responsible for completion of the following forms:

- Sample labels and Chain-of-Custody seals
- Chain-of-Custody forms
- Appropriate labels and forms required for shipment

Custody of the samples must be maintained and documented at all times. Chain-of-Custody begins with the collection of the samples in the field and is continued through the analysis of the sample at the analytical laboratory.

3.0 SITE 12- TOWN GUT LANDFILL

3.1 BACKGROUND INFORMATION AND SITE DESCRIPTION

Site 12 - Town Gut Landfill is located on the southwest side of the Station. The site is approximately two acres in size; it is bisected by Atkins Road Extension which runs northwest - southeast as shown in Figure 3-1. Runoff from the site drains into a stream and pond which are located adjacent to the northeastern and southeastern sides of the site respectively. The adjacent stream flows south into the pond and the pond outlets through a pipe located under Noble Road and into Mattawoman Creek.

Based on visual observations, historical maps and aerial photography, the landfill appears to have been built with construction debris and other fill material by working from original ground in a westerly direction and filling in an existing pond and topographically low area. The fill appears to be approximately 10 to 15 feet above the original ground. Construction debris and rubble is visible along the edge of the landfill adjacent to the pond.

This site was operated by NSWC for disposal of landscaping waste, fill material, and rubble. Operations began circa 1968 and terminated in June 1980. Reportedly, material was deposited at this site from off-Station sources until 1972. The site contains landscaping wastes, tree stumps, and demolition debris (NEESA, 1983). NEESA team interviews indicated that unauthorized discarding of trash may have occurred since operations at the site began, although estimates of quantities deposited were not available. Some of the items reportedly disposed at the Town Gut Landfill include paint and varnishes, demolition waste, and chemical wastes. Assorted debris and construction rubble is visible along the edge of the landfill adjacent to the pond. The NEESA document (NEESA, 1983) reported an arsenic concentration of 340 mg/L in a leachate sample collected approximately 100 feet northeast of the culvert under Atkins Road Extension on the north side of the landfill. According to the RCRA Facility Assessment (February, 1989) disposal of arsenic waste occurred at Site 12.

3.2 PREVIOUS ENVIRONMENTAL INVESTIGATIONS

One leachate water sample was collected by NEESA during the Initial Assessment Study (NEESA, 1983). It was collected from a small runoff point along the bank of the stream near a partially buried drum. Thirty milligrams per liter (mg/L) of arsenic were detected in the leachate sample. The NEESA report recommended a Confirmation Study to determine the existence and extent of contamination and the

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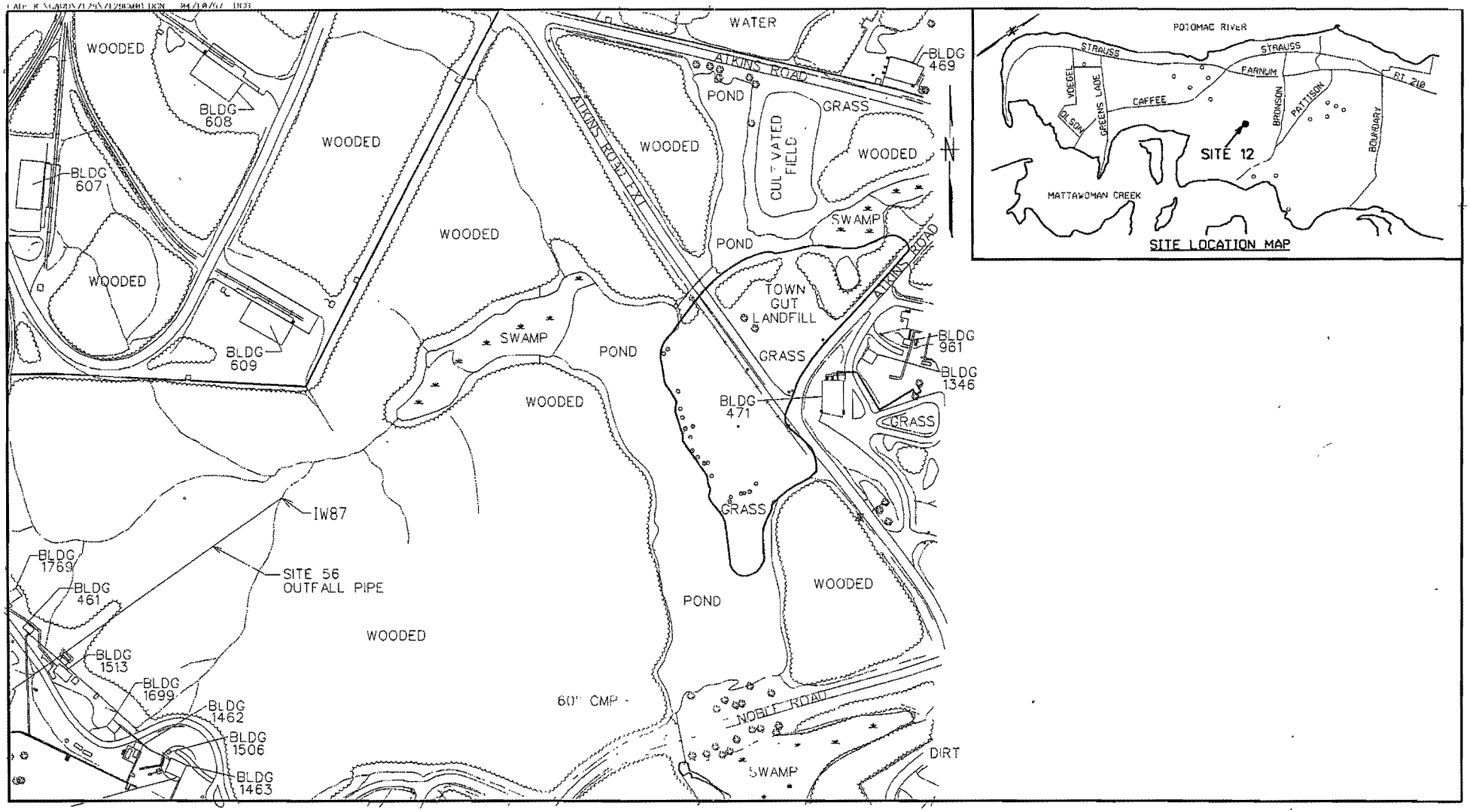

FIGURE 3-1

GENERAL SITE MAP
SITE 12 — TOWN GUT LANDFILL
INDIAN HEAD, MARYLAND

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potential risks to aquatic and terrestrial organisms. During the 1985 Confirmation Study (CH2M Hill, 1985), one surface water sample and one sediment sample were collected from the edge of the Town Gut Landfill, in the same approximate area as the earlier surface water sample. Analytical results are indicated on Figure 3-2.

The swamps and ponds adjacent to the Town Gut Landfill receive water from several area streams and also from daily tidal fluctuations. Discharges from streams identified with Site 8 (Nitroglycerin Plant Office) and Site 56 (IW87 - Lead Pipe Outfall) make up a portion of the total stream drainage that eventually flows into the swamps and ponds located south of Atkins Road Extension. For this reason, and because of the relative location of the Town Gut Landfill to these swamps and ponds, investigations have been initiated regarding the possible impact of these various contributing water sources on the ecological balance within these ponds and swamps.

3.3 HUMAN HEALTH RISK ASSESSMENT

A human health risk assessment for the site will be performed and documented in the RI Report. Analytical data generated under this Project Specific Work Plan, as well as historical data for the site, will be used to determine if measured chemical concentrations pose a significant threat to potential human receptors. The general methodologies which will be used to assess human health risks are contained in Section 3.0 of the Master Work Plan for the Indian Head Division, Naval Surface Warfare Center (B&R Environmental, June 1996). The remainder of this section of the Project Specific Work Plan identifies preliminary chemicals of concern (COCs) based on existing site information, screening levels which will be used to identify COCs in the risk assessment, and exposure scenarios to be evaluated.

No chemicals have been preliminarily identified as COCs for the site. USEPA Region III soil COC screening levels for industrial land use will be used to identify site-specific COCs for soil and sediment. For groundwater, USEPA Region III COC screening levels for tap water ingestion will be employed.

The following potential receptor groups will be evaluated in the human health risk assessment:

- Maintenance Workers
- Adolescent Trespassers
- Construction Workers

Adolescent trespassers (ages 6 to 16) will be evaluated since access to the landfill is not physically restricted. The receptor is evaluated primarily for future land use since the site is located in a restricted

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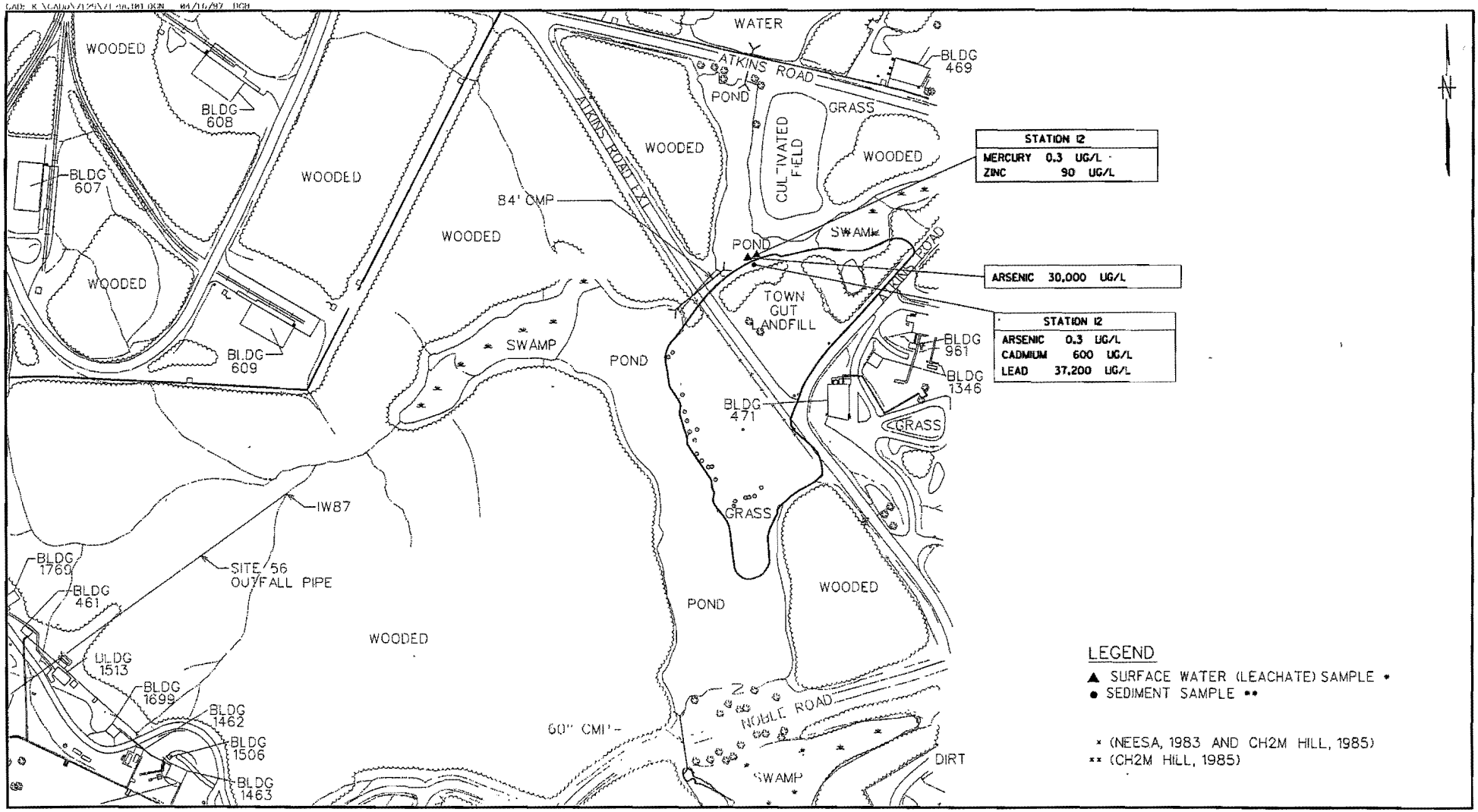

FIGURE 3-2

PREVIOUS SAMPLING
SITE 12 - TOWN GUT LANDFILL
INDIAN HEAD, MARYLAND

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area at the base. Since groundskeeping activities (mowing) currently occur at the site maintenance workers will be evaluated. These receptors will be assumed to be exposed to surface soil and sediment from seeps. Construction workers, who will be considered to be potential receptors for future land use, will be evaluated for exposure to surface/subsurface soil (to a depth of 10 feet). Pending further review of site-specific information (depth to groundwater, detected groundwater chemicals, etc.), the risks associated with dermal exposure to groundwater may also be evaluated for this receptor group. Potentially complete exposure pathways to be considered in the development of the human health risk assessment are provided in Table 3-2 of the Master Work Plan.

Based on previous project-specific discussions with the Station, NAVY, and USEPA (May 7, 1996), a future residential exposure scenario is not considered to be likely for the site and will not be evaluated in the RI Report since the site is situated in the main production area. If the Station were to close in the future, it is anticipated that the area would be used for industrial/commercial purposes only. Maintenance activities (i.e., mowing, landscaping) or daily occupational duties are not performed at the site, therefore, Station personnel (workers) will not be regarded as potential receptors.

3.4 ECOLOGICAL RISK ASSESSMENT

An ecological risk assessment for this site will be performed and documented in the RI Report. Extensive environmental studies have already been performed to investigate metals and their sources in the pond adjacent to the Town Gut Landfill. In addition, biomonitoring has been performed since 1992 to investigate metals concentrations in biota inhabiting the pond. However, the source(s) and nature and extent of organics in the pond has not been fully characterized. In particular, no conclusive investigations have been performed to assess potential contaminant inputs to the pond from the landfill. The stream that feeds the landfill from the northeast may also carry organic constituents to the pond. Although results of biomonitoring revealed that levels of metals in fish, reptiles, amphibians in the pond are not significantly elevated, data and information fully characterizing the nature and extent and source(s) of organic contaminants in the pond are needed to assess their potential impacts on biota inhabiting the pond area. These data and information will be used to conduct an ecological risk assessment (ERA) for the Town Gut Landfill area. Methods described in Section 4.0 of the Master RI Work Plan will be utilized to conduct the ERA.

The ecological investigation scoping and work plan are presented in the scoping and work plan sections, however details of the proposed events are as follows. Sediment samples will be taken in the stream to the northeast and in the pond itself to fully characterize the nature and extent of contamination in these areas. Sediment and moist soil samples will be taken near the landfill/pond interface to investigate

potential contaminant inputs from the landfill. Surface soil samples taken on the landfill will also serve to elucidate possible overland contaminant migration from the pond.

3.5 INVESTIGATIVE SCOPING

Analytical results from previous investigations indicate that the pond adjacent to the site has some elevated levels of metals. However, this pond is the collection point of a very large watershed and the contamination may be contributed from a variety of sites. No sampling has been conducted to evaluate the Town Gut Landfill specifically. Investigative scoping was conducted to address both human health and ecological risk. Evaluation of the various media is as follows:

- Subsurface Soil - No previous sampling was conducted to evaluate subsurface soils. Subsurface soils can impact groundwater and can leach into the adjacent pond. Subsurface soils are proposed for evaluation of both human health and ecological risk.

- Sediment - Only sediments adjacent to the landfill have been collected and analyzed. Surface sediment have the potential to migrate off site and have several pathways for exposure. To determine if contamination is seeping out of the landfill, sediment samples will be collected at observed seep locations and along the shoreline where the landfill is affected by fluctuation in the pond water level.

- Surface Water - A surface water sample has been collected from the Pond adjacent to the landfill, however additional surface water samples should be collected from the edge of the landfill where there is a potential the water is from a seep.

- Groundwater - No groundwater samples were collected in the past investigations. Groundwater needs to be sampled to determine if a potential human health or ecological risk exists. Migration of groundwater could impact adjacent surface waters. Groundwater samples will be collected by installing six temporary drive points to evaluate if groundwater has been impacted.

- Extent of Landfill - The horizontal extent of the Town Gut Landfill is not clearly defined. Informal discussions with facility personnel indicate that the landfill may, in fact, extend to the area north of the landfill as outlined on Figure 3-2 between Atkins Road and Atkins Road Extension. To better define the extent of the landfill, existing photograph, if available, will be reviewed for evidence of landfill-related activity. Additionally, a geophysical survey will be undertaken in the area north of the landfill between Atkins Road and Atkins Road Extension. The precise area covered by the survey will be determined after photographs are studied. The geophysical investigation will include establishing a

grid in the area to be surveyed, then utilizing electromagnetic conductivity to collect data regarding subsurface conditions. The data will be evaluated for evidence of past landfill-related activity.

Because of the potential nature of landfill contaminants and because limited data has been collected, the samples will be analyzed for Target Compound List (TCL) volatile organic compounds (VOCs), TCL semivolatile organic compounds (SemiVOCs), target analyte list (TAL) metals, pesticides/polychlorinated biphenyls (PCBs) and explosives. A summary of the investigative scoping is provided in Table 3-1 and because this area is considered an ecologically sensitive area, additional considerations concerning ecological impact have be evaluated and are presented in Table 3-2.

3.6 WORK PLAN

The proposed work plan for the field investigation is summarized on Table 3-3 and additional work plan items to further evaluate ecological risk is provided in Table 3-4. The proposed location of the sample to be collected is provided on Figure 3-3. Table 3-5 summarizes the sampling and analysis program and Table 3-6 provides sample bottle, container, and holding time requirements. The following provides a breakdown by media for the sampling to be conducted:

- Subsurface Soils - Four subsurface soils will be collected with the installation of the monitoring wells. One sample will be collected at the water table interface or where field screening (using organic vapor detection) indicates as described in Station SOP SA-14.

- Surface Soils - Five surface soil samples will be collected at the Landfill using the techniques identified in the Station SOP SA-03 "Soil Sampling".

- Sediment Soils - Four sediment samples will be collected at the areas identified as seep locations and an additional six sediment samples will be collected along the pond edge of the landfill to further evaluate potential ecological risks. These samples shall be collected in accordance with Station SOP SA-02 "Surface water and sediment sampling".

- Surface Water - Six surface water samples will be collected to evaluate the site for ecological risks. The water samples will be collected from ponding water at the edge of the landfill and along the pond landfill edge. These samples shall be collected in accordance with Station SOP SA-02 "Surface water and sediment sampling".

TABLE 3-1

INVESTIGATION SCOPING
SITE 12 - TOWN GUT LANDFILL
INDIAN HEAD, MARYLAND
PAGE 1 OF 2

Media/ Exposure Pathway	Identified/Suspected Contaminants	Screening Levels	Preliminary Risk Evaluation	Data Gaps/Investigative Objective	Potential Response Actions	Potential Remedial Technologies
Soil Surface Soil	No sampling performed. Potential variety of contaminants	USEPA Region III Screening Criteria	Surface soil contamination could pose risk to human health and environment	Conduct sampling to assess contaminants in surface soil.	If detected above the screening levels, then perform additional sampling to determine extent. If concentrations are below screening levels, then no further action is required.	Soil removal Capping. No Further Action
Subsurface Soil/Material Could Impact Groundwater (see below)				Subsurface soils will be collected with the installation of the monitoring well.		
Groundwater	No sampling conducted. Potential variety of contaminants.	USEPA Region III Screening Criteria	Groundwater contamination could impact environment and adjacent pond.	Conduct sampling to determine if contamination exists in the groundwater.	If detected above the screening levels, then perform additional sampling to determine extent. If concentrations are below screening levels, then no further action is required.	Pump and Treat. Containment. Air sparging. No Further Action

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TABLE 3-1

INVESTIGATION SCOPING
SITE 12 - TOWN GUT LANDFILL
INDIAN HEAD, MARYLAND
PAGE 2 OF 2

Media/ Exposure Pathway	Identified/Suspected Contaminants	Screening Levels	Preliminary Risk Evaluation	Data Gaps/Investigative Objective	Potential Response Actions	Potential Remedial Technologies
Sediments	Adjacent pond sediments analyzed and extensive biomonitoring performed.	USEPA Region III Screening Criteria	Contaminants in sediments could impact environment.	Conduct sampling to determine the nature of contamination in the sediments.	If detected above the screening levels, then perform additional sampling to determine extent.	Removal
					If concentrations are below screening levels, then no further action is required.	No Further Action

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TABLE 3-2

ECOLOGICAL INVESTIGATION SCOPING
SITE 12 - TOWN GUT LANDFILL
INDIAN HEAD, MARYLAND

Media/ Exposure Pathway	Identified/Suspect Contaminants	Screening Levels	Preliminary Risk Evaluation	Data Gaps/Investigative Objective	Decision Rule	Potential Remedial Action
Surface Water	Mainly metals and DCE	USEPA Region III BTAG Screening Levels	Some concentrations above screening levels, but metals are not bioaccumulating.	Investigate whether contaminants are migrating from the landfill to the pond and analyze organics in surface water. Also investigate other upstream potential inputs.	Use data to conduct ecological risk assessment.	Remove or cap contaminated soils or remove sediments/ No further action.
Sediments	Mainly metals	USEPA Region III BTAG Screening Levels	Some concentrations above screening levels, but lead and mercury are not bioaccumulating.	Investigate whether contaminants are migrating from the landfill to the pond and analyze organics in surface water sediments. Also investigate other upstream potential inputs.	Use data to conduct ecological risk assessment.	Remove or cap contaminated soils or remove sediments/ No further action.

TABLE 3-3

SITE SPECIFIC WORK PLAN
SITE 12 - TOWN GUT LANDFILL
INDIAN HEAD, MARYLAND

Data Needs	Investigative Technique	Location	Number of samples	Analysis
Surface Soil Investigate potential contamination in surface soils.	Collect four surface soil samples from a depth of 0 to 6" with hand auger.	Collect two samples west of Atkins Road extension, two east of Atkins Road, and one sample in the area north of the pond near Atkins Road. Use field measurements to bias sample locations. Soil boring locations are provided in Figure 3-3.	5	TCL VOCs, TCL Semi-VOCs, TAL Metals, Arsenic, Pest/PCBs, Explosives
Groundwater Investigate potential contamination in the groundwater.	Install 6 temporary drive points and collect one groundwater sample from each point.	Temporary drive point locations are provided in Figure 3-3.	6	TCL VOCs and SemiVOCs, TAL Metals, Arsenic, Pest/PCB
Sediment Investigate potential contamination in the sediments.	Collect one sample from maximum of four observed seep locations.	Sediment sample locations are provided in Figure 3-3.	4	TCL VOCs and SemiVOCs, TAL Metals, Arsenic, Pest/PCB, Explosives, TOC, SEM/AVS

TABLE 3-4

ECOLOGICAL SITE-SPECIFIC WORK PLAN
SITE 12- TOWN GUT LANDFILL
INDIAN HEAD, MARYLAND

Data Needs	Investigative Technique	Location	Number of Samples	Analysis
Determine if contaminants are migrating from the landfill to the pond, migrating from upstream, or both.	Collect six surface water samples from pond and stream.	Upstream of landfill and in the pond as identified in Figure 3-3.	6	TCL VOCs, TCL Semi-VOCs, TAL Metals, Arsenic, Pest/PCBs
Determine if contaminants are migrating from the landfill to the pond, migrating from upstream or both.	Collect sediment from pond, edge of landfill (moist soils), and stream.	Upstream of landfill, at pond's edge, and in the pond as identified in Figure 3-3.	6	TCL VOCs, TCL Semi-VOCs, TAL Metals, Arsenic, Pest/PCBs, Explosives, TOC, SEM/AVS

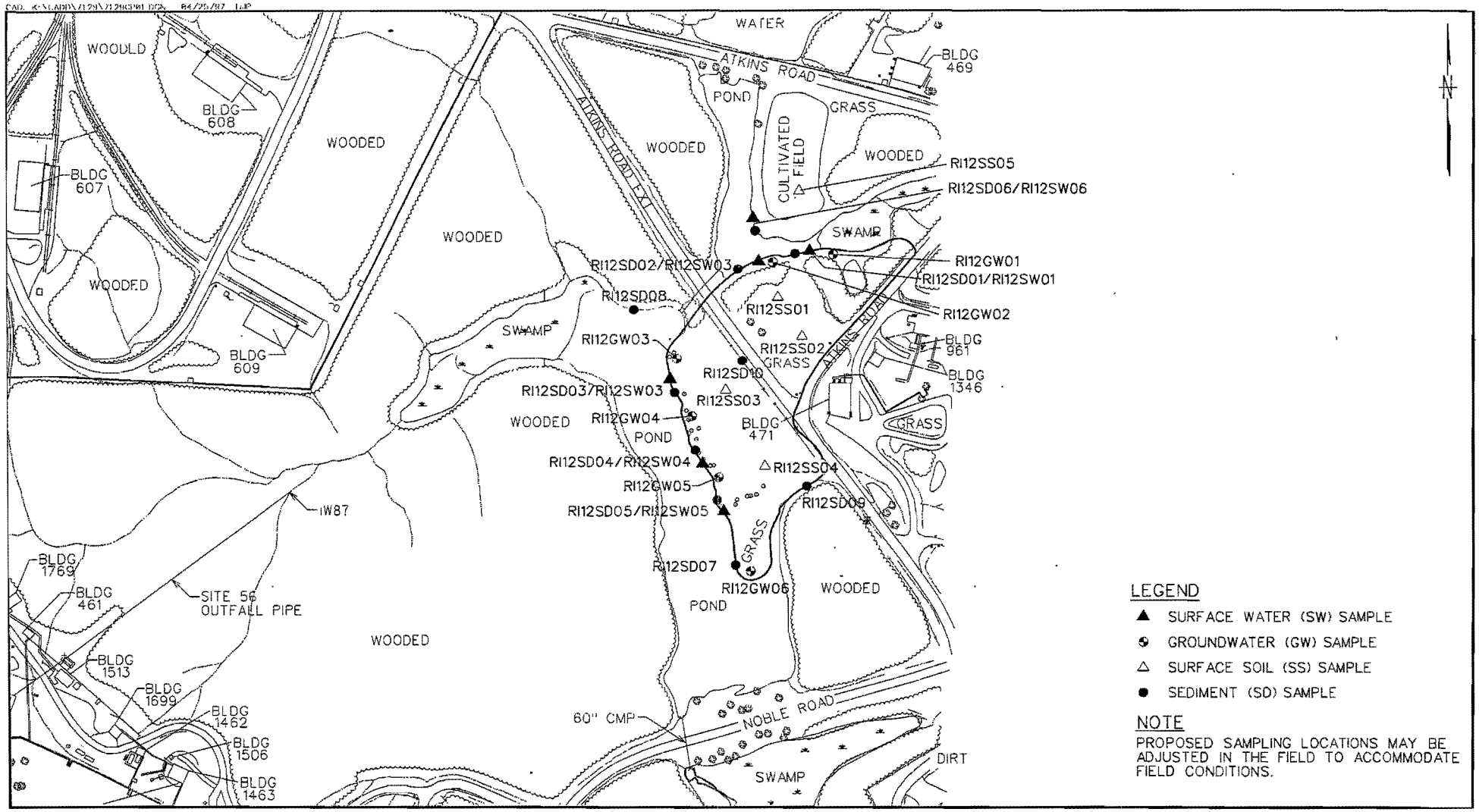

FIGURE 3-3

PROPOSED SAMPLING LOCATION MAP
SITE 12 - TOWN GUT LANDFILL
INDIAN HEAD, MARYLAND

0 200 400
SCALE IN FEET

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TABLE 3-5

SUMMARY OF SAMPLING PROGRAM
SITE 12 - TOWN GUT LANDFILL
INDIAN HEAD, MARYLAND
PAGE 1 OF 2

Sample Media	Sample ID Number	Sample Depth/ Location	Analysis							
			VOCs	SVOCs	Metals	Arsenic	Pesticides/ PCBs	Explosives	TOC	SEM/ AVC
Surface Soil	RI12SS01	0-6"/East of Atkins Road Extension	•	•	•	•	•	•		
	RI12SS02	0-6"/East of Atkins Road Extension	•	•	•	•	•	•		
	RI12SS03	0-6"/West of Atkins Road Extension	•	•	•	•	•	•		
	RI12SS04	0-6"/West of Atkins Road Extension	•	•	•	•	•	•		
	RI12SS05	0-6"/North side of Pond	•	•	•	•	•	•		
Sediment	RI12SD01	Seep along edge of landfill	•	•	•	•	•	•	•	•
	RI12SD02	Seep along edge of landfill	•	•	•	•	•	•	•	•
	RI12SD03	Seep along edge of landfill	•	•	•	•	•	•	•	•
	RI12SD04	Seep along edge of landfill	•	•	•	•	•	•	•	•
	RI12SD05	Seep along edge of landfill	•	•	•	•	•	•	•	•
	RI12SD06	Edge of field across from landfill	•	•	•	•	•	•	•	•
	RI12SD07	Within Site 8 pond	•	•	•	•	•	•	•	•
	RI12SD08	Upstream of Landfill	•	•	•	•	•	•	•	•
	RI12SD09	Edge of Site 8 near stream	•	•	•	•	•	•	•	•
	RI12SD10	Along edge of Atkins Road extension	•	•	•	•	•	•	•	•
Groundwater	RI12GW01	Temporary Drive Point East of Atkins Road extension	•	•	•	•	•			
	RI12GW02	Temporary Drive Point East of Atkins Road extension	•	•	•	•	•			
	RI12GW03	Temporary Drive Point West of Atkins Road extension	•	•	•	•	•			
	RI12GW04	Temporary Drive Point West of Atkins Road extension	•	•	•	•	•			
	RI12GW05	Temporary Drive Point West of Atkins Road extension	•	•	•	•	•			
	RI12GW06	Temporary Drive Point West of Atkins Road extension	•	•	•	•	•			

TABLE 3-5

SUMMARY OF SAMPLING PROGRAM
SITE 12 - TOWN GUT LANDFILL
INDIAN HEAD, MARYLAND
PAGE 2 OF 2

Sample Media	Sample ID Number	Sample Depth/ Location	Analysis							
			VOCs	SVOCs	Metals	Arsenic	Pesticides/ PCBs	Explosives	TOC	SEM/ AVC
Surface Water	RI12SW01	Seep along edge of landfill	•	•	•	•	•			
	RI12SW02	Seep along edge of landfill	•	•	•	•	•			
	RI12SW03	Seep along edge of landfill	•	•	•	•	•			
	RI12SW04	Seep along edge of landfill	•	•	•	•	•			
	RI12SW05	Seep along edge of landfill	•	•	•	•	•			
	RI12SW06	Edge of field across from identical area	•	•	•	•	•			

TABLE 3-6

BOTTLEWARE, PRESERVATION, AND HOLDING TIME REQUIREMENTS
SITE 12 - TOWN GUT LANDFILL
INDIAN HEAD, MARYLAND
PAGE 1 OF 2

Media	Analysis	Total Number of Samples	Number of Containers Per sample	Container Type	Preservation	Holding Times
Groundwater	TCL VOCs - CLP OLM03.0	6	2	40 ml glass	HCL pH <2, Cool to 4°C	14 days to analysis
	TCL SVOCs - CLP OLM03.0	6	1	1L amber glass	Cool to 4°C	7 days to extract; 40 days to analysis
	Arsenic/TAL Metals - CLP ILM04.0	6	1	1L plastic	HNO_3 pH <2	6 months; Hg 28 days
	Pesticides/PCBs - CLP OLM03.0	6	1	1L amber glass	Cool to 4°C	7 days to extract; 40 days to analysis
Surface Water	TCL VOCs - CLP OLM03.0	6	2	40 ml glass	HCL pH <2, Cool to 4°C	14 days to analysis
	TCL SVOCs - CLP OLM03.0	6	1	1L amber glass	Cool to 4°C	7 days to extract; 40 days to analysis
	Arsenic/TAL Metals - CLP ILM04.0	6	1	1L plastic	HNO_3 pH <2	6 months; Hg 28 days
	Pesticides/PCBs - CLP OLM03.0	6	1	1L amber glass	Cool to 4°C	7 days to extract; 40 days to analysis
Sediment	TCL VOCs - CLP OLM03.0	10	1	250 ml CWM glass	Cool to 4°C	14 days to analysis
	TCL SVOCs - CLP OLM03.0	10	1	250 ml CWM glass	Cool to 4°C	14 days to extract; 40 days to analysis
	Arsenic/TAL Metals - CLP ILM04.0	10	1	250 ml CWM glass	Cool to 4°C	6 months; Hg 28 days
	Pesticides/PCBs - CLP OLM03.0	10	1	250 ml CWM glass	Cool to 4°C	14 days

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TABLE 3-6

BOTTLEWARE, PRESERVATION, AND HOLDING TIME REQUIREMENTS
SITE 12 - TOWN GUT LANDFILL
INDIAN HEAD, MARYLAND
PAGE 2 OF 2

Media	Analysis	Total Number of Samples	Number of Containers Per sample	Container Type	Preservation	Holding Times
Sediment (Continued)	Explosives-Modified SW-846-8330*	10	1	250 ml CWM glass	Cool to 4°C	14 days to extract; 40 days to analysis
	Total Organic Carbon - Lloyd Kahn Method	10	1	250 ml CWM glass	Cool to 4°C	28 days
	SEM/AVS - EPA Draft Method**	10	1	250 ml CWM glass	Cool to 4°C; zero to minimal headspace	14 days
Surface Soil	TCL VOCs - CLP OLM03.0	5	1	250 ml CWM glass	Cool to 4°C	14 days to analysis
	TCL SVOCs - CLP OLM03.0	5	1	250 ml CWM glass	Cool to 4°C	14 days to extract; 40 days to analysis
	Arsenic/TAL Metals - CLP ILM04.0	5	1	250 ml CWM glass	Cool to 4°C	6 months; Hg 28 days
	Pesticides/PCBs - CLP OLM03.0	5	1	250 ml CWM glass	Cool to 4°C	14 days
	Explosives - Modified SW-846-8330*	5	1	250 ml CWM glass	Cool to 4°C	14 days to extract; 40 days to analysis

CWM - Clear Wide Mouth
* - Includes analysis for nitrate esters (nitroglycerin, nitrocellulose, nitroquanidine) in Modified SW-846-8330.
SVE/AVS - Simultaneously Extractable Metals/Acid Volatile Sulfide
** - "Draft Analytical Method for Determination of Acid Volatile Sulfide in Sediment."

- Groundwater - To determine if the groundwater has been impacted, six temporary drive points will be installed and a groundwater sample will be collected from each point. The wells shall be installed according to Station SOP GH-12 "Groundwater Monitoring Point Installation". The sample shall be collected in accordance with Station SOP SA-01 "Groundwater Sample Acquisition and Onsite Water Quality Testing".

- Geophysical Survey - A geophysical survey will be performed to more accurately identify and define the landfill boundaries.

- Photosurvey - A survey of existing aerial photographs of the Town Gut Landfill will be reviewed in conjunction with the results of the geophysical survey to more accurately define the landfill's horizontal limits.

4.0 SITE 39 - ORGANICS PLANT

4.1 SITE DESCRIPTION AND ENVIRONMENTAL SETTING

Site 39 organic plant is in the southeast portion of the station. Site 39 consists of a discharge pipe, outlet area, and the section of Mattawoman Creek adjacent to the site as shown in Figure 4-1. This section will evaluate all the sediments associated with Mattawoman Creek in the vicinity of Sites 39, 40, and 41. The discharge pipe conveys flow from the organics plant to Mattawoman Creek at IW05, an NPDES discharge point. The pipe discharges on a steep slope into Mattawoman Creek.

Operations in the organics plant occurred from 1961 to 1965 which included formulating bis-2,2-dinitropropanol acetal/formal (acetal/formal), a propellant binder (E/A&H, 1994). Silver nitrate was used as a catalyst in producing acetal/formal. Reportedly, several accidental releases occurred via the Site 39 outfall as a result of an improperly closed valve (E/A&H, 1994). Compounds suspected of having been released include: acetal/formal, silver, dinitropropanol, ethylene dichloride, methylene chloride, and formaldehyde. Also, site personnel reported that acetal/formal and silver were visible at times on the surface of Mattawoman Creek near this outfall.

There are two other potential sources of sediment contamination in the vicinity of Site 39 that discharge into Mattawoman Creek (Site 40 - Paladium Catalyst Site and Site 41 - Scrap Yard). Previous sediment sampling in Mattawoman Creek was performed separately for these three sites. However, in order to assess the impact that these operations may have on Mattawoman Creek, the potential area impacted will be assessed as one area under Site 39.

4.2 PREVIOUS INVESTIGATION

A Potomac River Sediment Study was conducted by the Chesapeake Laboratory of the United States Environmental Protection Agency (USEPA) in 1970. Results of the analysis showed unusually high concentrations of elemental silver existing in the sediments in the area. Silver appeared at a concentration of 1207 ppm, compared with upstream and downstream levels of 2 to 4 ppm respectively (Hauser and Faith).

Sampling was conducted during the Phase II Site Inspection to determine if sediments in the IW-05 outfall of Site 39 and in Mattawoman Creek were contaminated from reported releases. Sampling and analysis performed is summarized as shown in Table 4-1.

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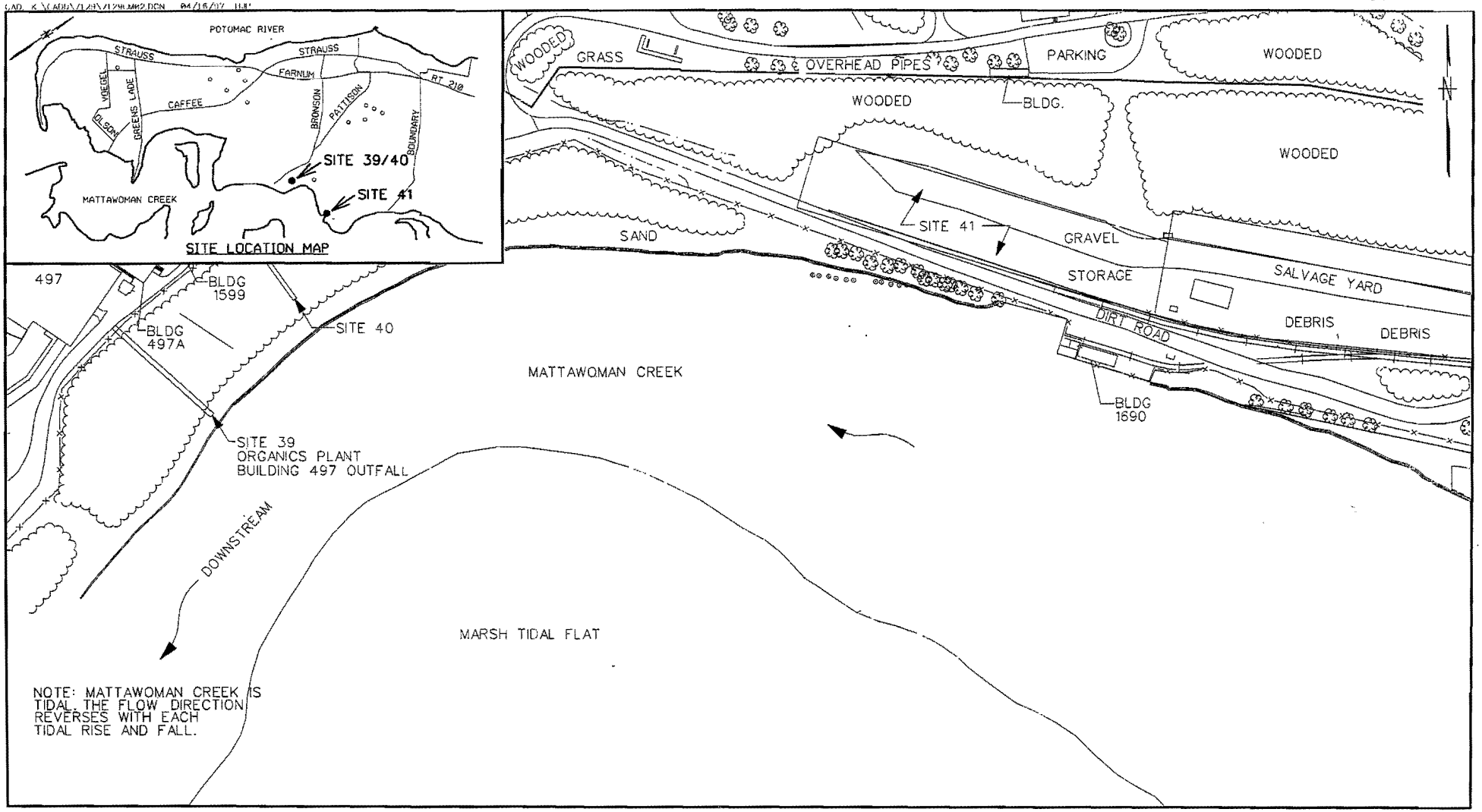

FIGURE 4-1

GENERAL SITE MAP
SITE 39/40/41 - ORGANICS PLANT & MATTAWOMAN CREEK(SEDIMENTS)
INDIAN HEAD, MARYLAND

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TABLE 4-1
PREVIOUS INVESTIGATION
SITE 39 - ORGANICS PLANT OUTFALL AND
MATTAWOMAN CREEK SEDIMENTS
INDIAN HEAD, MARYLAND

Sample Media:	Surface sediments (at outfall) Sediments in Mattawoman Creek (Sites 39, 40, and 41)			
Sampling Performed:	**Type**	**Number**	**Sam/Loc**	**Total**
	Surface sediments	2	1	2
	Sediment samples (Sites 39, 40, and 41)	11	1	11
Analysis Performed:	**Media**	**Analyses**		
	Surface sediments	TAL, VOC, SemiVOC, Acetal/formal, PNC, UDMH, HBNQ		
	Sediment (Sites 39, 40, 41)	TAL, VOC, SemiVOC, Acetal/formal, PNC, UDMH, HBNQ, Palladium; Site 40 Palladium only		

Surficial (top 6 inches) sediment samples were collected from Mattawoman Creek and two surface sediment locations were sampled at the outfall. The samples were submitted for analysis of VOCs, SemiVOCs, TAL metals, and Explosive Derivatives. Figure 4-2A provides the location and analytical results which exceed the USEPA screening levels for the two samples collected at the Site 39 outfall and the location and analytical results of the sediment samples in Mattawoman Creek near the Site 39 outfall which exceed the USEPA Region III screening levels. Figure 4-2B provides the location and analytical results which exceed the USEPA Region III screening levels for the sediment samples collected in Mattawoman Creek near the Site 41 scrap yard.

The samples collected for Site 40 in Mattawoman creek were analyzed for palladium only and results were all nondetect. The two Site 39 surface sediment locations, 01 and 02, were collected at the immediate outfall of the pipe and in the channel leading to Mattawoman Creek. No visible sign of stressed vegetation exist in this area. Neither sample contained detectable volatile organics, however DP01 had thirteen detectable semivolatile organics and had levels of silver and lead above background levels. Nitroquanidine (NQ) and nitrocellulose were detected in both sample locations.

In the eleven sediment samples collected from Mattawoman Creek in the area of Sites 39, 40, and 41, low levels of volatile organic compounds, semivolatile organic compounds, pesticides and metals were detected. Three volatile organic compounds were detected (acetone, chloromethane, and carbon disulfide) at minimum concentrations.

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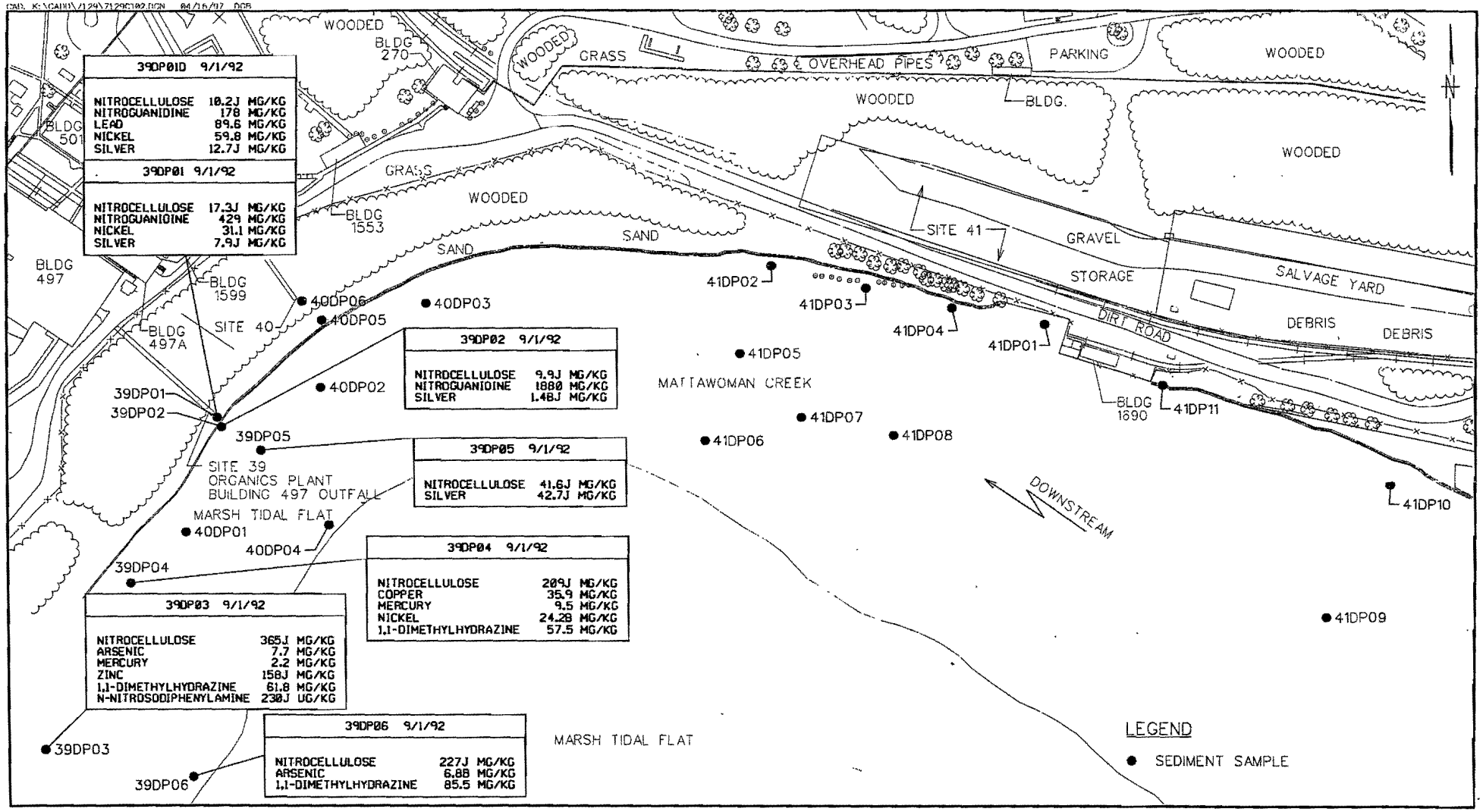

PREVIOUS SAMPLING RESULTS
SITE 39/40/41 - ORGANICS PLANT OUTFALL
AND MATTAWOMAN CREEK SEDIMENTS (CONTINUED ON FIGURE 4-2B)
INDIAN HEAD, MARYLAND

FIGURE 4-2A

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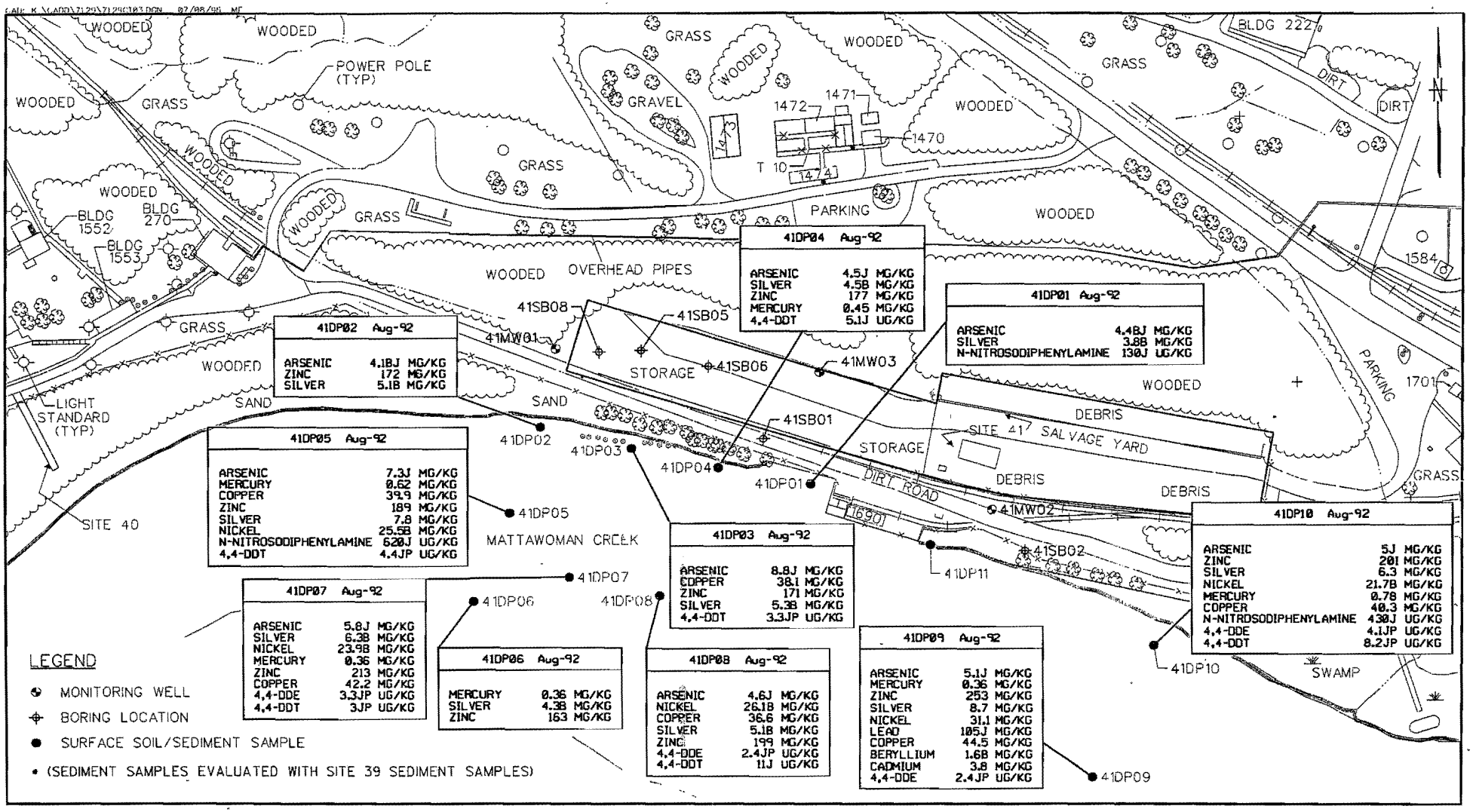

FIGURE 4-2B

PREVIOUS SAMPLING
SITE 39/40/41 – MATTAWOMAN CREEK SEDIMENTS (CONTINUED FROM FIGURE 4-2A)
INDIAN HEAD, MARYLAND

0 100 200
SCALE IN FEET

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4.3 HUMAN HEALTH RISK ASSESSMENT

A human health risk assessment for the site will be performed and documented in the RI Report. Analytical data generated under this Project-Specific Work Plan, as well as historical data for the site, will be used to determine if measured chemical concentrations pose a significant threat to potential human receptors. The general methodologies which will be used to assess human health risks are contained in Section 3.0 of the Master Work Plan for the Station. The remainder of this section of the Project-Specific Work Plan identifies preliminary COCs based on existing site information, screening levels which will be used to identify COCs in the risk assessment, and exposure scenarios to be evaluated.

Several metals, nitrate esters, and pesticides, as indicated on Figures 4-2A and 4-2B, have been identified as preliminary COCs for the site. USEPA Region III soil COC screening levels for industrial land use will be used to identify site-specific COCs for sediment in the human health risk assessment.

Although access to the plant is physically restricted by a chain-link fence, adolescent trespassers (ages 6 to 16) under current land use will be evaluated in the risk assessment since the outfall areas at the site are potentially accessible. Adolescent trespassers will be assumed to be exposed to sediment at the discharge locations near Mattawoman Creek. Potentially complete exposure pathways to be considered in the development of the human health risk assessment are provided in Table 3-2 of the Master Work Plan.

Based on previous project-specific discussions with the Station, NAVY, and USEPA (May 7, 1996), a future residential exposure scenario is not considered to be likely for the site and will not be evaluated in the RI Report since the site is situated in the main production area. If the Station were to close in the future, it is anticipated that the area would be used for industrial/commercial purposes only. Maintenance activities and daily occupational duties are not performed at the site, therefore, Station personnel (workers) will not be regarded as potential receptors.

4.4 ECOLOGICAL RISK ASSESSMENT

The results of previous investigations in Mattawoman Creek revealed slightly elevated levels of VOCs, SemiVOCs, pesticides and metals in sediments near Site 39. This stretch of Mattawoman Creek supports an excellent tidal fishery and tidal marshes. In addition, Site 41 is located immediately to the east of Site 39, also adjacent to Mattawoman Creek. However, the results of previous investigations did not clearly implicate these two sites as the source(s) of contaminants in Mattawoman Creek sediments, and the nature and extent of contamination could be more fully characterized. Since Sites 39 and 41 are in

proximity to each other, and since Mattawoman Creek may receive contaminant inputs from other, upstream sources, the area near the sites will be investigated together as a contiguous reach of the creek. These data and related information will be used to conduct an Ecological Risk Assessment (ERA) for Site 39. The watershed approach, and the generalized methodology for the ERA, are described in Section 4.0 of the Master RI Work Plan.

The ecological investigation scoping and work plan is presented in the investigative scoping section, but to highlight the specifics, sediment samples will be taken near the Site 39 outfall and in Mattawoman Creek at and around Site 39. These data will help define the full nature and extent of contamination, further determine whether Site 39 is a contaminant source, and be used to assess potential risks to ecological receptors that utilize Mattawoman Creek.

4.5 INVESTIGATIVE SCOPING

The two surface sediment samples collected at the Organics plant outfall and the sediment samples collected in Mattawoman Creek were evaluated against Human Health and Ecological risk screening levels. Evaluation of these samples indicate elevated levels of contamination above the USEPA Region III screening levels. Additional sampling to further evaluate the sediments of Mattawoman Creek is warranted.

Scoping of the various media is as follows:

- Subsurface Soil - No previous sampling was conducted to evaluate subsurface soils. This outfall is at the edge of the Mattawoman creek, so subsurface sampling is not warranted.
- Sediment - Sediment samples previously collected indicate contamination above the screening levels. Surface sediments have the potential to migrate off site and have several pathways for both human and ecological exposure. Additional sediment sampling shall be conducted to determine the extent of contamination. Based on historical information and past analytical results the samples should be analyzed for metals, semi volatiles and nitrate esters.
- Surface Water - No surface water has been collected and based on the large value of water that regularly flows through this area, surface water samples would not provide a representative indication of sediment concentrations of contaminants.

- Groundwater - No groundwater samples were collected in the past investigations. This area is directly on or in the Mattawoman creek, therefore groundwater sampling is not appropriate.

A summary of the investigative scoping for Site 39, which includes sediment investigation of an area of Mattawoman Creek contiguous and adjacent to Sites 39, 40, and 41, is presented in Table 4-2. This area has been determined to be an ecologically sensitive area, therefore a separate evaluation concentrating on ecological factors was performed and the scoping is as shown in Table 4-3.

4.6 WORK PLAN

The proposed scope for the field investigation is summarized on Table 4-4 and the ecological samples are summarized on Table 4-5. Table 4-6 summarizes the sampling program and analysis and Table 4-7 provides sample bottle, containers, and holding time requirements. The proposed location of the samples are provided on Figure 4-3.

- Subsurface/Surface Soils - No sampling proposed.

- Sediment Soils - Four sediment samples will be collected to evaluate the area in the immediate vicinity of the organics plant outfall (three at the outfall and one downgradient). The sediments of Mattawoman creek will be further evaluated by collecting four additional samples in the area within Mattawoman Creek between Site 39 and 41. The samples will be collected using the techniques identified in Station SOP SA-02 "Surface water and sediment sampling". These samples will be analyzed for TCL VOCs, TCL SemiVOCs, TAL metals, pesticides/PCBs, explosives, Total Organic Carbon (TOC) and Simultaneously Extractable Metals/Acid Volatile Sulfice (SEM/AVS).

- Surface Water - No sampling proposed.

- Groundwater - No sampling proposed.

TABLE 4-2

INVESTIGATION SCOPING
SITE 39 - ORGANICS PLANT
INDIAN HEAD, MARYLAND

Media/ Exposure Pathway	Identified/ Suspect Contaminants	Screening Level	Preliminary Risk Evaluation	Data Gaps/Investigative Objective	Potential Response Actions	Potential Remedial Technologies
Sediments for Sites 39, 40, and 41	Metals and explosives	EPA Region III screening levels	Sediments exceed screening levels and may have potential for additional downstream transport.	Conduct additional sampling to determine if contamination exists at concentrations that pose risk. Further evaluate or a site specific risk based.	If contamination is detected above the screening levels, determine if additional work is needed (biota sampling, etc.) to assess site. If concentrations are below screening levels, then no further action is required	Sediment removal No further action required.

TABLE 4-3

ECOLOGICAL INVESTIGATION SCOPING
SITE 39 - ORGANICS PLANT
INDIAN HEAD, MARYLAND

Media/ Exposure Pathway	Identified/Suspect Contaminants	Screening Levels	Preliminary Risk Evaluation	Data Gaps/Investigative Objective	Potential Response Actions	Potential Remedial Action
Sediments	Metals and PAHs	Region III BTAG Screening Levels	Some concentrations above screening levels, but most concentrations are relatively low.	Fully characterize nature and extent of contamination in sediments/use data to conduct ecological risk assessment.	Determine potential risks to ecological receptors and the need, if any, for additional sediment investigations.	Removal of sediments/ Biomonitoring/No further action.

TABLE 4-4

SITE SPECIFIC WORK PLAN
SITE 39 - ORGANICS PLANT
INDIAN HEAD, MARYLAND

Data Needs	Investigative Technique	Location	Number of samples	Analysis
Further characterize the nature and extent of contamination in the sediments.	Collect 4 sediment samples in suspected contaminated area.	Collect surface sediment samples one upstream of Site 41 and 3 in suspected area	4	TCL VOCs, TCL SVOCs, TAL Metals, Pesticides/PCBs, Explosives, TOC, SEM/AVS

TABLE 4-5

ECOLOGICAL SITE-SPECIFIC WORK PLAN
SITE 39 - ORGANICS PLANT
INDIAN HEAD, MARYLAND

Data Needs	Investigative Technique	Location	Number of Samples	Analysis
Verify the nature of contamination in Mattawoman Creek sediments.	Collect sediment from Mattawoman Creek.	In Mattawoman Creek upstream, adjacent to, and downstream of Site 39 (in conjuction with Site 41 investigations).	4	TCL VOCs, TCL SVOCs, TAL Metals, Pesticides/PCBs, Explolsives, TOC, SEM/AVS

TABLE 4-6

SUMMARY OF SAMPLING PROGRAM
SITE 39 - ORGANICS PLANT
INDIAN HEAD, MARYLAND

Sample Media	Sample ID Number	Sample Depth/ Location	Analysis						
			VOCs	SVOCs	Metals	Pesticides/ PCBs	Explosives	TOC	SEM/AVS
Sediments	RI39SD01	Downstream of Site 39	•	•	•	•	•	•	•
	RI39SD02	Outfall IW05	•	•	•	•	•	•	•
	RI39SD03	Outfall IW05	•	•	•	•	•	•	•
	RI39SD04	Outfall IW05	•	•	•	•	•	•	•
	RI39SD05	Upstream of Site 39	•	•	•	•	•	•	•
	RI39SD06	Adjacent to Site 41	•	•	•	•	•	•	•
	RI39SD07	Adjacent to Site 41	•	•	•	•	•	•	•
	RI39SD08	Upstream of Site 41	•	•	•	•	•	•	•

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TABLE 4-7

BOTTLEWARE, PRESERVATION, AND HOLDING TIME REQUIREMENTS
SITE 39 - ORGANICS PLANT
INDIAN HEAD, MARYLAND

Media	Analysis	Total Number of Samples	Number of Containers Per sample	Container Type	Preservation	Holding Times
Sediment	TCL VOCs - CLP OLM03.0	8	1	250 ml CWM glass	Cool to 4°C	14 days to analysis
	TCL SemiVOCs - CLP OLM03.0	8	1	250 ml CWM glass	Cool to 4°C	14 days to extract; 40 days to analysis
	TAL Metals - CLP ILM04.0	8	1	250 ml CWM glass	Cool to 4°C	6 months; Hg 28 days
	Pesticides/PCBs - CLP OLM03.0	8	1	250 ml CWM glass	Cool to 4°C	14 days
	Explosives - Modified SW-846-8330*	8	1	250 ml CWM glass	Cool to 4°C	14 days to extract; 40 days to analysis
	Total Organic Carbon - Lloyd Kahn Method	8	1	250 ml CWM glass	Cool to 4°C	28 days
	SEM/AVS - USEPA Draft Method**	8	1	250 ml CWM glass	Cool to 4°C, zero to minimal headspace	14 days

CWM - Clear Wide Mouth
* - Includes analysis for nitrate esters (nitroglycerin, nitrocellulose, nitroquanidine) in Modified SW-846-8330.
SEM/AVS - Simultaneously Extractable Metals/Acid Volatile Sulfide
** - "Draft Analytical Method for Determination of Acid Volatile Sulfide in Sediment"

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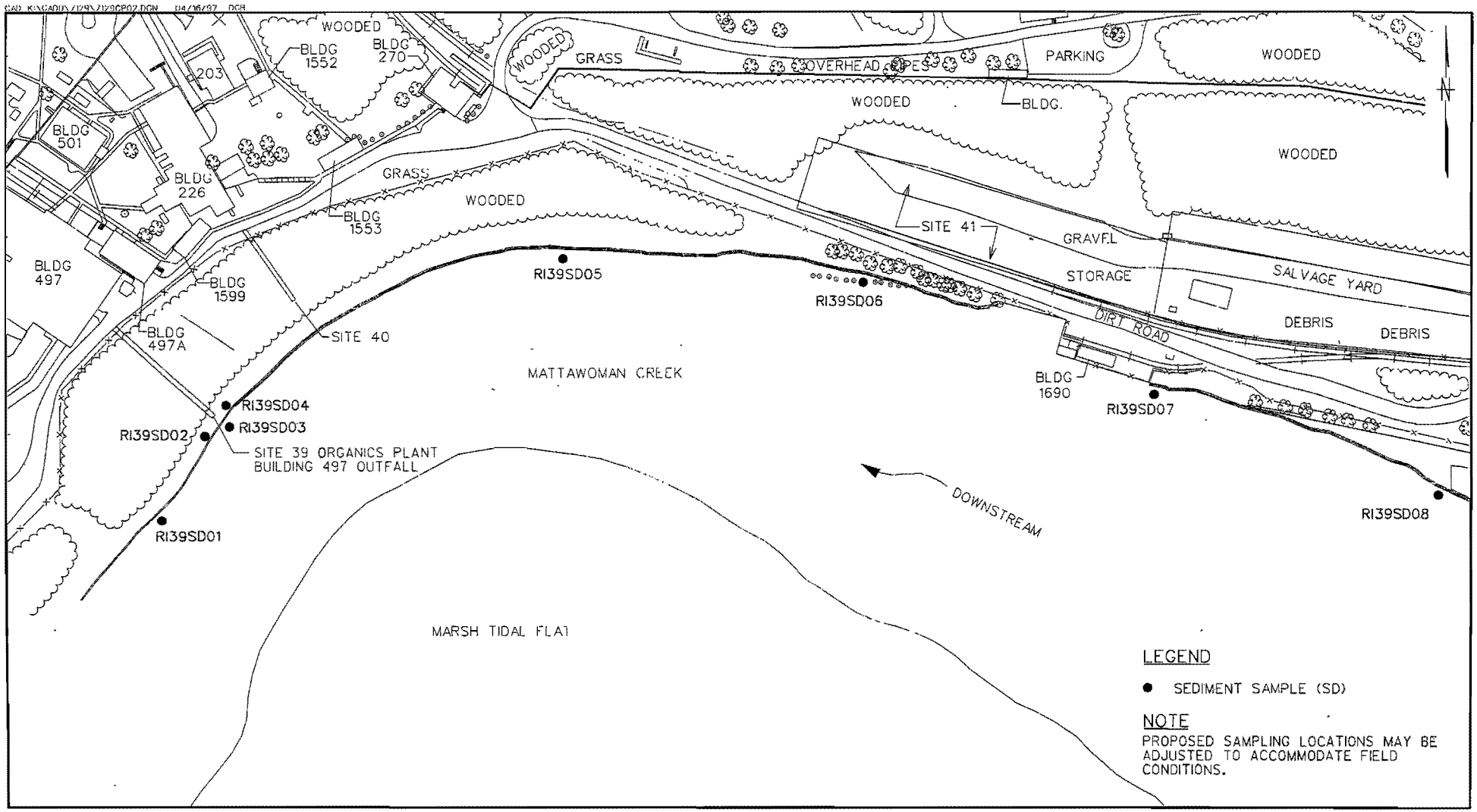

PROPOSED SAMPLING LOCATIONS MAP
SITE 39/40/41 - ORGANICS PLANT OUTFALL
AND MATTAWOMAN CREEK SEDIMENTS
INDIAN HEAD, MARYLAND

0 100 200
SCALE IN FEET

FIGURE 4-3

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5.0 SITE 41 - SCRAP YARD

5.1 BACKGROUND INFORMATION AND SITE DESCRIPTION

Site 41 - Scrap Yard, is located in the southeastern section of the facility along the shore of Mattawoman Creek, approximately 650 feet upstream of Site 39. The site is approximately 700' long by 100' wide and is surrounded by 10' chain-link fence as shown in Figure 5-1. The area is generally flat and surface runoff is toward the south in the direction of Mattawoman Creek. The majority of the area is paved with concrete, however the extent of the concrete area has not been fully identified.

This active scrap yard, is used to store metal materials and scraps, including empty storage drums, electrical transformers, spent batteries, and old office furniture. The scrap materials eventually are sold to be recycled and/or reused. The northwest end of the scrap yard was once a coal storage area.

From the 1960s to 1988, electrical transformers were stored at the northwest end of the scrap yard before offsite disposal. Seventeen transformers were identified as either PCB-contaminated or as PCB-containing after an inspection conducted in 1981 (NEESA, 1983). These transformers were believed to have leaked, potentially contaminating this area. In addition, lead batteries also have been stored in the scrap yard and may have released lead to the surface soils (E/A&H, 1994). No batteries or transformers were identified in the western portion of the scrap yard, however large stains were observed in the area which formerly contained the transformers.

5.2 PREVIOUS ENVIRONMENTAL INVESTIGATION

Sampling and analysis was conducted to determine if PCBs, solvents, or lead had contaminated the shallow soil zone, shallow groundwater, and/or creek sediments. Table 5-1 provides a summary of the sampling and analysis conducted during the Site Inspection (SI) Study. Figure 5-2A provides the location and analytical results of the soil samples which exceeds the USEPA Region III screening levels and Figure 5-2B provides the groundwater. Figure 5-2C provides the location of the soil gas samples collected, of which only low levels of organics were detected.

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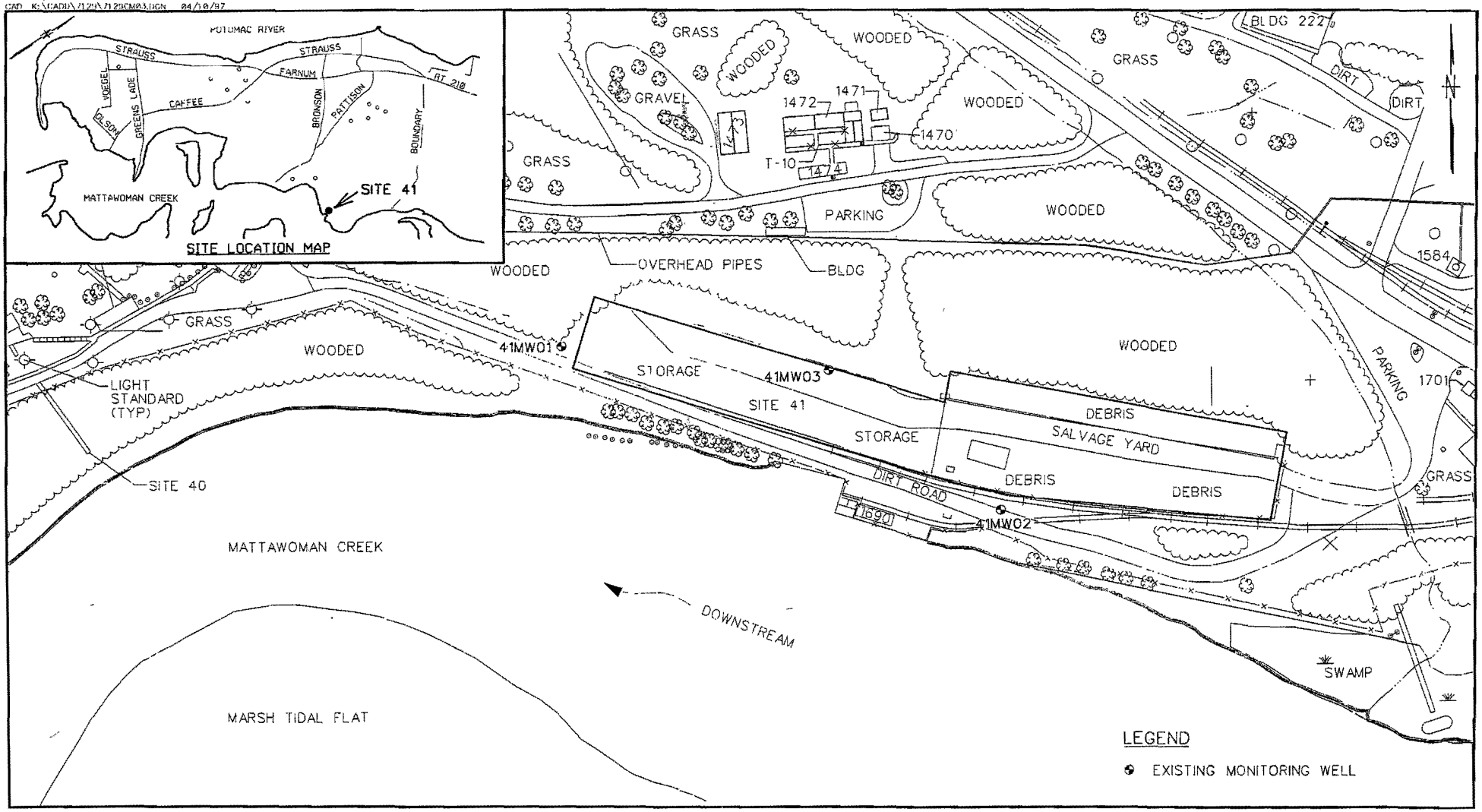

GENERAL SITE MAP
SITE 41 – SCRAP YARD
INDIAN HEAD, MARYLAND

0 100 200
SCALE IN FEET

FIGURE 5-1

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CTO 0245

TABLE 5-1
PREVIOUS INVESTIGATION
SITE 41 - SCRAP YARD
INDIAN HEAD, MARYLAND

Sample Media:	Shallow soil profile (0-20 feet, at 5-foot sample intervals) Shallow aquifer (water table aquifer) Soil-gas (vadose Zone) Sediments in Mattawoman Creek (see Section 3.0) Water puddle			
Sampling Performed:	**Type**	**Number**	**Sam/Loc**	**Total**
	Shallow soil borings*	8	3	24
	Monitoring wells - September, 1992	3	1	3
	Monitoring wells - April, 1993	3	1	3
	Soil-gas borings	8	1	8
	Sediment samples in Mattawoman Creek (see Section 3.0)			
	Grab-Water puddle	1	1	1
Analyses Performed:	**Media**	**Analyses**		
	Soil	TCL, TAL, TPH		
	Groundwater	TCL, TAL, TPH		
	Soil-gas	GC/FID Volatile Organic Compounds		
	Sediment	(see Section 3.0)		
	Water puddle	TCL, TAL		
	* Includes soil boring samples collected during the completion of soil borings and monitoring well borings.			

VOCs were observed, however, none of the detected concentrations of VOCs exceeded USEPA Region III screen levels for the 8 collected soil borings.

The three groundwater monitoring wells located on Site 41 were sampled by E/A&H in September 1992 and April 1993. Trichloroethene was detected in water samples 01 (4J, 5) and 03 (15 µg/L) during the September 1992 sampling event (E/A&H, 1994). All detected pesticide concentrations for water samples collected in April 1993 were below Contract Required Quantitation Limits (CRQLs). However, aluminum, beryllium, iron, manganese and nickel were reported at concentrations above the Federal Drinking Water Standard (E/A&H, 1994).

Finally, according to the E/A&H report, total gas chromatograph/flame ionization detection (GC/FID) volatiles were detected at 2.3 µg/L in soil-gas sample 41-7 (E/A&H, 1994). No other selected target compounds were detected in the soil-gas samples.

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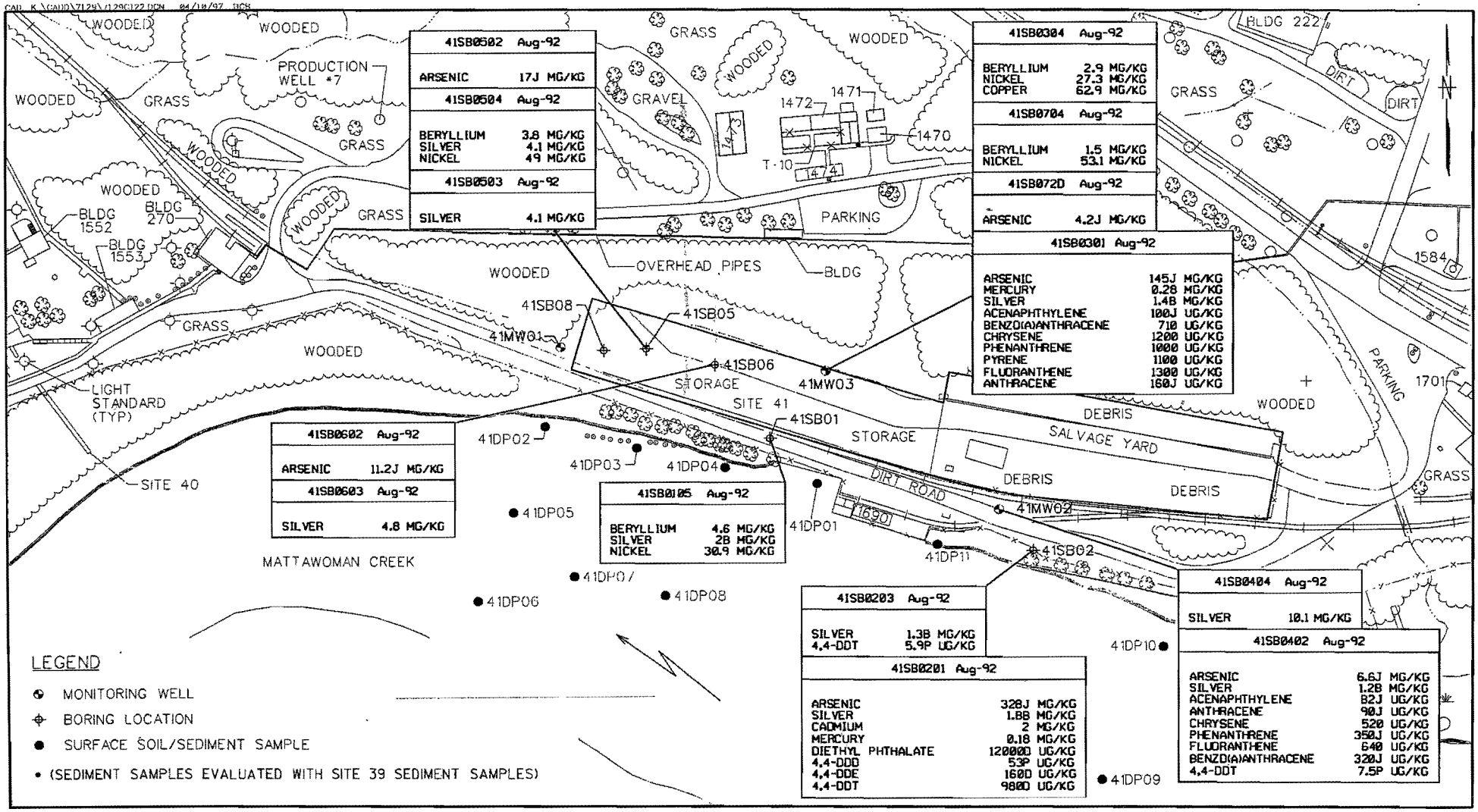

FIGURE 5-2A

PREVIOUS SOIL SAMPLING
SITE 41 – SCRAP YARD
INDIAN HEAD, MARYLAND

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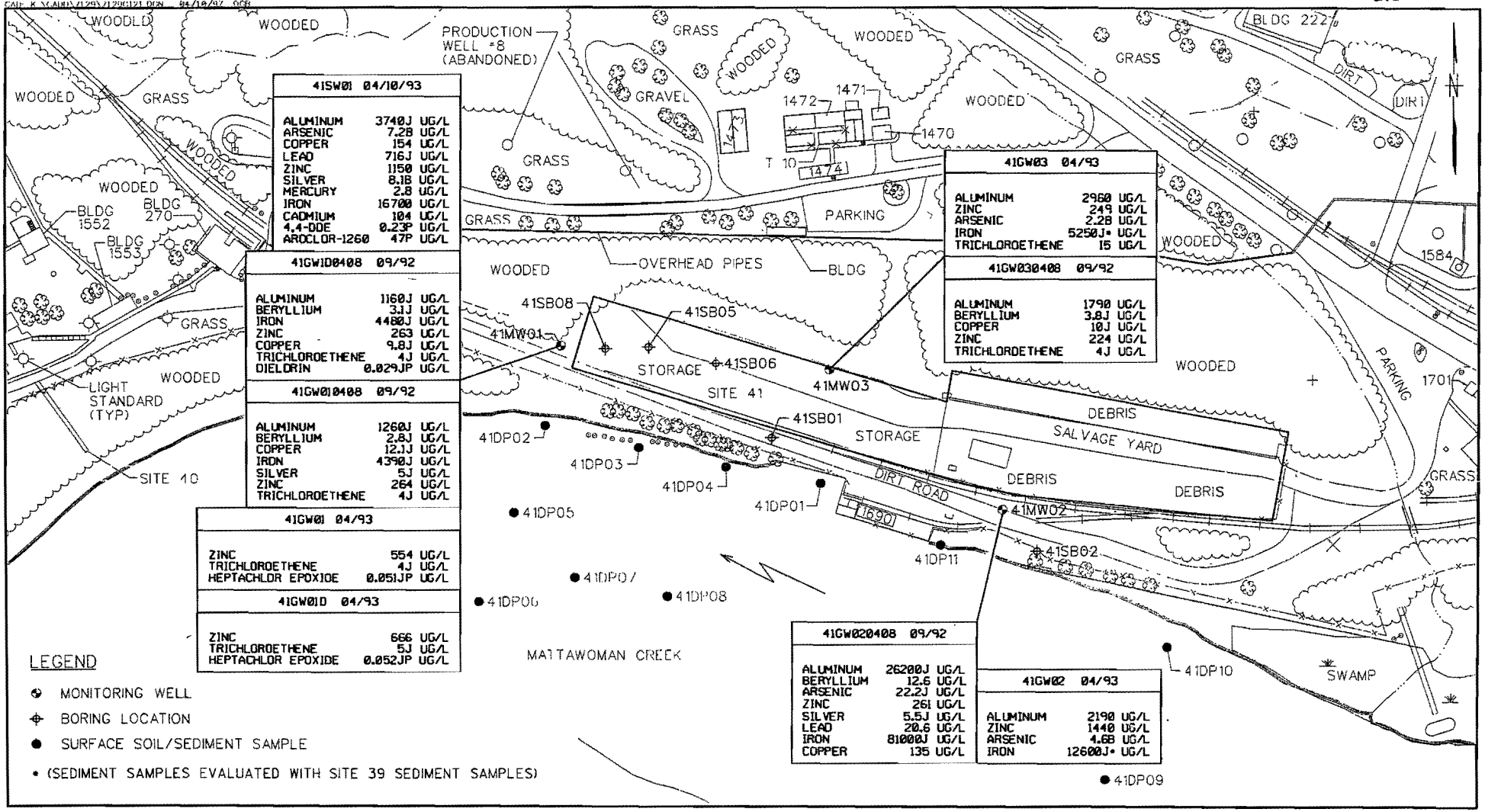

FIGURE 5-2B

PREVIOUS GROUNDWATER SAMPLING
SITE 41 – SCRAP YARD
INDIAN HEAD, MARYLAND

0 100 200
SCALE IN FEET

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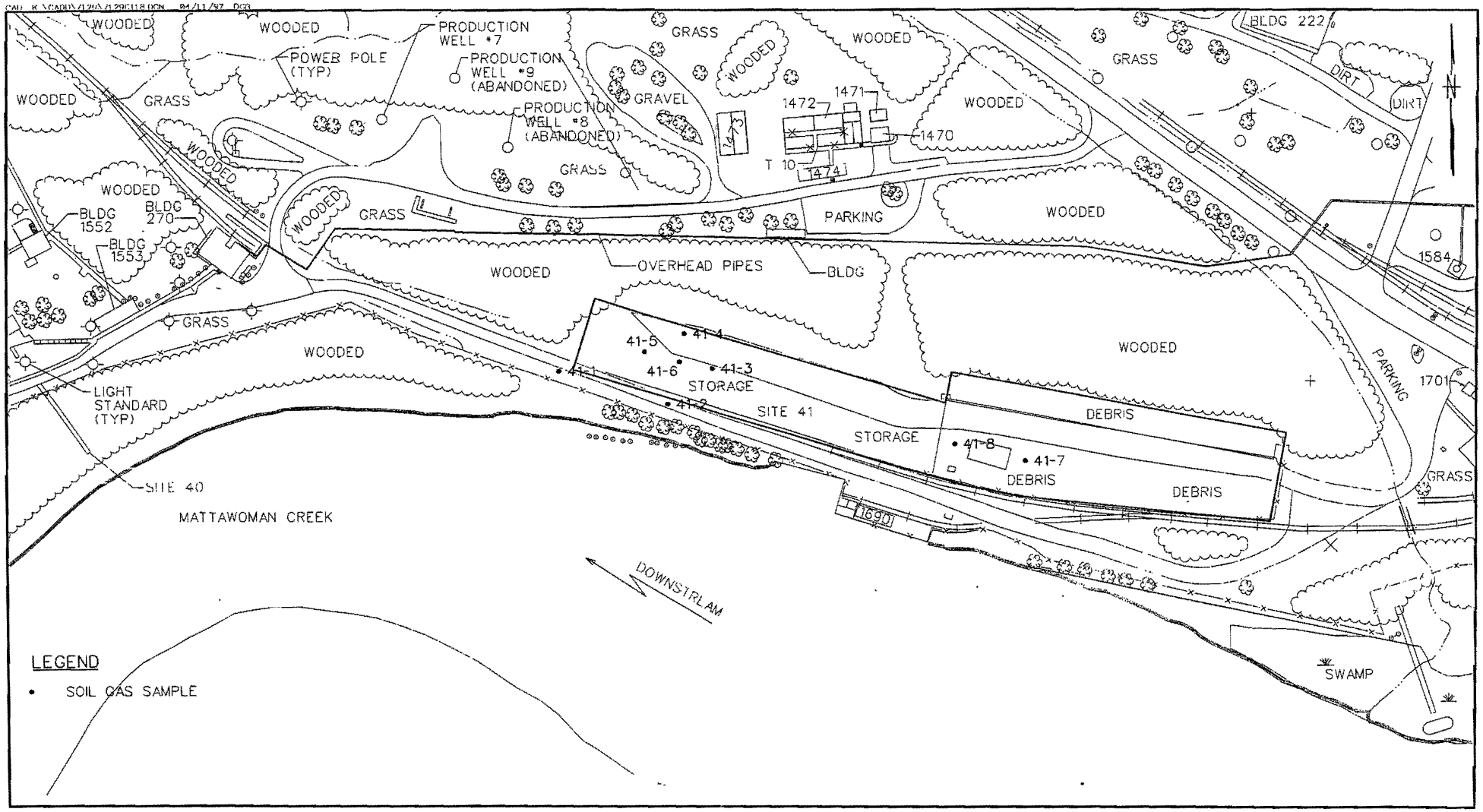

PREVIOUS SOIL GAS SAMPLING
SITE 41 – SCRAP YARD
INDIAN HEAD, MARYLAND

0 100 200
SCALE IN FEET

FIGURE 5-2C

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5.3 HUMAN HEALTH RISK ASSESSMENT

A human health risk assessment for the site will be performed and documented in the RI Report. Analytical data generated under this work plan, as well as historical data for the site, will be used to determine if measured chemical concentrations pose a significant threat to potential human receptors. The general methodologies which will be used to assess human health risks are contained in Section 3.0 of the Master Work Plan for the Station. The remainder of this section of the project-specific work plan identifies preliminary COCs based on existing site information, screening levels which will be used to identify COCs in the risk assessment, and exposure scenarios to be evaluated.

Preliminary COCs for the site consist of trichloroethene, pesticides (4,4'-DDE, dieldrin, and heptachlor epoxide), and metals (arsenic, beryllium, cadmium, iron, and lead). USEPA Region III soil COC screening levels for industrial land use will be used to identify site-specific COCs for soil and sediment in the risk assessment. For groundwater, USRegion III COC screening levels for tap water ingestion will be employed.

The following potential receptor groups will be evaluated in the human health risk assessment:

- Adolescent Trespassers
- Construction Workers

Adolescent trespassers (ages 6 to 16) under current land use will be evaluated since access to the landfill is not physically restricted. These receptors will be assumed to be exposed to sediment from the shoreline of Mattawoman Creek near the site. Exposure to soil is not anticipated for adolescent trespassers as all of the existing and proposed soil sample locations are located within the scrap yard, which is surrounded by a locked, chain-link fence. Construction workers, who will be considered to be potential receptors for future land use, will be evaluated for exposure to surface/subsurface soil (to a depth of 10 feet). Pending further review of site-specific information (depth to groundwater, detected groundwater chemicals, etc.), the risks associated with dermal exposure to groundwater may also be evaluated for this receptor group. Potentially complete exposure pathways to be considered in the development of the human health risk assessment are provided in Table 3-2 of the Master Work Plan.

Based on previous project-specific discussions with the Station, NAVY, and USEPA (HNUS, 96), a future residential exposure scenario is not considered to be likely for the site and will not be evaluated in the RI Report since the site is situated in the main production area. If the Station were to close in the future, it is anticipated that the area would be used for industrial/commercial purposes only. Maintenance activities

and daily occupational duties are not performed at the site; therefore, Station personnel (workers) will not be regarded as potential receptors.

5.4 ECOLOGICAL RISK ASSESSMENT

The results of previous investigations in Mattawoman Creek revealed slightly elevated levels of VOCs, SVOCs, pesticides and metals in sediments near Site 41. This stretch of Mattawoman Creek supports an excellent tidal fishery and tidal marshes. In addition, Site 39 is located in the area, also adjacent to Mattawoman Creek. However, the results of previous investigations did not clearly implicate these two sites as the source(s) of contaminants in Mattawoman Creek sediments, and the nature and extent of contamination could be more fully characterized. Since Sites 39 and 41 are in proximity to each other, and since Mattawoman Creek may receive contaminant inputs from other, upstream sources, the area near the sites will be investigated together as a contiguous reach of the creek. These data and related information to be collected will be used to conduct an ERA for Site 41. The approach, and the generalized methodology for the ERA, are described in Section 4.0 of the Master RI Work Plan.

The ecological investigation scoping and work plan is presented in subsequent sections, however to highlight the specifics, sediment samples will be taken in Mattawoman Creek at and around Site 41, and surface soil samples may be taken between the Scrap Yard and creek to investigate potential contaminant migration from the site to the creek, as suggested in the Site Investigation (E/S&H, 1994). Surface water and sediment samples may also be taken from the drainage depression east of the scrap yard to investigate overland migration and inputs from other sources on the base that drain to Mattawoman Creek. These data will help define the full nature and extent of contamination, further elucidate whether Site 41 is a potential contaminant source, and be used to assess potential risks to ecological receptors that utilize Mattawoman Creek.

5.5 INVESTIGATIVE SCOPING

Analytical results from the previous sampling that have been summarized in Table 5-1 indicates a wide range of sampling was conducted. Mattawoman Creek has been determined to be an ecologically sensitive area, therefore a separate evaluation concentrating on ecological factors was performed and are being evaluated with Site 39 in section 4.0. The previous analytical results have been evaluated to asses both human health and ecological risk, and the results indicate concentrations exist above these screening levels.

Evaluation of the various media is as follows:

- Surface Soils - Several surface soil samples are to be collected at Site 41 during this investigation.

- Subsurface Soils - Subsurface sampling was conducted during the installation of the monitoring wells and no additional sampling is proposed.

- Sediment Soils - Sediment samples have previously been collected from this section of Mattawoman Creek as discussed in section 4.0. Additional sediment samples will be collected from this section of Mattawoman Creek as discussed in section 4.0.

- Surface Water - No surface water samples have previously been collected at Site 41. Surface water samples are proposed in this plan to be collected at locations to be distributed in the field.

- Groundwater - Groundwater samples were collected in the past investigations. The existing monitoring wells will be resampled during this investigation.

A summary of the investigative scoping for the scrap yard is presented in Table 5-2 and because this area is considered to be ecologically sensitive additional investigation scoping to address ecological concerns is presented in Table 5-3.

5.6 WORK PLAN

The proposed scope for the field investigation is summarized on Table 5-4 and additional ecological scoping is presented in Table 5-5. The proposed location of the samples are provided on Figure 5-3. The sediments of Mattawoman Creek are evaluated as described in section 4.0 of this work plan. Table 5-6 summarizes the sampling and analysis program and Table 5-7 provides sample bottleware, preservation, and holding time requirements. The sampling to be performed by media at the Scrap Yard is as follows:

- Surface Soils - Nine surface soil samples will be collected from Site 41. Seven of the nine samples will be collected along the strip of land located immediately south of the Site 41 boundary line. Two additional samples will be collected within the southern boundary line for Site 41. All nine sample locations are indicated on Figure 5-3.

- Subsurface Soils - No samples are proposed.

TABLE 5-2

INVESTIGATION SCOPING
SITE 41 - SCRAP YARD
INDIAN HEAD, MARYLAND

Media/Exposure Pathway	Identified/ Suspected Contaminants	Screening Levels	Preliminary Risk Evaluation	Data Gaps/ Investigative Objective	Decision Rule	Potential Remedial Action
Surface Soil	VOCs, SemiVOCs, Metals, Pesticides, Petroleum Hydrocarbons	USEPA Region III screening levels	Surface soil could pose human and/or ecological risk.	Further define the extent of soil contamination.	If above screening levels perform risk assessment. If below screening levels no further action required.	Removal action
Surface Water	VOCs, Metals	USEPA Region III screening levels	Surface water contamination could pose human and/or ecological risks.	Identify localized sources of surface water contamination.	If above screening levels perform risk assessment. If below screening levels no further action required.	Localized removal actions
Groundwater	TCE, DCE, Pesticides, Metals	USEPA Region III screening levels	Groundwater contamination may impact Mattawoman Creek.	Update groundwater monitoring results.	If above screening levels perform risk assessment. If below screening levels no further action required.	Pump and treat Slurry wall
Mattawoman Sediments (See Section 3, Site 39)	NA	NA	NA		NA	NA

TABLE 5-3

ECOLOGICAL INVESTIGATION SCOPING
SITE 41 - SCRAP YARD
INDIAN HEAD, MARYLAND

Media/ Exposure Pathway	Identified/Suspect Contaminants	Screening Levels	Preliminary Risk Evaluation	Data Gaps/Investigative Objective	Potential Response Actions	Potential Remedial Action
Sediments	Metals and PAHs	USEPA Region III BTAG Screening Levels	Some concentrations above screening levels, but most concentrations are relatively low.	Fully characterize nature and extent of contamination in sediments/investigate migration pathways/use data to conduct ecological risk assessment.	Determine potential risks to ecological receptors and the need, if any, for additional sediment investigations.	Removal of sediments/ Biomonitoring/No further action.

TABLE 5-4

SITE SPECIFIC WORK PLAN
SITE 41 - SCRAP YARD
INDIAN HEAD, MARYLAND

Media	Data Needs	Investigative Technique	Location	Number of Samples	Analysis
Surface Soil	Further define the extent of soil contamination.	Collect surface soil samples.	Locations shown on Figure 5-3.	9	Full TCL and TAL analysis, Pesticides/ PCBs, and explosives.
Surface Water	Identify localized sources of surface water contamination.	Collect surface water samples in areas of visible seeps.	To be determined in field.	4	Full TCL and TAL analysis
Groundwater	Define the nature and concentrations of contamination in the upper aquifer.	Collect quarterly groundwater samples from the existing monitoring wells and production wells.	Locations shown on Figure 5-3.	16	Full TCL and TAL analysis and explosives (1st quarter).
Mattawoman Creek Sediments (see Section 4.0, Site 39)	See Table 4-4.	See Table 4-4.	See Table 4-4.	See Table 4-4	See Table 4-4.

TABLE 5-5

ECOLOGICAL SITE-SPECIFIC WORK PLAN
SITE 41 - SCRAP YARD
INDIAN HEAD MARYLAND

Data Needs	Investigative Technique	Location	Number of Samples	Analysis
Verify the nature of contamination in Mattawoman Creek sediments. (Identified in Section 4.0)	See Table 4-5	See Table 4-5	See Table 4-5	See Table 4-5
Determine possible migration pathways from scrap yard and nearby potential sources.	Collect surface water samples.	At any visible seep locations between Site 41 and Mattawoman Creek.	6	TCL, TAL

TABLE 5-6

SUMMARY OF SAMPLING PROGRAM
SITE 41 - SCRAP YARD
INDIAN HEAD, MARYLAND
PAGE 1 OF 2

Sample Media	Sample ID Number	Sample Depth/ Location	Analysis				
			VOCs	SVOCs	Metals	Pesticides/ PCBs	Explosives
Surface Soil	RI41SS01	0-6" (See Figure 5-3*)	•	•	•	•	•
	RI41SS02	0-6" (See Figure 5-3*)	•	•	•	•	•
	RI41SS03	0-6" (See Figure 5-3*)	•	•	•	•	•
	RI41SS04	0-6" (See Figure 5-3*)	•	•	•	•	•
	RI41SS05	0-6" (See Figure 5-3*)	•	•	•	•	•
	RI41SS06	0-6" (See Figure 5-3*)	•	•	•	•	•
	RI41SS07	0-6" (See Figure 5-3*)	•	•	•	•	•
	RI41SS08	0-6"/Visibly stained area in western portion of site	•	•	•	•	•
	RI41SS09	0-6"/Visibly stained area in eastern portion of site	•	•	•	•	•
Surface Water	RI41SW01	Determined in the Field	•	•	•		
	RI41SW02	Determined in the Field	•	•	•		
	RI41SW03	Determined in the Field	•	•	•		
	RI41SW04	Determined in the Field	•	•	•		
	RI41SW05	Determined in the Field	•	•	•		
	RI41SW06	Determined in the Field	•	•	•		

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TABLE 5-6

SUMMARY OF SAMPLING PROGRAM
SITE 41 - SCRAP YARD
INDIAN HEAD, MARYLAND
PAGE 2 OF 2

Sample Media	Sample ID Number	Sample Depth/ Location	Analysis				
			VOCs	SVOCs	Metals	Pesticides/ PCBs	Explosives
Groundwater	RI41GW01/ RI41GW05/ RI41GS08/ RI41GW11	Existing Monitoring Well 41MW01 (4 Quarters)	•	•	•	•	•
	RI41GW02/ RI41GW06/ RI41GW09/ RI41GW12	Existing Monitoring Well 41MW02 (4 Quarters)	•	•	•	•	•
	RI41GW03/ RI41GW07/ RI41GW10/ RI41GW13	Existing Monitoring Well 41MW03 (4 Quarters)	•	•	•	•	•
	RI41GW04	Existing Production Well #7	•	•	•	•	•
Sediment		See Site 39 (Table 4-6)					

* It is preferred that the sample is collected from within any defined runoff drainage path located in this general area.

TABLE 5-7

BOTTLEWARE, PRESERVATION, AND HOLDING TIME REQUIREMENTS
SITE 41 - SCRAP YARD
INDIAN HEAD, MARYLAND
PAGE 1 OF 2

Media	Analysis	Total Number of Samples	Number of Containers Per sample	Container Type	Preservation	Holding Times
Groundwater	TCL VOCs - CLP OLM03.0	13	2	40 ml glass	HCL pH <2, Cool to 4°C	14 days to analysis
	TCL SemiVOCs - CLP OLM03.0	13	1	1L amber glass	Cool to 4°C	7 days to extract; 40 days to analysis
	TAL Metals - CLP ILM04.0	13	1	1L plastic	HNO_3 pH <2	6 months; Hg 28 days
	Pesticides/PCBs - CLP OLM03.0	13	1	1L amber glass	Cool to 4°C	7 days to extract; 40 days to analysis
	Explosives - Modified SW-846-8330*	13	1	1L amber glass	Cool to 4°C	7 days to extract; 40 days to analysis
Surface Water	TCL VOCs - CLP OLM03.0	6	2	40 ml glass	HCL pH <2, Cool to 4°C	14 days to analysis
	TCL SemiVOCs - CLP OLM03.0	6	1	1L amber glass	Cool to 4°C	7 days to extract; 40 days to analysis
	TAL Metals - CLP ILM04.0	6	1	1L plastic	HNO_3 pH <2	6 months; Hg 28 days
Sediment	TCL VOCs - CLP OLM03.0	See Site 39 (Table 4-7)				
	TCL SemiVOCs - CLP OLM03.0					
	TAL Metals - CLP ILM04.0					
	Pesticides/PCBs - CLP OLM03.0					

BOTTLEWARE, PRESERVATION, AND HOLDING TIME REQUIREMENTS
SITE 41 - SCRAP YARD
INDIAN HEAD, MARYLAND
PAGE 2 OF 2

Media	Analysis	Total Number of Samples	Number of Containers Per sample	Container Type	Preservation	Holding Times
Sediment (Continued)	Explosives - Modified SW-846-8330*	See Site 39 (Table 4-7)				
	Total Organic Carbon - Lloyd Kahn Method					
	SEM/AVS - USEPA Draft Method**					
Surface Soil	TCL VOCs - CLP OLM03.0	9	1	250 ml CWM glass	Cool to 4°C	14 days to analysis
	TCL SVOCs - CLP OLM03.0	9	1	250 ml CWM glass	Cool to 4°C	14 days to extract; 40 days to analysis
	TAL Metals - CLP ILM04.0	9	1	250 ml CWM glass	Cool to 4°C	6 months; Hg 28 days
	Pesticides/PCBs - CLP OLM03.0	9	1	250 ml CWM glass	Cool to 4°C	14 days
	Explosives - Modified SW-846-8330*	9	1	250 ml CWM glass	Cool to 4°C	14 days to extract; 40 days to analysis

CWM - Clear Wide Mouth
* - Includes analysis for nitrate esters (nitroglycerin, nitrocellulose, nitroquanidine) in Modified SW-846-8330.
SEM/AVS - Simultaneous Extractable Metals/Acid Volatile Sulfide.
** - "Draft Analytical Method for Determination of Acid Volatile Sulfide in Sediment."

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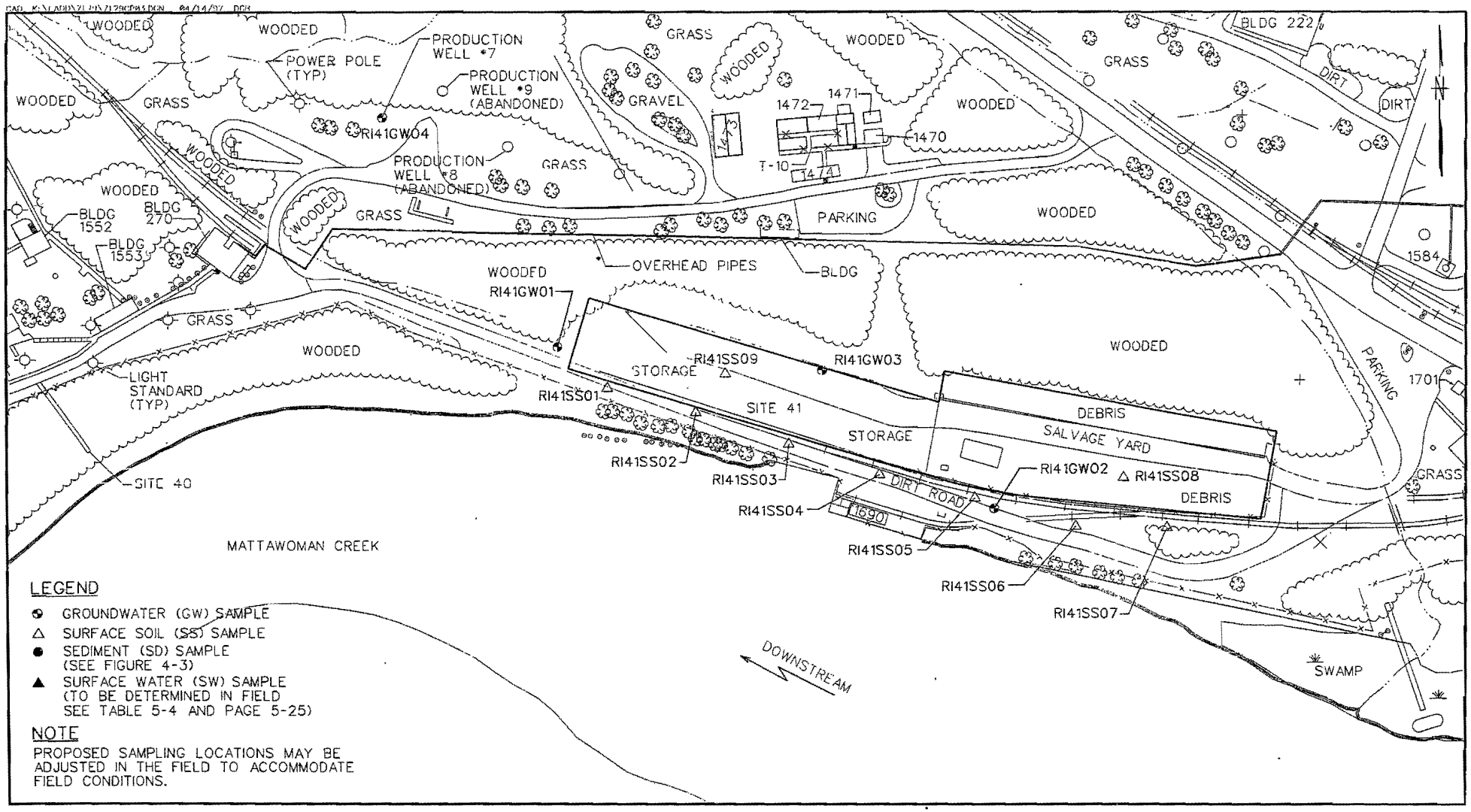

FIGURE 5-3

PROPOSED SAMPLING LOCATION MAP
SITE 41 – SCRAP YARD
INDIAN HEAD, MARYLAND

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- Sediments - See the Work Plan for Site 39 for a description and location of sediment samples to be collected from the Site 39/40/41 areas.

- Surface Water - Six surface water samples will be collected along the Mattawoman Creek shoreline, south of the Site 41 boundary. Each sample will be collected in the immediate area downgradient of any Site 41 seeps that are located along this section of the shoreline.

- Groundwater - The three existing groundwater monitoring wells will be sampled quarterly in accordance with Station SOP SA-01 "Ground Water Sample Acquisition and Onsite Water Quality Testing". Production well #7 will be sampled during the first quarter only.

6.0 SITE 42 - OLSON ROAD LANDFILL

6.1 SITE DESCRIPTION

Olson Road Landfill is in the southwestern section of the station and covers approximately 2 acres southwest of Olson Road as shown in Figure 6-1. From approximately 1982 to 1987 the area of Olson Road Landfill was used as an unauthorized solid waste disposal area. Various solid wastes from the station were dumped at the site. Disposal of hazardous wastes at the landfill cannot be confirmed or denied by activity records or personnel. A mixing, assembly, and cure facility was constructed over the northern half of the landfill in 1992.

Prior to construction of the mixing, assembly, and cure facility and paving of the area surrounding it, the landfill was bisected by a dirt road extension of Olson Road. The southern half of the site slopes to the south with visible debris of construction rubble (asphalt and concrete), wooden pallets, branches, and unlabeled cans and drums along the edges. Drainage swales border the western and southern edges of the site. A drainage pipe outfall (IW71) with a swale runs along the eastern side of the site.

The drainage swale along the western edge of the site drains into a pond at the southwestern corner of the site, which, subsequently, drains into another pond at the southeastern corner of the site. The drainage pipe outfall and accompanying swale also drain into the pond in the southeastern corner. The southeastern pond drains south into the Mattawoman Creek. Based on water level measurements collected during the Phase I Site Inspection (EnSafe/Allen & Hoshall, 1992), the shallow groundwater flow is to the south/southeast.

The Preliminary Assessment Report (NEESA, 1992) indicates the present topography does not conform to earlier topographic maps, suggesting landfilling activities. During the Phase I Site Inspection (EnSafe/Allen & Hoshall, 1992), topsoil, gravel and fill were encountered in surface soils. The Phase I Site Inspection also identified two soil units underlying the site: a silty clay unit approximately 10 to 20 feet thick and a saturated sand unit below the silty clay. A clay layer was encountered below the sand unit. Fill material, including wood, metal, asphalt, and plastic, was encountered at depths of 5 to 15 feet in the southwestern portion of the site.

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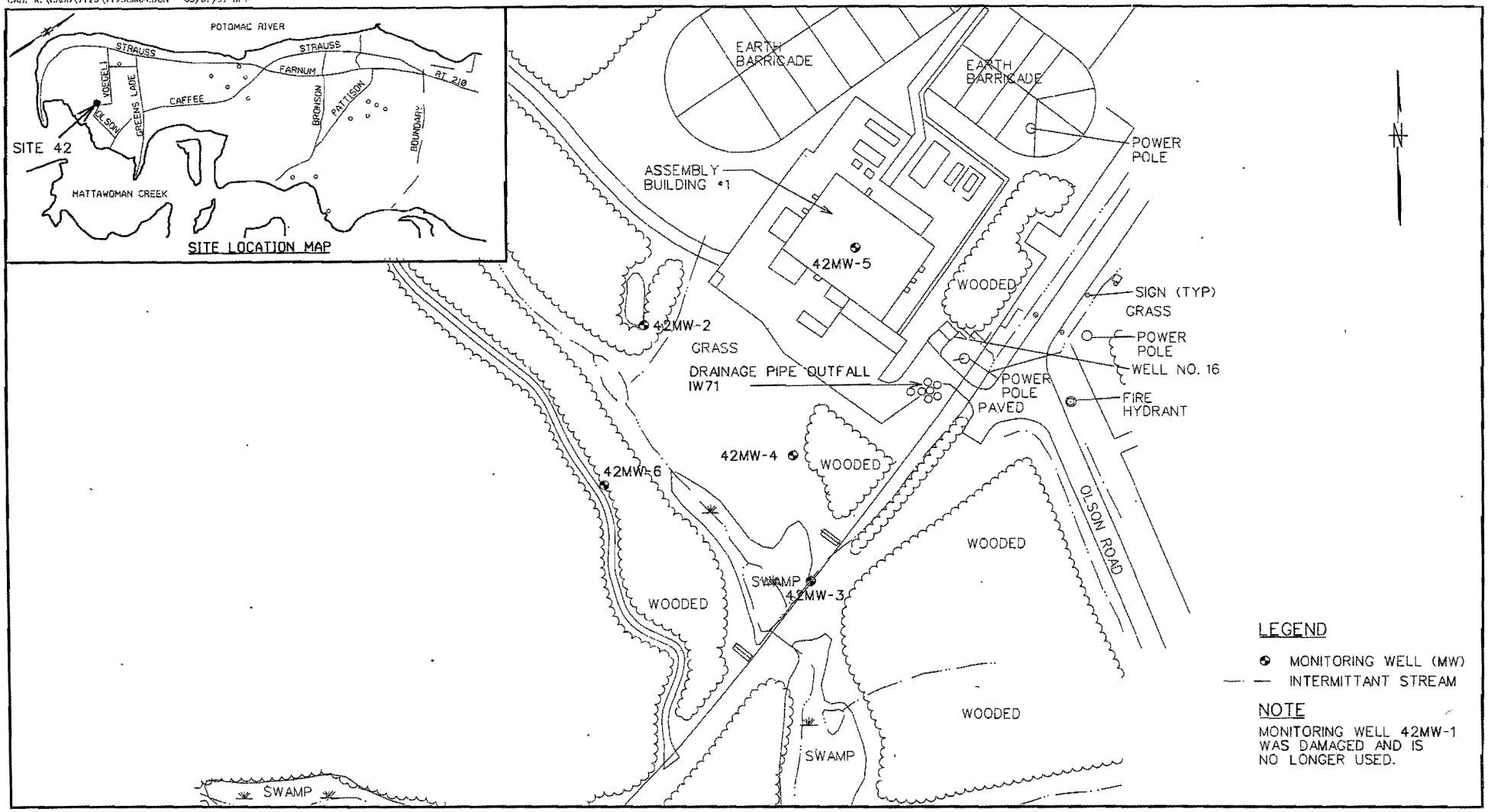

FIGURE 6-1

GENERAL SITE MAP
SITE 42 – OLSON ROAD LANDFILL
INDIAN HEAD, MARYLAND

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6.2 PREVIOUS INVESTIGATIONS

A Preliminary Assessment was prepared for Site 42 in 1992 by NEESA and concluded the site was not designated a landfill but had been used as such. The preliminary assessment recommended a Site Inspection be conducted.

Two geotechnical studies were conducted by ATEC Associates of Virginia, Inc., in 1988 and 1989 to evaluate the site soils for the foundation design of the mixing, assembly, and cure facility. Several soil borings were drilled at each corner of the proposed facility to depths of approximately 25 feet.

A Phase I Site Inspection (SI) was performed by EnSafe/Allen & Hoshall during two sampling events in 1991 and 1992. Twenty-four soil borings were drilled for the SI, and two temporary and four permanent monitoring wells were installed in six of the soil borings. Seventy-two soil samples were collected from the soil borings. Seven surface soils samples were collected in the area of the proposed mixing, assembly, and cure facility. Eight sediment samples and four surface water samples were collected from the drainage swales and ponds along the edge of the landfill. Groundwater samples were collected from the four permanent monitoring wells and the two temporary monitoring wells installed in borings 42B19 and 42B20. Groundwater grab samples were also collected from borings 42B9, 42B11, and 42B14. In addition, a geophysical survey, consisting of a magnetic study and ground penetrating radar study, was performed. Table 6-1 provides a summary of the sampling and analysis performed and Figure 6-2A provides the location and analytical results of the surface soil/sediment samples which exceed the EPA Region III screening levels. Figure 6-2B provides the location and analytical results of the groundwater samples collected which exceed the EPA Region III tap water screening levels and Figure 6-2C provides the location and analytical results of the soil boring and corresponding subsurface soil samples collected which exceed the EPA Region III screening levels. Bis(2-ethylhexyl)phthalate was detected in more than one soil sample at concentrations exceeding EPA Region III screening levels. Because concentrations of this same compound were detected by the analytical laboratory in sample blanks, however, the concentrations reported in Figure 6-2A and Figure 6-2C may not reflect actual site conditions.

Silver removal actions were performed on two swales that drain from Site 5 -Grain Manufacture and X-Ray Building- into the western and southern drainage swales of Site 42. From November 1992 to January 1993, soils and sediments from Swale 1 of Site 5, which drains into the southern drainage swale of Site 42, were excavated and removed to action levels of 10 mg/kg of silver. Silver-contaminated soil from Swale 2 of Site 5, which drains into the western drainage swale of Site 42, were excavated and removed in December 1994 to the same action levels as Swale 1. An area adjacent to the northwestern

part of Olson Road Landfill and a portion of the western swale of Site 42 were included in the removal actions for Swale 1 of Site 5.

TABLE 6-1

PREVIOUS INVESTIGATION
SITE 42 - OLSON ROAD LANDFILL

Sample Media:	Shallow soil profile (0 to 1) Subsurface soils Groundwater			
Sampling Performed:	**Type**	**Number**	**Sam/Loc**	**Total**
	Surface soils	7	1	7
	Soil borings	24	3	72
	Geophysical survey	1	NA	1
	Monitoring wells	6	1	6
Analyses Performed:	**Media**	**Analyses**		
	Soil (hand-auger)	VOC, BNA		
	Soil-gas	GC, FID Volatile Organic Compounds		

6.3 HUMAN HEALTH RISK ASSESSMENT

A human health risk assessment for the site will be performed and documented in the RI Report. Analytical data generated under this work plan, as well as historical data for the site, will be used to determine if measured chemical concentrations pose a significant threat to potential human receptors. The general methodologies which will be used to assess human health risks are contained in Section 3.0 of the Master Work Plan for the Station. The remainder of this section of the project-specific work plan identifies preliminary COCs based on existing site information, screening levels which will be used to identify COCs in the risk assessment, and exposure scenarios to be evaluated.

Preliminary COCs for the site consist of trichloroethene and metals (arsenic, beryllium, iron, and manganese). Region III soil COC screening levels for industrial land use will be used to identify site-specific COCs for soil and sediment in the risk assessment. For groundwater and surface water, Region III COC screening levels for tap water ingestion will be employed.

Under current land use, exposure to site media is limited because 1) the area near the mixing, assembly, and cure facility is covered with asphalt, and 2) the remaining area near the drainage swales are heavily vegetated and marshy. An occasional site visitor (i.e., a worker collecting samples at the associated

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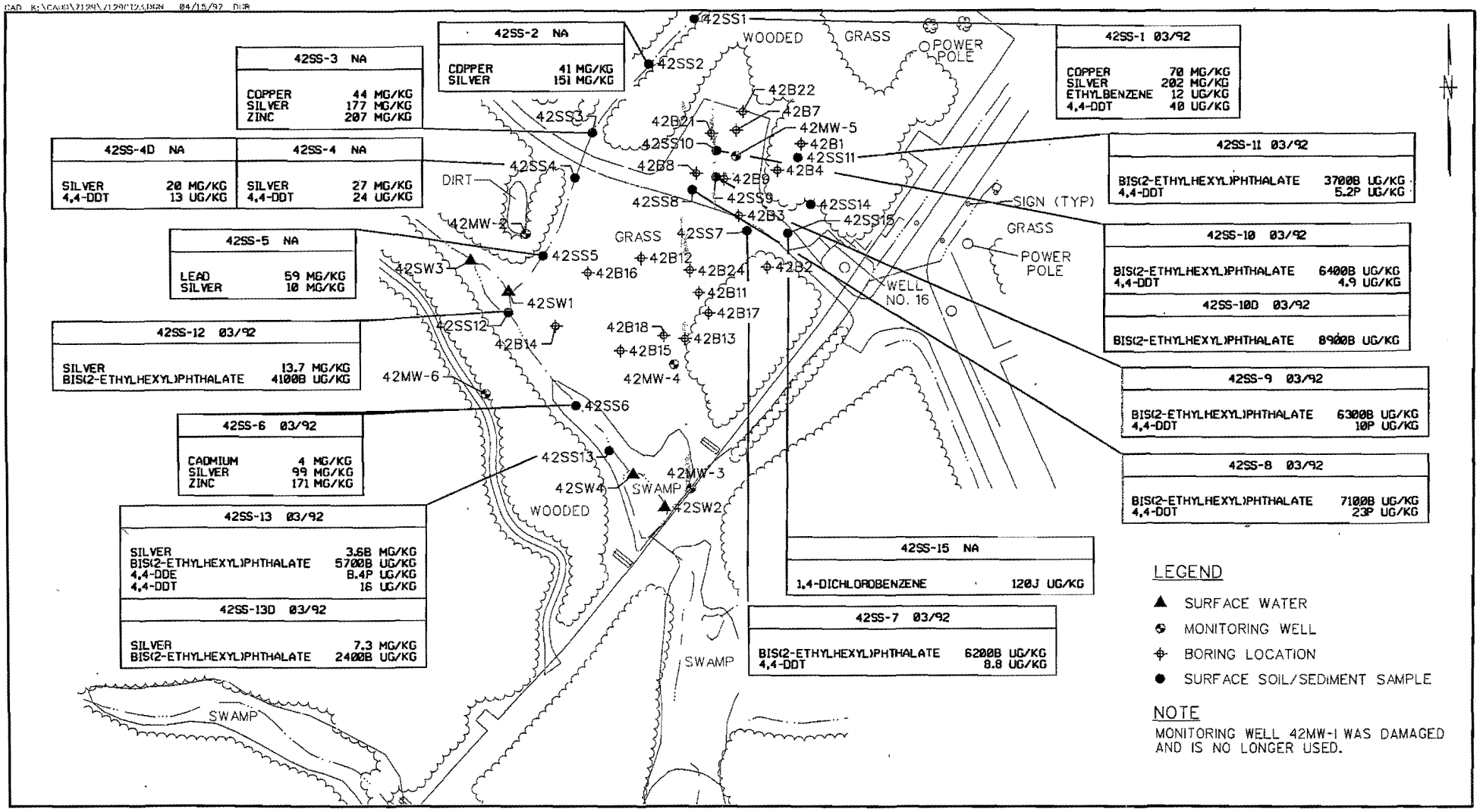

FIGURE 6-2A

PREVIOUS SURFACE SOIL/SEDIMENT SAMPLING
SITE 42 - OLSON ROAD LANDFILL
INDIAN HEAD, MARYLAND

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CTO 0245

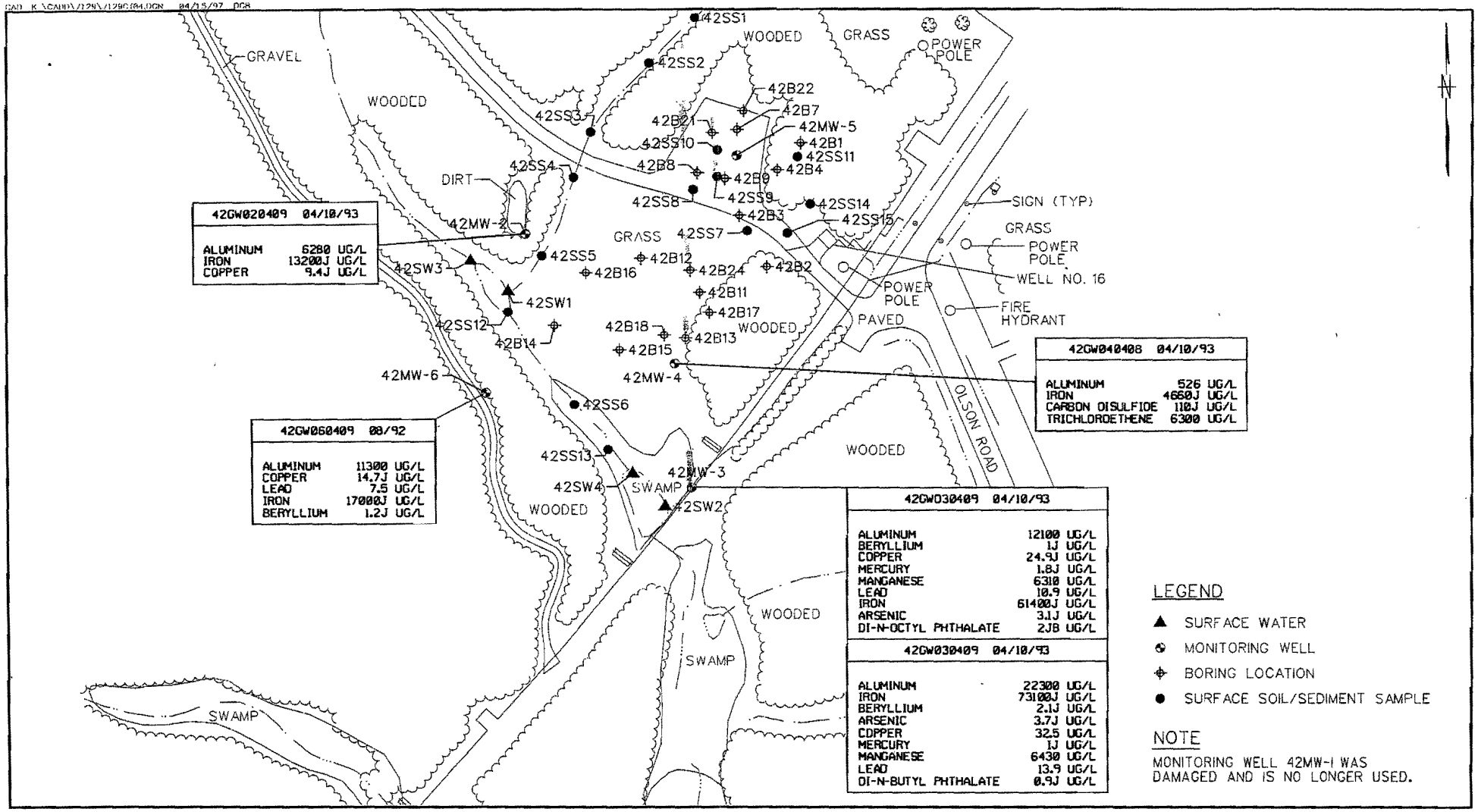

FIGURE 6-2B

PREVIOUS GROUNDWATER SAMPLING
SITE 42 - OLSON ROAD LANDFILL
INDIAN HEAD, MARYLAND

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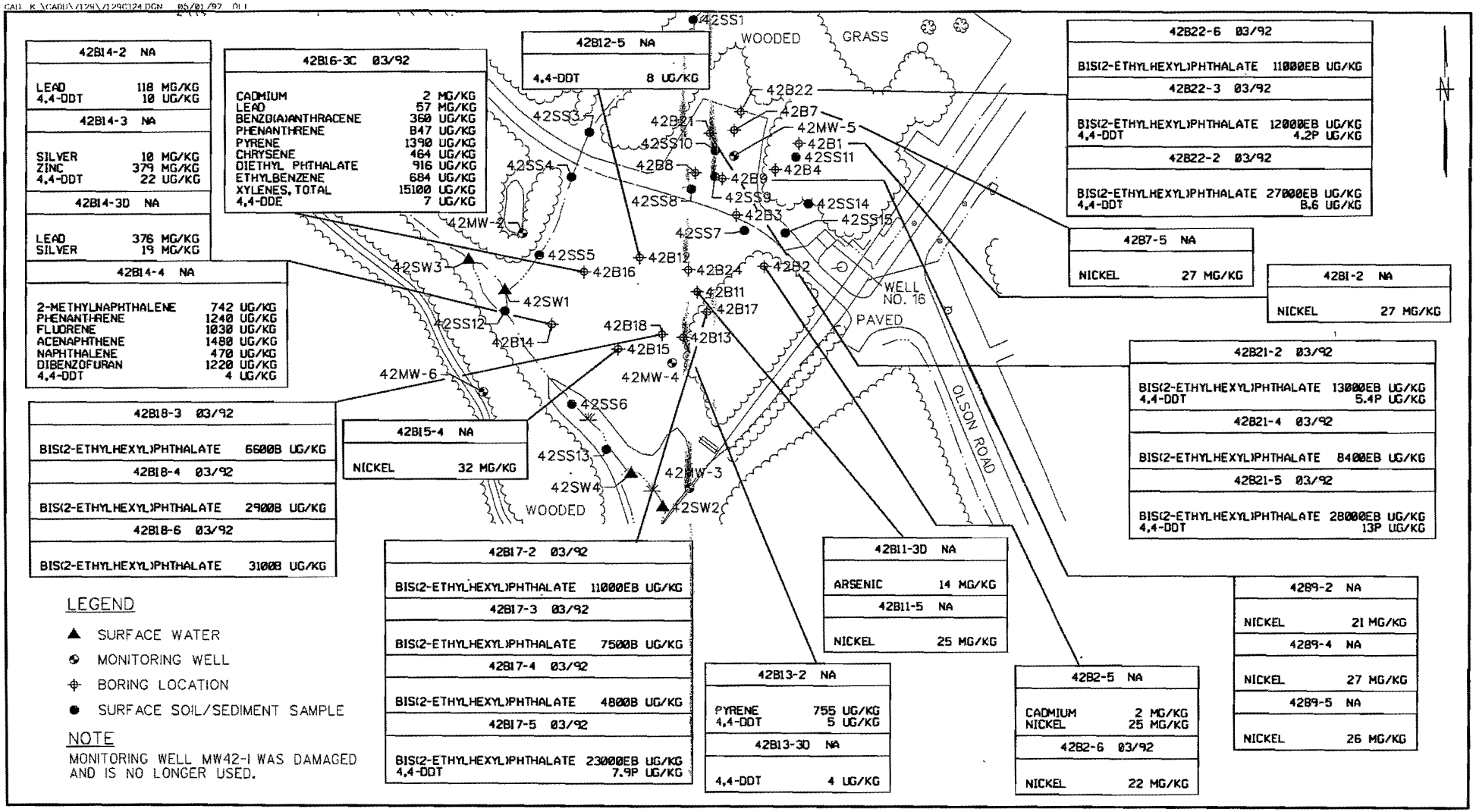

FIGURE 6-2C

PREVIOUS SOIL BORING SAMPLING
SITE 42 – OLSON ROAD LANDFILL
INDIAN HEAD, MARYLAND

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NPDES discharge location) under current site conditions will be evaluated in the human health risk assessment. This receptor will be assumed to be intermittently exposed to surface soil, surface water, and sediment from the grassy areas at the site. Potentially complete exposure pathways for the occasional worker are similar to those for the maintenance worker, which are outlined in Table 3-2 of the Master Work Plan.

Based on previous project-specific discussions with the Station, NAVY, and USEPA (May 7, 1996), a future residential exposure scenario is not considered to be likely for the site and will not be evaluated in the RI Report since the site is situated in the main production area. If the Station were to close in the future, it is anticipated that the area would be used for industrial/commercial purposes only. Maintenance activities, full-time employees, and adolescent trespassers will not be evaluated as potential receptors because of the aforementioned exposure limitations.

6.4 ECOLOGICAL RISK ASSESSMENT

The results of previous investigations revealed that some contaminants, mainly silver, were present in elevated concentrations in the drainage swale that flows through the site. The swale area contains marginal and limited aquatic habitat, while the southern and western portions of the landfill, near the swale, are in the late stages of primary succession and contain viable but limited habitat. Removal actions have also been performed in contaminated swales from other sites, mainly for silver removal, that feed the Site 42 drainage swale. Nonetheless, the drainage swale leads to marshy areas approximately 200 yards south of the site that eventually lead to Mattawoman Creek. These marshy areas, known as the Cornwallis Neck Marshes, have been designated as a "Natural Protection Area" (MDNR, 1992). The marshes are known to contain two sensitive plant species; the Tickseed Sunflower (*Bidens coronata*), a state endangered species, and the coolwort (*Pilea fontana*), a state rare species. Therefore, although the immediate Site 42 area is not of great ecological concern, the downstream areas are. Hence, off-site contaminant migration to downstream marshes is of potential concern. Data regarding possible downstream migration and related information will be used to conduct an ERA. The general ERA approach is presented in Section 4.0 of the Master RI Work Plan.

Sediment samples to be collected downstream in the drainage swale will help determine if contamination has migrated off-site into the marshes. The ecological investigation scoping and work plan for Site 42 is presented in subsequent sections.

6.5 INVESTIGATIVE SCOPING

Extensive site investigation has been conducted at the Olson Road landfill. The investigative scoping for the landfill is presented in Table 6-2, and additional scoping because the area is considered to be ecologically sensitive is provided in Table 6-3. As shown on these tables a wide range of sampling was conducted. This data was evaluated to assess both human health and ecological risk. Evaluation of the various media is as follows:

- Subsurface Soil - Subsurface soils were evaluated to determine if contamination exist which could impact groundwater. Evaluation of samples collected indicate all were below the ecological and human risk levels, therefore no additional sampling is proposed.

- Surface Soil / Sediment - Surface soils and sediments were evaluated to determine if they pose a human health and/or ecological risk. Because of the potential for off site migration to ecologically sensitive areas additional sampling is proposed.

- Surface Water - Surface water was evaluated to determine if a human health or ecological risk exists. Surface water analysis indicated levels of inorganics above the screening level. Surface water migrates to a sensitive wet land area immediately down stream. Additional sampling to further evaluated surface water is proposed.

- Groundwater - Groundwater was evaluated to determine if a human health or ecological risk exists. Migration of groundwater may impact the deep aquifer Station potable well source and also migrate to the surface waters of the stream. Levels of TCE, Benzene, and inorganics which exceed the screening levels and the potential for migration warrant additional sampling.

6.6 WORK PLAN

The proposed scope for the field investigation is summarized on Table 6-4 and additional sampling to further evaluate ecological risk is provided in Table 6-5. Table 6-6 summarizes the sampling and analysis program and Table 6-7 provides sample bottleware preservation and holding time requirements. The proposed location of the samples to be collected is provided on Figure 6-3. The following provides a summary of the proposed sampling by media:

- Subsurface Soils - No subsurface soils samples are proposed to be collected.

TABLE 6-2

INVESTIGATION SCOPING
SITE 42 - OLSON ROAD LANDFILL
INDIAN HEAD, MARYLAND

Media/ Exposure Pathway	Identified/ Suspect Contaminants	Screening Level	Preliminary Risk Evaluation	Data Gaps/ Investigative Objective	Decision Rule	Potential Remedial Action
Subsurface Soils	Subsurface samples were analyzed for TCL VOCs, SVOCs, Pesticides/PCBs, TAL Inorganics.	EPA Region III screening levels	No concentrations above screening levels exist.	None	Prepare No Further Action document.	None
Surface Soils/ Sediments.	Sediment samples were analyzed for TCL VOCs, SVOCs, Pesticides/PCBs, TAL Inorganics.	EPA Region III screening levels	SVOCs, metals and PCBs detected in sediment samples.	Conduct additional sampling	If contamination is detected above the screening levels, then perform human risk assessment. If concentrations are below screening levels, then no additional sampling is required.	Remediate. No further action.
Groundwater	Groundwater samples were analyzed for TCL VOCs, SVOCs, Pesticides/PCBs, TAL Inorganics.	EPA Region III screening levels	TCE and benzene and inorganics detected in groundwater.	Conduct additional sampling.	If contamination is detected above the screening levels, then perform human risk assessment. If concentrations are below screening levels, then no additional sampling is required.	Pump and treat. No further action required.
Surface Water	Surface water samples were analyzed for TCL VOCs, SVOCs, Pesticides/PCBs, TAL Inorganics.	EPA Region III screening levels	Inorganics detected. Surface water may be impacted.	Conduct additional sampling to confirm results.	If contamination is detected above the screening levels, then perform human risk assessment. If concentrations are below screening levels, then no additional sampling is required.	Diversion and treatment. No further action required.

TABLE 6-3

ECOLOGICAL INVESTIGATION SCOPING
SITE 42 - OLSON ROAD LANDFILL
INDIAN HEAD, MARYLAND

Media/ Exposure Pathway	Identified/ Suspected Contaminants	Screening Levels	Preliminary Risk Evaluation	Data Gaps/Investigative Objective	Decision Rule	Potential Remedial Action
Surface Water	Silver	Region III BTAG Screening Levels	Some concentrations above screening levels, but concentrations decrease downgradient.	Investigate whether contaminants are migrating off-site to wetlands downgradient.	Use data to conduct ecological risk assessment.	Remove or cap contaminated soils or remove sediments/ No further action.
Sediments	Silver and Lead	Region III BTAG Screening Levels	Some concentrations above screening levels, but concentrations decrease downgradient.	Investigate whether contaminants are migrating off-site to wetlands downgradient.	Use data to conduct ecological risk assessment.	Remove or cap contaminated soils or remove sediments/ No further action.

TABLE 6-4

SITE SPECIFIC WORK PLAN
SITE 42 - OLSON ROAD LANDFILL
INDIAN HEAD, MARYLAND

Data Needs	Investigative Technique	Location	Number of samples	Analysis
Verify the nature and concentrations of contamination in the groundwater.	Collect 1st quarter groundwater samples from each existing monitoring well and new well MW-7. Collect quarterly samples from 42MW-3, 42MW-4, 42MW-5 and 42MW-7. Collect quarterly samples from 42MW-2 and 42MW-6 if first quarter results indicate the presence of contamination.	Collect groundwater samples from 42MW2, 42MW3, 42MW4, 42MW5, 42MW6 and 42MW7.	24	TCL VOCs, TCL SVOCs , TAL Metals
Identify the nature and concentrations of contamination in the surface water.	Collect two grab surface water samples along drainages of site.	Collect surface water samples from locations on Figure 6-3.	2	TAL Metals
Identify the nature and concentrations of contamination in the Site 42 surface soil.	Collect three surface soil samples from the downgradient side of the ponding area at Site 42.	See Figure 6-3.	3	TCL VOCs, TCL SVOCs, Pest/PCBs

TABLE 6-5

ECOLOGICAL SITE-SPECIFIC WORK PLAN
SITE 42 - OLSON ROAD LANDFILL
INDIAN HEAD, MARYLAND

Data Needs	Investigative Technique	Location	Number of Samples	Analysis
Determine if contaminants are migrating off-site to downgradient wetlands.	Collect surface water from drainage swale.	In drainage swale where swale leaves the site and downstream of the site.	2	TAL Metals
Determine if contaminants are migrating off-site to downgradient wetlands or from upgradient Site 6.	Collect sediment from drainage swale.	In drainage swale where swale leaves the site and downstream of the site.	6	TAL Metals, TOC, SEM/AVS

TABLE 6-6

SUMMARY OF SAMPLING PROGRAM
SITE 42 - OLSON ROAD LANDFILL
INDIAN HEAD, MARYLAND

Sample Media	Sample ID Number	Sample Depth/ Location	Analysis					
			VOCs	SVOCs	Metals	Pesticides/ PCBs	Total Organic Carbon	SEM/AVS
Groundwater	RI42GW02	Existing Well 42MW2	•	•	•			
	RI42GW03	Existing Well 42MW3	•	•	•			
	RI42GW04	Existing Well 42MW4	•	•	•			
	RI42GW05	Existing Well 42MW5	•	•	•			
	RI42GW06	Existing Well 42MW6	•	•	•			
	RI42GW07	New Well 42MW7	•	•	•			
Surface Water	RI42SW01	Site 42 drainage			•			
	RI42SW02	Site 42 drainage			•			
	RI42SW03	Drainage swale leaving Site 42			•			
	RI42SW04	Drainage swale downstream of Site 42			•			
Sediment	RI42SD01	Drainage swale leaving Site 42			•		•	•
	RI42SD02	Site 42 drainage swale/stream			•		•	•
	RI42SD03	In swamp from Site 6			•		•	•
	RI42SD04	In swamp from Site 6			•		•	•
	RI42SD05	In swamp south of Site 42			•		•	•
	RI42SD06	In swamp south of Site 42			•		•	•
Surface Soil	RI42SS01	0-6" Southwest of Swamp	•	•		•		
	RI42SS02	0-6" South of Swamp	•	•		•		
	RI42SS03	0-6" Southeast of Swamp	•	•		•		

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TABLE 6-7

BOTTLEWARE, PRESERVATION, AND HOLDING TIME REQUIREMENTS
SITE 42 - OLSON ROAD LANDFILL
INDIAN HEAD, MARYLAND

Media	Analysis	Total Number of Samples	Number of Containers Per sample	Container Type	Preservation	Holding Times
Groundwater	TCL VOCs - CLP OLM03.0	24	2	40 ml glass	HCL pH <2, Cool to 4°C	14 days to analysis
	TCL SVOCs - CLP OLM03.0	24	1	1L amber glass	Cool to 4°C	7 days to extract; 40 days to analysis
	TAL Metals - CLP ILM04.0	24	1	1L plastic	HNO3 pH <2	6 months; Hg 28 days
Surface Water	TAL Metals - CLP ILM04.0	4	1	1L plastic	HNO3 pH <2	6 months; Hg 28 days
Sediment	TAL Metals - CLP ILM04.0	6	1	250 ml CWM glass	Cool to 4°C	6 months; Hg 28 days
	Total Organic Carbon - Lloyd Kahn Method	6	1	250 ml CWM glass	Cool to 4°C	28 days
	SEM/AVS - EPA Draft Method**	6	1	250 ml CWM glass	Cool to 4°C, zero to minimal headspace	14 days
Surface Soil	TCL VOCs - CLP OLM03.0	3	1	250 ml CWM glass	Cool to 4°C	14 days to analysis
	TCL SVOCs - CLP OLM03.0	3	1	250 ml CWM glass	Cool to 4°C	14 days to extract; 40 days to analysis
	Pesticides/PCBs - CLP OLM03.0	3	1	250 ml CWM glass	Cool to 4°C	14 days

CWM - Clear Wide Mouth
* - Includes analysis for nitrate esters (nitroglycerin, nitrocellulose, nitroquanidine) in Modified SW-846-8330.
SEM/AVS - Simultaneously Extractable Metals/Acid Volatile Sulfide.
** - "Draft Analytical Method for Determination of Acid Volatile Sulfide in Sediment."

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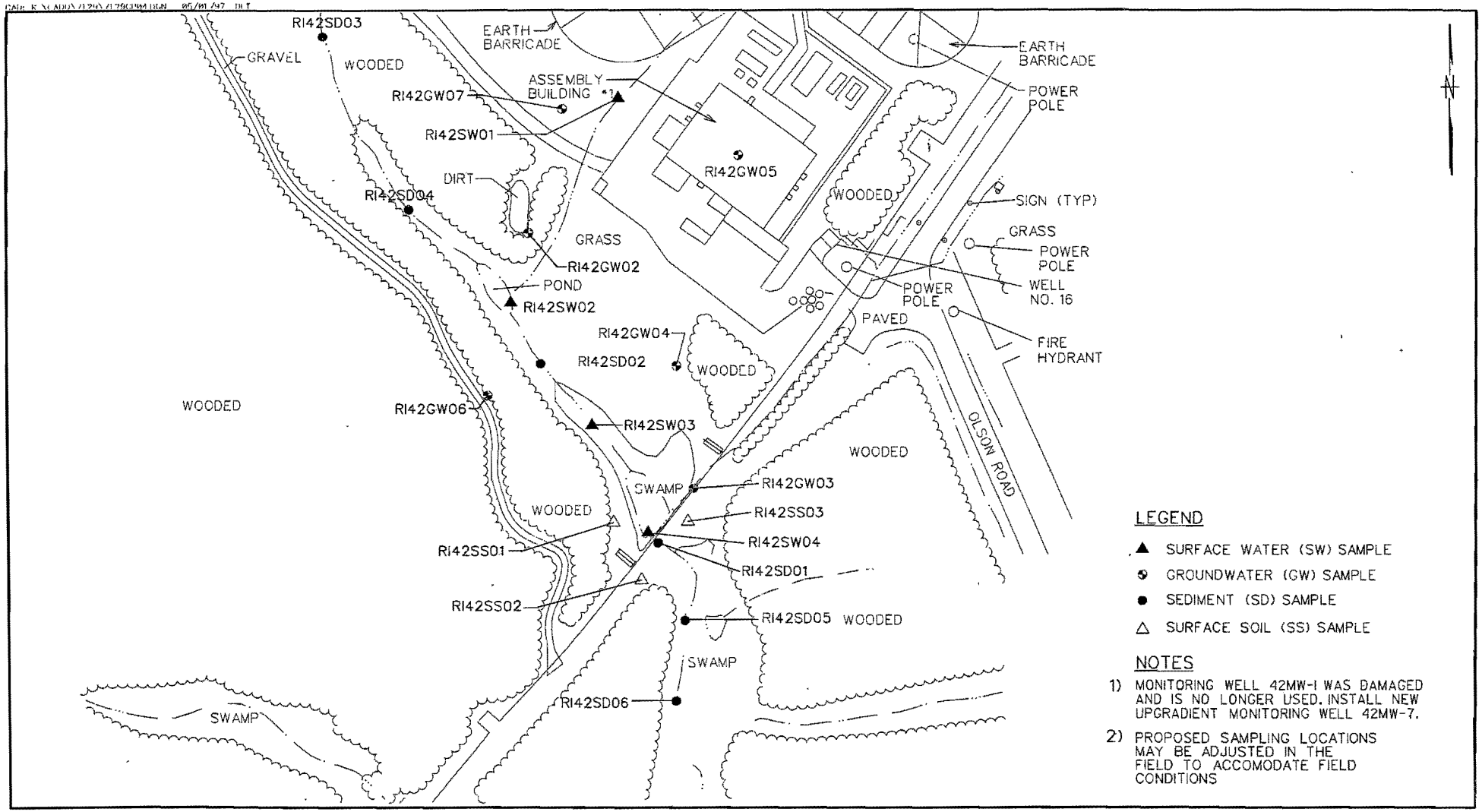

FIGURE 6-3

PROPOSED SAMPLING LOCATION MAP
SITE 42 - OLSON ROAD LANDFILL
INDIAN HEAD, MARYLAND

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- Sediment - To evaluate if sediments with elevated levels of metals are migrating off site one sediment sample will be collected in the drainage swale (stream) where the swale leaves the site. Two additional sediment samples will be collected along the drainage swale leading from Site 6 to Site 42. Two additional sediment sample will be collected from the swamp located south of Site 42. The sample shall be collected in accordance with Station SOP SA-02 "Surface water and sediment sampling".

- Surface Water - A total of three surface water samples will be collected to determine if elevated levels of metals are present. One sample will be collected to determine if the contamination is entering the site from another site. This will be done by collecting a sample upgradient of the site. One sample will be collected in the site area, and one sample will be collected to determine if elevated levels of metals are being transported down stream to the ecologically sensitive area. The samples shall be collected in accordance with Station SOP SA-02 "Surface water and sediment sampling".

- Surface Soil - Three surface soil samples will be collected from location south of the swamp.

- Groundwater - To verify that the groundwater is still impacted a groundwater sample will be collect from each of the existing monitoring wells.

  A new groundwater well (MW-07) will be installed upgradient of Site 42 in order to characterize the background constituents and to quantify any contaminant concentrations contained in the water entering Site 42.

  Groundwater wells MW-2 through MW-7 will be sampled for the 1st quarter round. Wells MW-3, MW-4, MW-5, and MW-7 will be resampled on a quarterly basis. Wells MW-2 and MW-6 will only continue to be sampled quarterly if the first quarterly sample from each well contains concentrations of contaminants detected in earlier Site 42 groundwater samples. The samples shall be collected in accordance with Station SOP SA-01 "Groundwater Sample Acquisition and Onsite Water Quality Testing".

7.0 SITE 43 - TOLUENE DISPOSAL SITE

7.1 BACKGROUND INFORMATION AND SITE DESCRIPTION

Site 43 - Toluene Disposal Site is in the western portion of the station and consists of the area west of Gallery Road across from Building 1041 in the area of the utility pole as shown in Figure 7-1. The site is in the immediate vicinity of the utility pole abutting a large soil bunker to the northwest. A drainage ditch which has a general slope towards the south bisects the site east of the utility pole.

Site 43 was reportedly active between the late 1950s and 1989 when solvents, used in the Cast Plant (Buildings 1040 and 1041) to remove propellants and oily residues from various metal parts, were disposed of directly on the ground by the utility pole across from Building 1041.

This cleaning activity took place two or three times per week in Building 1041. After the parts were cleaned, the spent solvents were to be combined or "slummed" with sawdust and placed in 55-gallon drums for disposal at the Cast Plant burn point (Site 19). On many occasions, however, the spent solvents were carried across Galley Road and poured on the ground at the base of the telephone pole (NEESA, 1992). At Building 1040, acetone was reportedly disposed of in the drainage ditch just outside the door. The total quantity of solvents disposed immediately outside Buildings 1040 and 1041 was estimated to be between 23,000 and 30,000 gallons (NEESA, 1992). No signs of stressed vegetation or solvent dumping stains were observed at the site in 1995 or 1996 during site inspections.

7.2 PREVIOUS ENVIRONMENTAL INVESTIGATIONS

Sampling was conducted to determine if there was contamination in the soils in the vicinity of the utility pole. Table 7-1 summarizes the sampling effort. As Figure 7-2B indicates, soil-gas samples were collected from within the adjacent drainage ditch.

TABLE 7-1

PREVIOUS INVESTIGATION
SITE 43 - TOLUENE DISPOSAL SITE
INDIAN HEAD, MARYLAND

Sample Media:	Shallow soil profile (0 to 1) Soil-gas (Vadose Zone)			
Sampling Performed:	**Type**	**Number**	**Sam/Loc**	**Total**
	Soil boring-hand-auger	4	1	4
	Soil-gas borings	10	1	10
Analyses Performed:	**Media**	**Analyses**		
	Soil (hand-auger)	VOC, BNA		
	Soil-gas	GC, FID Volatile Organic Compounds		

Figure 7-2A provides the location of the soil boring-hand-auger samples. Figure 7-2B provides the location of the soil gas samples collected. None of the analytical results exceed the EPA Region III RBC screening level. For this reason no containment concentrations are indicated on Figure 7-2A or Figure 7-2B.

Acetone was detected in soil sample 43SA01 at an average concentration of 483 µg/kg (E/A&H, 1994). All other results were below the detection limits. The soil gas survey detected total volatiles in low levels in three samples (43-6, 43-8, 43-9) and toluene were detected at a concentration of 81 µg/L in sample 43-6.

7.3 HUMAN HEALTH RISK ASSESSMENT

A human health risk assessment for the site will be performed and documented in the RI Report. Analytical data generated under this work plan, as well as historical data for the site, will be used to determine if measured chemical concentrations pose a significant threat to potential human receptors. The general methodologies which will be used to assess human health risks are contained in Section 3.0 of the Master Work Plan for the Station. The remainder of this section of the project-specific work plan identifies preliminary COCs based on existing site information, screening levels which will be used to identify COCs in the risk assessment, and exposure scenarios to be evaluated.

No chemicals have been preliminarily identified as COCs for the site. Region III soil COC screening levels for industrial land use will be used to identify site-specific COCs for soil in the risk assessment. For groundwater, Region III COC screening levels for tap water ingestion will be employed.

The following potential receptor groups will be evaluated in the human health risk assessment:

- Adolescent Trespassers
- Maintenance Workers

Since access to the disposal area is not physically restricted, adolescent trespassers (ages 6 to 16) will be evaluated. Maintenance workers and adolescent trespassers under current land use will be assumed to be exposed to surface soil only. Potentially complete exposure pathways to be considered in the development of the human health risk assessment are provided in Table 3-2 of the Master Work Plan.

Exposure to groundwater is not expected to occur under current and/or future potential land use. This medium will be evaluated qualitatively in the RI Report via a comparison of detected groundwater concentrations to COC screening values and other health-based criteria (i.e., Federal and State drinking water standards).

Based on previous project-specific discussions with the Station, NAVY, and USEPA (May 7, 1996), a future residential exposure scenario is not considered to be likely for the site and will not be evaluated in the RI Report since the site is situated in the main production area. If the Station were to close in the future, it is anticipated that the area would be used for industrial/commercial purposes only.

7.4 ECOLOGICAL RISK ASSESSMENT

Site 43 is comprised of an extremely small area, a relatively small source term, and contains no ecological habitat. Overland migration of Site 43 contaminants to wetland or terrestrial habitats is unlikely, and groundwater to surface water migration is precluded by the absence of surface water near the site. Hence, potential risks to terrestrial or aquatic receptors or contaminant contributions to the watershed from Site 43 contaminants are negligible. For these reasons, Site 43 will be excluded from quantitative ecological risk assessment for the RI.

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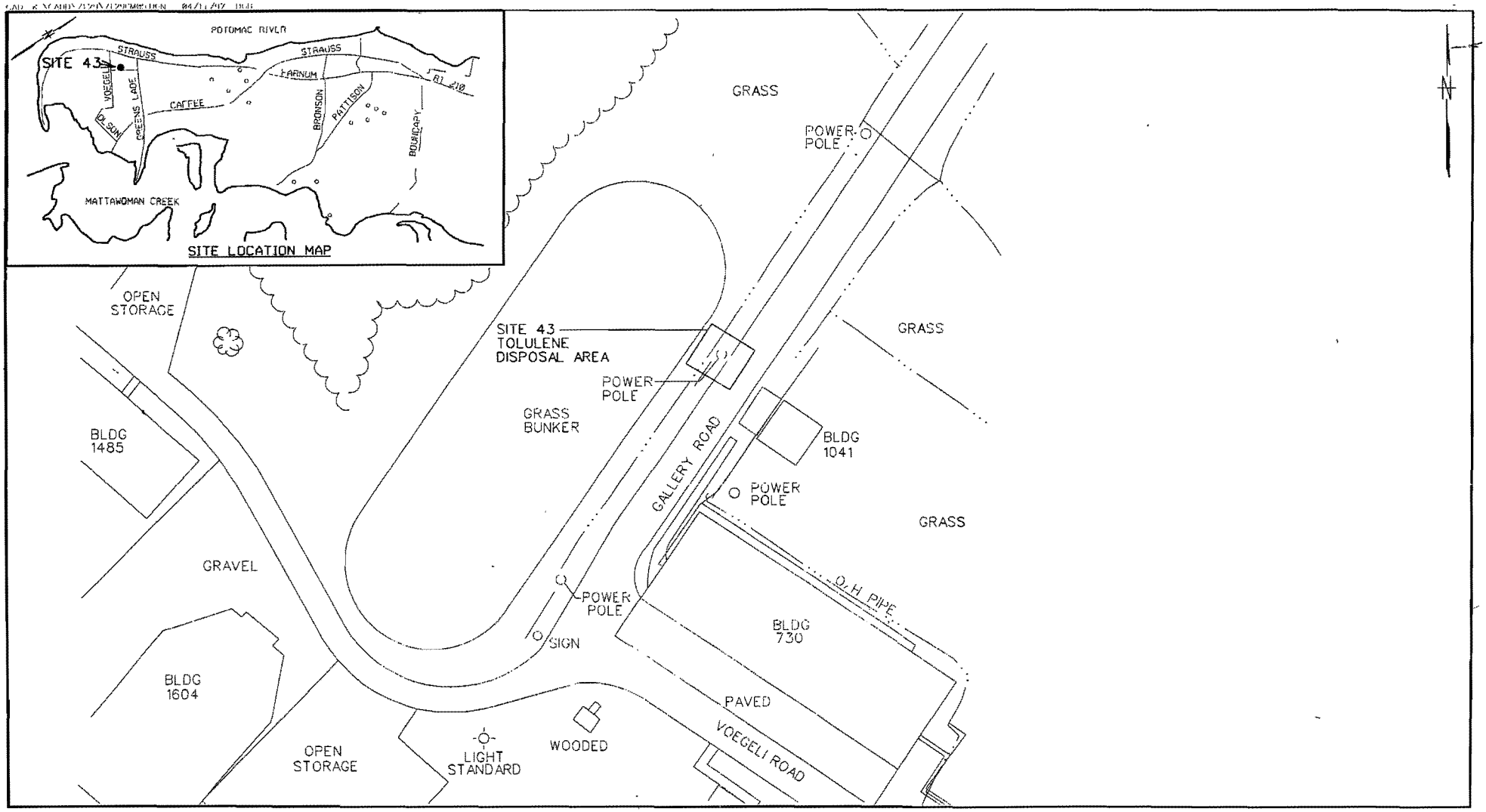

FIGURE 7-1

GENERAL SITE MAP
SITE 43 – TOLUENE DISPOSAL SITE
INDIAN HEAD, MARYLAND

0 50 100
SCALE IN FEET

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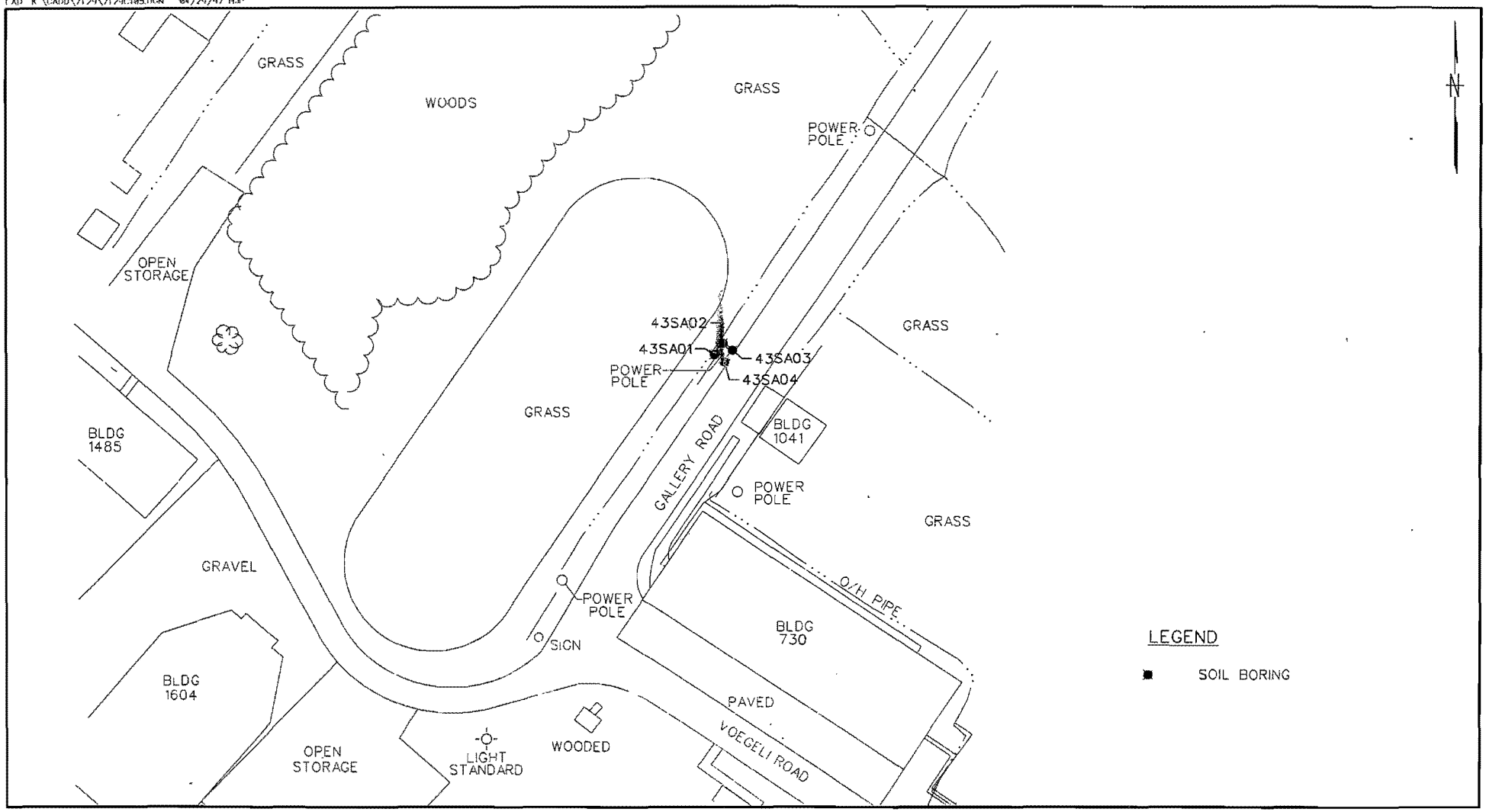

FIGURE 7-2A

0 50 100
SCALE IN FEET

PREVIOUS SAMPLING
SITE 43-TOLUENE DISPOSAL SITE
INDIAN HEAD, MARYLAND

Brown & Root Environmental

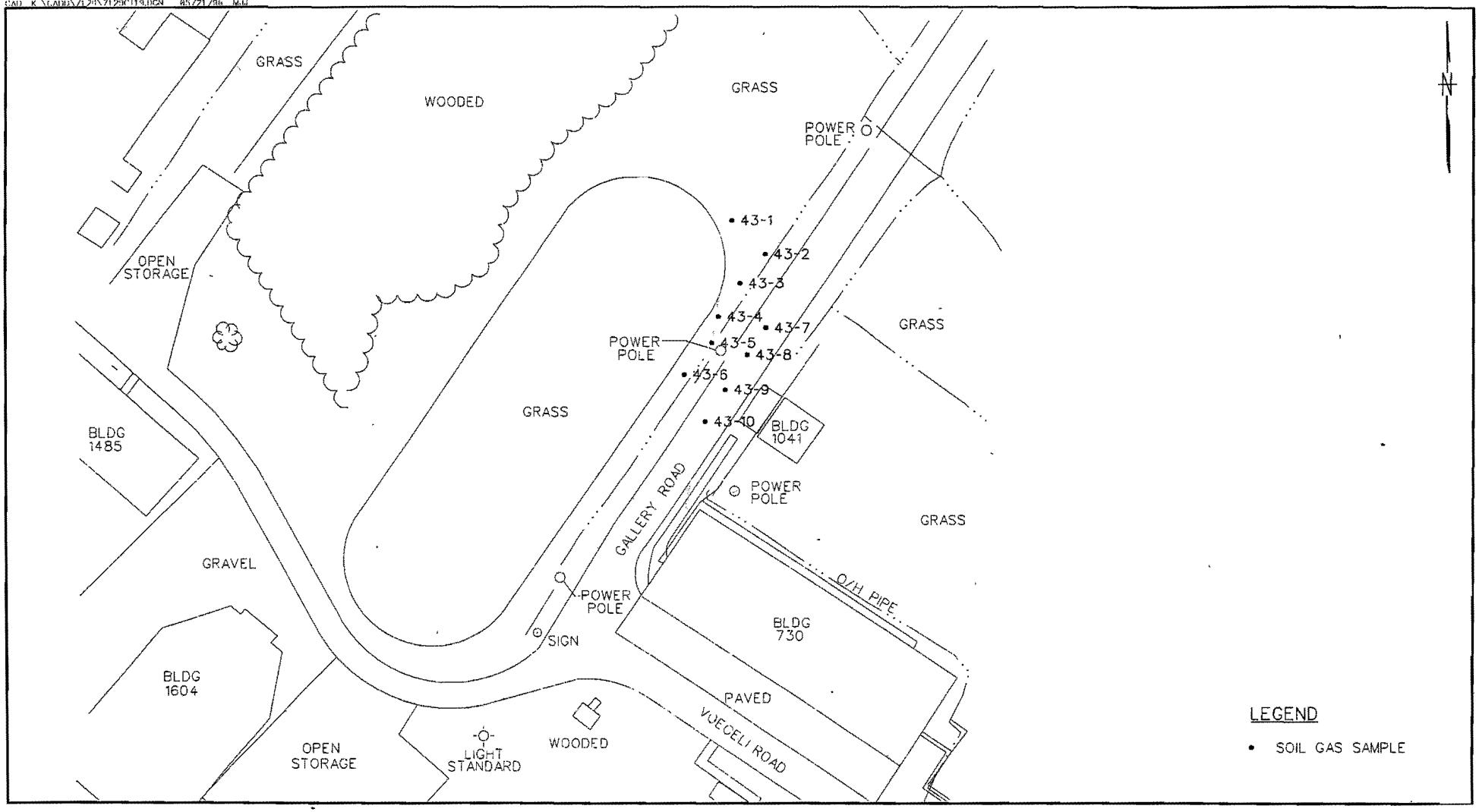

FIGURE 7-2B

PREVIOUS SOIL GAS SAMPLING
SITE 43 – TOLUENE DISPOSAL SITE
INDIAN HEAD, MARYLAND

0 50 100
SCALE IN FEET

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7.5 INVESTIGATIVE SCOPING

Soil gas investigation and soil analysis conducted at the suspected Toluene disposal site is summarized in Table 7-1 and the results of the analysis indicates that the soil is below the screening levels for VOCs and SVOCs. This evaluation was conducted to address human health risk. Evaluation of the various media is as follows:

- Subsurface Soil - Subsurface soils were evaluated to determine if contamination exist which could impact groundwater. Soil gas and soil borings were used to collect the data. Evaluation of samples collected indicates all results were below the human risk-based concentration levels, therefor no additional sampling is proposed. Metals were not analyzed but historical information does not indicate that this fraction would be a concern.

- Surface Soil - Surface soil samples were collected and evaluated along with the subsurface soils to determine if they pose a human health risk. Evaluation of samples collected indicate all were below the EPA Region III RBC levels, therefore no additional sampling is proposed.

- Surface Water - No surface water exists in this area.

- Groundwater - No groundwater samples were collected in the past investigations. Groundwater needs to be evaluated to verify the presence or absence of contamination if a human health risk exists. Groundwater protection may be an issue.

A summary of the investigative scoping for the Toluene Disposal Site is presented in table 7-2.

7.6 WORK PLAN

The proposed scope for the field investigation is summarized on Table 7-3. Table 7-4 summarizes the sampling and analysis program for Site 43 and Table 7-5 provides sample bottleware, preservation, and holding time requirements. Evaluation of the various media is as follows:

- Subsurface Soils - No subsurface soil sampling is proposed, because previous sampling indicated no contamination exist above the established screening levels.

TABLE 7-2

INVESTIGATION SCOPING
SITE 43 - TOLUENE DISPOSAL AREA
INDIAN HEAD, MARYLAND

Media/Exposure Pathway	Identified/ Suspected Contaminants	Screening Levels	Preliminary Risk Evaluation	Data Gaps/Investigative objective	Decision Rule	Potential Remedial Action
Subsurface Soil and potential Impact to Groundwater	Volatiles detected at low levels in subsurface soil and soil gas. No groundwater sampling performed.	EPA Region III RBC screening Criteria	Soil contaminants could impact groundwater. Groundwater protection may be an issue.	Determine if soil contaminants have impacted qroundwater at levels which exceed the EPA Region III RBC screening levels for tap water.	If detected above the screening levels, then perform additional sampling to determine extent. If concentrations are below screening levels, then no further action is required.	Natural Attenuation. Air Sparging . Pump and Treat. Prepare No Further Action Document.

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TABLE 7-3

SITE SPECIFIC WORK PLAN
SITE 43 - TOLUENE DISPOSAL AREA
INDIAN HEAD, MARYLAND

Data Needs	Investigative Technique	Location	Number of samples	Analysis
Determine potential impact to groundwater: Investigate potential VOC contamination in groundwater.	Collect three groundwater samples using hydropunch if applicable in the area. If a hydropunch is unsuccessful, a temporary monitoring well will be installed using conventional drilling equipment. Contaminant concentrations in the headspace will be monitored during installation of each hydropunch or monitoring well.	See Figure 7-3	3	TCL VOCs TAL Metals Explosives

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TABLE 7-4

SUMMARY OF SAMPLING PROGRAM
SITE 43 - TOLUENE DISPOSAL AREA
INDIAN HEAD, MARYLAND

Sample Media	Sample ID Number	Sample Depth/ Location	Analysis				
			VOCs	SVOCs	TAL Metals	Pesticides/ PCBs	Explosives
Groundwater	RI43GW01	Hydropunch or monitoring well west of utility pole and in drainage swale.	•		•		•
	RI43GW02	Hydropunch or monitoring well east of utility pole	•		•		•
	RI43GW03	Hydropunch or monitoring well south of utility pole	•		•		•

Note: Headspace monitoring for VOCs will be performed during installation of each hydropunch/monitoring well.

TABLE 7-5

BOTTLEWARE, PRESERVATION, AND HOLDING TIME REQUIREMENTS
SITE 43 - TOLUENE DISPOSAL AREA
INDIAN HEAD, MARYLAND

Media	Analysis	Total Number of Samples	Number of Containers Per sample	Container Type	Preservation	Holding Times
Groundwater	TCL VOCs - CLP OLM03.0	3	2	40 ml glass	HCL pH <2, Cool to 4°C	14 days to analysis
	TAL Metals - CLP ILM04.0	3	1	1L plastic	HNO3 pH <2	6 months; Hg 28 days
	Explosives - Modified SW-846-8330*	3	1	1L amber glass	Cool to 4°C	7 days to extract; 40 days to analysis

CWM - Clear Wide Mouth
* - Includes analysis for nitrate esters (nitroglycerin, nitrocellulose, nitroquanidine) in Modified SW-846-8330.

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- Surface Soils - No surface sampling is proposed, because previous sampling indicated that no contamination exists above the established screening levels.

- Surface Water - No surface water exists in this area.

- Groundwater - Three groundwater samples will be collected at the locations indicated on Figure 7-3. Each sample will be collected by using a hydropunch sampler. A temporary groundwater monitoring well will be installed and sampled at those locations where the hydropunch sampling method is unsuccessful.

  Also the headspace at each sample location will be monitored for VOCs during installation of the hydropunch/monitoring well.

  Each hydropunch will be installed in accordance with Station SOP SA-06 "Ground Penetrating Sampling Techniques" if use of a hydropunch is unsuccessful then a monitoring well shall be installed according to Station SOP GH-12 "Groundwater Monitoring Point Installation". The sample shall be collected in accordance with Station SOP SA-01 "Groundwater Sample Acquisition and Onsite Water Quality Testing". Headspace within each hydropunch will be monitored according to the guidelines contained in station SOP SA-05.

The proposed location of the groundwater sample to be collected is provided on Figure 7-3.

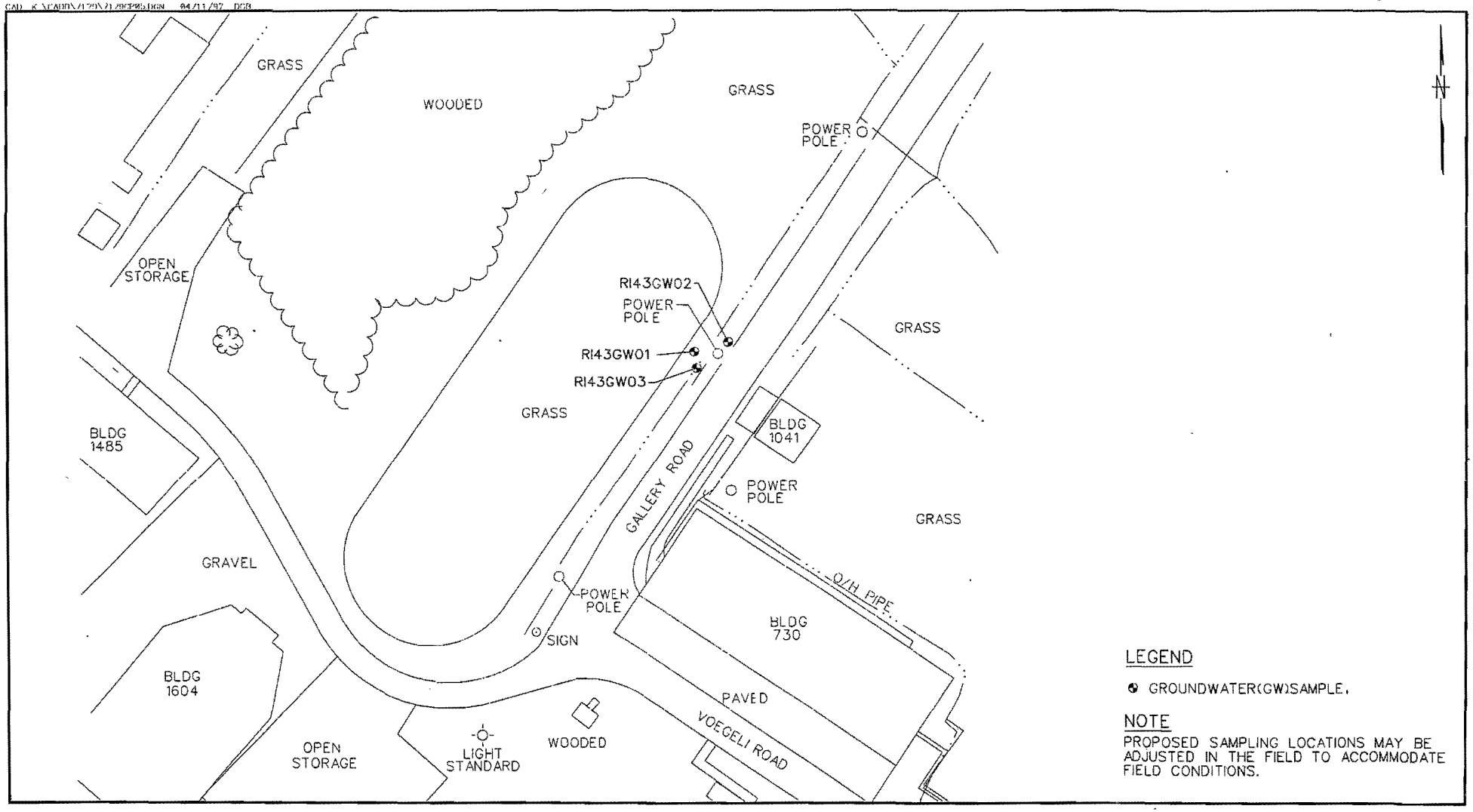

FIGURE 7-3

PROPOSED SAMPLING LOCATION MAP
SITE 43 – TOLUENE DISPOSAL SITE
INDIAN HEAD, MARYLAND

0 50 100
SCALE IN FEET

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8.0 SITE 44 - SOAK OUT AREA

8.1 BACKGROUND INFORMATION AND SITE DESCRIPTION

Site 44 - Soak Out Area, is located between Buildings 903 and 907 in the northwest-central portion of the facility. The area is flat grassy open area with a slight grade to the southwest and a drainage ditch which extends along the southeastern edge of the site to a culvert which extends beneath Boyd Road. A concrete walkway which connects Building 903 with Building 1182 bisects the site as shown in Figure 8-1.

Site 44 was reportedly active during the late 1960s to early 1970s, when a soak out tank was used to remove propellant from rocket motor catapult tubes (NEESA, 1992). The soak tank consisted of two 55-gallon drums welded together one on top of the other and was located about 75 feet east of Building 1363. The drums were filled with a nonflammable solvent believed to be Pennchem 9018, a polysulfide solvent containing mercaptan (NEESA, 1992). The propellant contaminated tubes were dipped into the solvent from a large A-frame structure, and soaked for 2 to 3 days. A smaller catch tank was placed at the bottom of the larger tank to collect pieces of propellant that would fall out of the tubes during cleaning. The soak out drums were located directly on the ground, and an unknown amount of solvent would be spilled. During the 3 to 4 years that the cleaning was performed, no vegetation was able to grow in an area about 20 feet in diameter around the tank. No signs of stressed vegetation currently exist in this area. It was reported that the solvent drums (approximately ten 55-gallon drums) were placed in the woods behind Building 1363 which currently is known as Site 45 - Abandoned Drums. Three groundwater monitoring wells (44MW01, 44MW02, and 4MW03) were installed in this area during the Site Inspection (SI) Study. The wells are located to encompass a center point which lies in-between Buildings 903 and 1182. The wells indicate, based on data collected in September 1992, that groundwater flows toward the northeast.

8.2 PREVIOUS INVESTIGATION

A field investigation was conducted to determine if shallow soil and/or groundwater has been contaminated by spilled solvents. A summary of the sampling effort previously conducted during the SI study is in Table 8-1:

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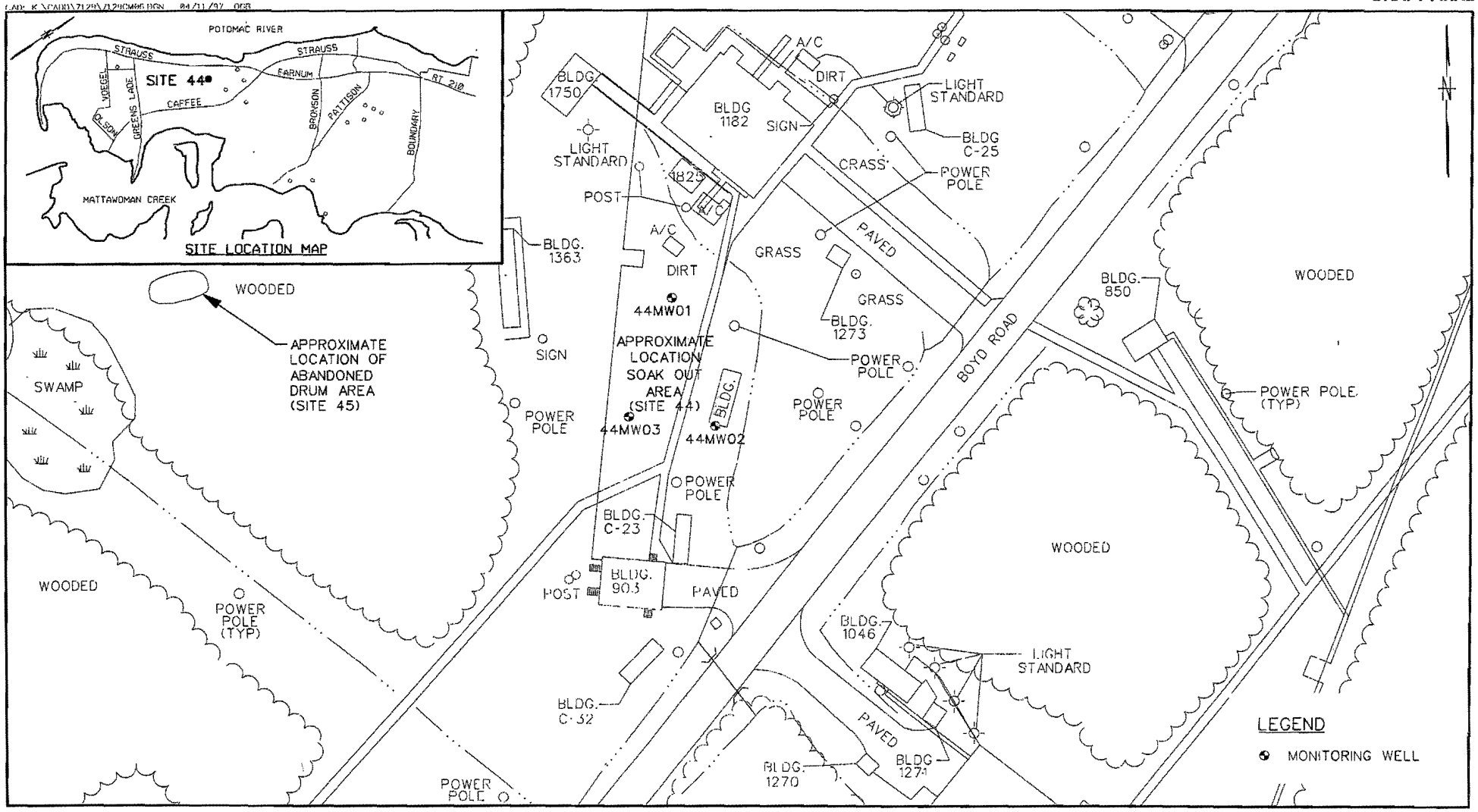

FIGURE 8-1

GENERAL SITE MAP
SITE 44 – SOAK OUT AREA
INDIAN HEAD, MARYLAND

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TABLE 8-1
PREVIOUS INVESTIGATION
SITE 44 - SOAK OUT AREA
INDIAN HEAD, MARYLAND

Sample Media:	Shallow soil profile (0-20 feet, at 5-foot sample intervals) Shallow aquifer (water table aquifer) Soil-gas (vadose Zone)			
Sampling Performed:	**Type**	**Number**	**Sam/Loc**	**Total**
	Shallow soil borings*	5	3	15
	Monitoring wells - September, 1992	1	1	3
	Monitoring wells - April, 1993	3	1	3
	Surface sediments-hand-auger	2	1	2
	Soil-gas borings	15	1	15
Analyses Performed:	**Media**	**Analyses**		
	Soil	VOC, BNA, TPH		
	Groundwater	VOC, BNA, TPH		
	Sediments	VOC, BNA, TPH		
	Soil-gas	GC/FID VOCs		
	* Include soil boring samples collected during the completion of soil borings and monitoring well borings.			

Figure 8-2A provides the location of environmental sampling and results of the analysis conducted which exceeded the EPA Region III RBC screening levels. Figure 8-2B provides the location of the soil gas sampling conducted in this area.

Fifteen shallow soil-gas borings were performed in the grassy area between Buildings 903 and 1182. Two sediment samples were collected using a hand auger from the drainage ditch along the southern boundary of the site and five soil borings (three of which were turned into monitoring wells) were installed.

Soil borings 44SB01, 44SB04, and 44SB05 were developed into shallow monitoring wells (44MW01, 44MW02 and 44MW03, respectively). The monitoring wells ranged in depth from 15.4 to 18.6 feet below ground surface. Each monitoring well was sampled in September 1992 during the Phase II (SI Study) field work and again in April 1993 (E/A&H, 1994).

Very low levels of total GC/FID volatiles were detected in two of the 15 soil-gas samples. None of the standardized analytes (GC/FID or GC/ECD) were detected in any of the samples (E/A&H, 1994).

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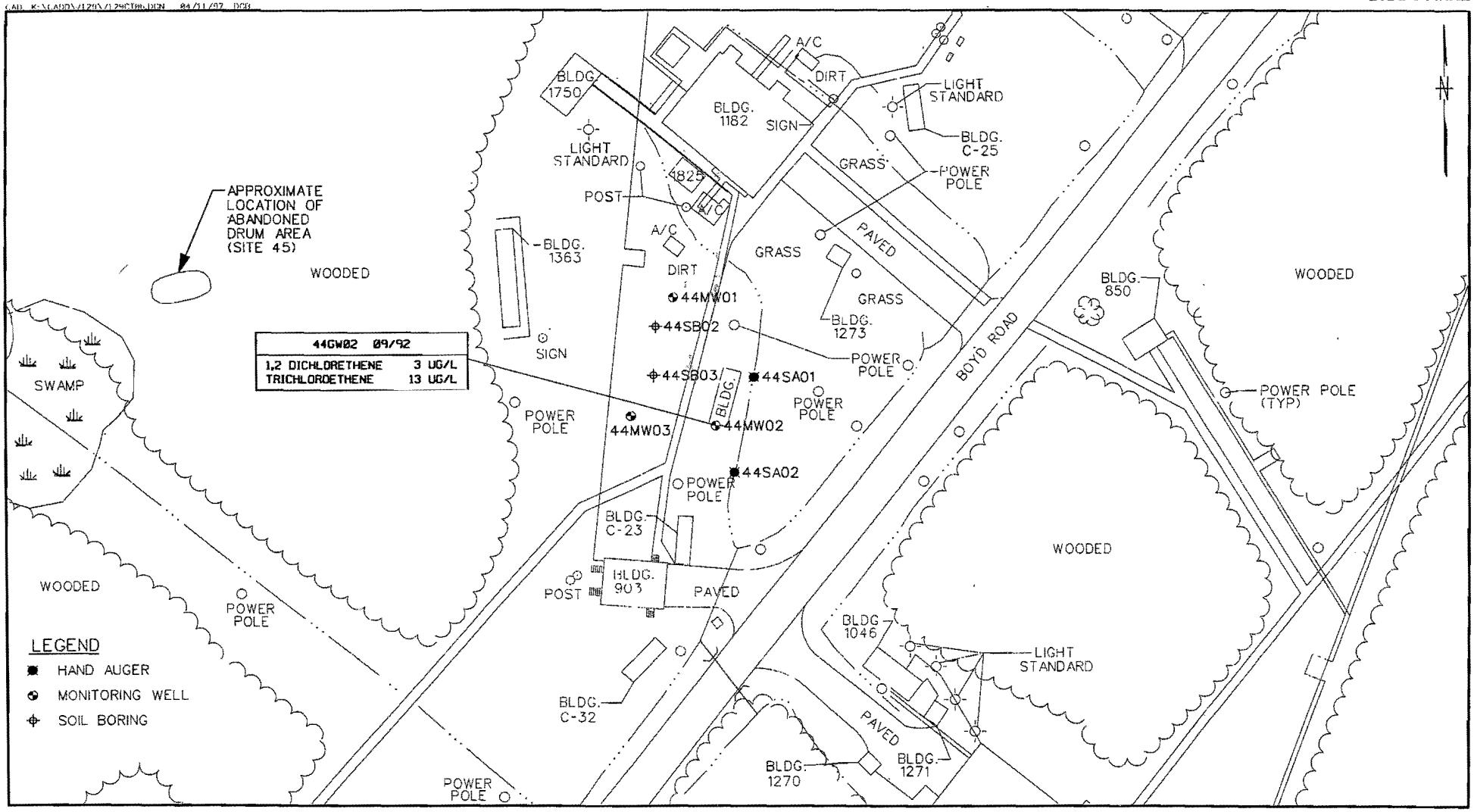

FIGURE 8-2A

PREVIOUS SAMPLING
SITE 44 – SOAK OUT AREA
INDIAN HEAD, MARYLAND

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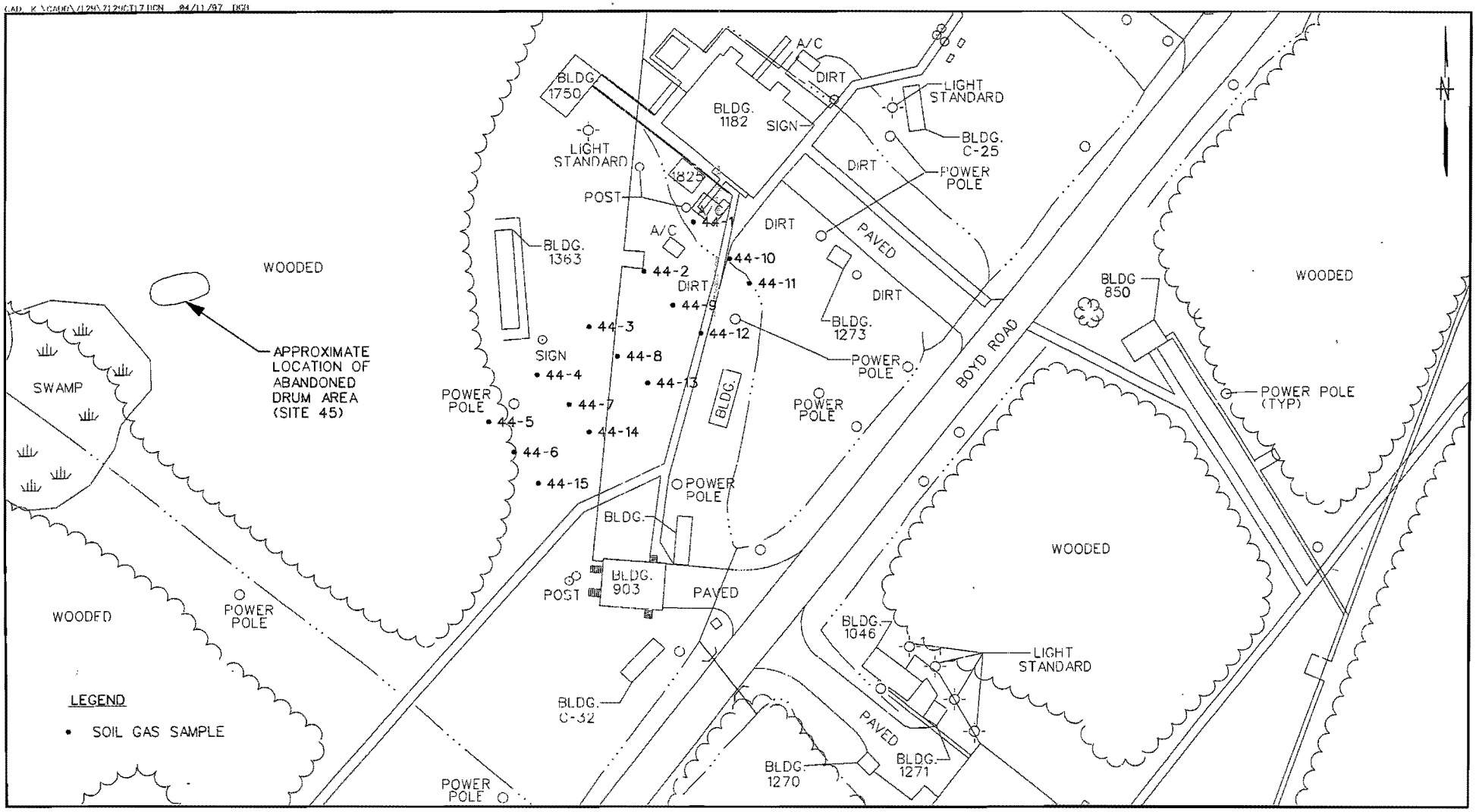

FIGURE 8-2B

PREVIOUS SOIL GAS SAMPLING
SITE 44 – SOAK OUT AREA
INDIAN HEAD, MARYLAND

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Acetone was detected in sediment sample 44SA01 at 460 µg/kg (E/A&H, 1994). Acetone also was reported in the accompanying laboratory blank. No TPH or semivolatile organic compounds were detected in the sediment samples above method detection limits (E/A&H, 1994).

TPH was reported in soil samples from borings 44SB04 and 44SB05 at concentrations of 14.6 and 17.0 mg/kg, respectively (E/A&H, 1994). Three semivolatile organic compounds were detected at low levels in sample 44SB0304 and one semivolatile organic compound was detected in sample 44SB053D. The detected compounds and the respective concentrations found in sample 44SB0304 were: phenanthrene, 340 µg/kg; fluoranthene, 61 µg/kg; and, pyrene, 91 µg/kg (E/A&H, 1994). Phenanthrene was detected in sample 44SB053D (duplicate of sample 44SB0503) at a concentration of 110 µg/kg (E/A&H, 1994).

The two VOCs were detected in the September 1992 groundwater sample for monitoring well 44MW02 they were 1-2 (total) dichloroethene at 3.0 µg/L and trichloroethene at 13.0 µg/L. MCLs for these constituents are 70 µg/L and 5.0 µg/L, respectively. These compounds are common solvents used as degreasers (E/A&H, 1994). No VOCs were detected in the April 1993 water samples collected from the Site 44 monitoring wells. Similarly, no total petroleum hydrocarbons were detected in any groundwater samples collected during either sampling event (E/A&H, 1994).

Potentiometric surface results generated by the three site groundwater monitoring wells indicated a general flow direction toward the northeast. The groundwater gradient was calculated to be 7.5×10^{-3} ft/ft (E/A&H, 1994).

Comparison of the data against the EPA Region III RBC screening levels indicated only one value, TCE, exceed these values and only during the 1993 groundwater sampling event.

8.3 HUMAN HEALTH RISK ASSESSMENT

A human health risk assessment for the site will be performed and documented in the RI Report. Analytical data generated under this work plan, as well as historical data for the site, will be used to determine if measured chemical concentrations pose a significant threat to potential human receptors. The general methodologies which will be used to assess human health risks are contained in Section 3.0 of the Master Work Plan for the Station. The remainder of this section of the project-specific work plan identifies preliminary COCs based on existing site information, screening levels which will be used to identify COCs in the risk assessment, and exposure scenarios to be evaluated.

Trichloroethene has been identified as a preliminary COC for the site. Region III soil RBC screening levels for industrial land use will be used to identify site-specific COCs for soil in the risk assessment. For groundwater, Region III RBC screening levels for tap water ingestion will be employed.

The following potential receptor groups will be evaluated in the human health risk assessment:

- Adolescent Trespassers
- Maintenance Workers
- Construction Workers

Adolescent trespassers (ages 6 to 16) will be evaluated since access to the landfill is not physically restricted. Maintenance workers and adolescent trespassers under current land use will be assumed to be exposed to surface soil only. Construction workers, who will be considered to be potential receptors for future land use, will be evaluated for exposure to surface/subsurface soil (to a depth of 10 feet). Pending further review of site-specific information (depth to groundwater, detected groundwater chemicals, etc.), the risks associated with dermal exposure to groundwater may also be evaluated for this receptor group. Potentially complete exposure pathways to be considered in the development of the human health risk assessment are provided in Table 3-2 of the Master Work Plan.

Based on previous project-specific discussions with the Station, NAVY, and USEPA (May 7, 1996), a future residential exposure scenario is not considered to be likely for the site and will not be evaluated in the RI Report since the site is situated in the main production area. If the Station were to close in the future, it is anticipated that the area would be used for industrial/commercial purposes only.

8.4 ECOLOGICAL RISK ASSESSMENT

Results of previous investigations indicate that contaminants associated with Site 44 are confined to subsurface soil and groundwater in a developed area with limited habitat. As a result, ecological receptor exposure to these contaminants is expected to be insignificant. In addition, migration of contaminants via overland runoff to surface water or migration of groundwater contaminants to surface water is unlikely since surface water is limited near the site. For these reasons, potential risks to ecological receptors are insignificant, and hence, the site will be excluded from quantitative ecological risk assessment.

8.5 INVESTIGATIVE SCOPING

The previous investigation which has been summarized in Table 8-1, indicates that the TCE was observed in one groundwater sample which exceeded the RBC screening level (Note: Phenanthrene was discovered in a soil boring which exceed the EPA region III ecological screening levels, however this sample was collected at a depth of 4 feet and does not pose an ecological risk). Analysis for inorganics was not conducted. Although site history does not indicate that the absence of inorganic data is a problem, the inorganic fraction will be analyzed during the field investigation. Evaluation of the various media is as follows:

- Subsurface Soil - Previous sampling conducted to evaluate subsurface soils for human health risk did not exceed the EPA region III RBC screening levels. No additional sampling is proposed.

- Surface Soil - The two surface soil samples previously collected in the drainage channel did not exceed EPA Region III RBC screening levels. However, four additional surface soil samples will be collected to identify possible areas of contamination outside the drainage channel.

- Surface Water - No water bodies are located in the area of Site 44. However, one surface water sample may be collected from seasonal, shallow pools that form at the site.

- Groundwater - Two rounds of groundwater testing were conducted (10/92 and 4/93). A groundwater sample collected during the first round of sampling indicated an elevated level of TCE which exceeds the EPA region III RBC screening level. Additional sampling of the existing monitoring wells are proposed to evaluate if contamination of the groundwater still exists.

A summary of the investigative scoping is provided in Table 8-2.

8.6 WORK PLAN

The proposed scope for the field investigation is summarized on Table 8-3. The location of the existing monitoring wells and groundwater samples to be collected is provided on Figure 8-3. Table 8-4 summarizes the sampling program for Site 44, and Table 8-5 provides sample bottleware, preservation, and holding time requirements. The following provides a breakdown by media of the sampling to be conducted:

TABLE 8-2

INVESTIGATION SCOPING
SITE 44 - SOAK OUT AREA
INDIAN HEAD, MARYLAND

Media/Exposure Pathway	Identified/ Suspected Contaminants	Screening Levels	Preliminary Risk Evaluation	Data Gaps/ Investigative Objective	Decision Rule	Potential Remedial Action
Groundwater Shallow aquifer	Two rounds of groundwater sampling from three monitoring wells was conducted and analyzed for VOC, SemiVolatiles, and TPH.	EPA Region III RBC Screening Criteria	TCE, detected above the screening levels in one monitoring well (02). Contamination may pose human health and/or ecological risk.	Conduct another round of groundwater testing at existing monitoring well to determine if levels of contamination still exceed the screening levels.	If contamination is detected above the screening levels, then a site specific evaluation shall be performed to determine health based risk action levels. If contamination is not detected above the screening levels, then no further action is required	Natural Attenuation. Air Sparging. Pump and Treat. Prepare No Further Action Document.

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TABLE 8-3

SITE SPECIFIC WORK PLAN
SITE 44 - SOAK OUT AREA
INDIAN HEAD, MARYLAND

Data Needs	Investigative Technique	Location	Number of samples	Analysis
Groundwater: Investigate potential VOC contamination in the groundwater.	Collect one groundwater sample from each of the three existing monitoring wells.	Sample monitoring wells 44MW01, 44MW02, and 44MW03 (Figure 8-2).	3	TCL VOC and SemiVOC, TAL Metals, Explosives
	If results of analysis are above the screening levels, then a site specific evaluation based on health risks will be performed to determine action levels and if necessary additional wells will be installed to determine the extent of the contamination.	To be determined.		
	If results of the analysis are below the screening levels, then no further action is required and a No Further Action document is appropriate.	Not Applicable.	---	Not Applicable
Surface Soil: Identify areas of possible surface soil contamination at Site 44.	Collect four surface soil samples (0-6").	See Figure 8-3 for approximate locations.	4	TAL Metals, Explosives
Surface Water: Identify localized areas of possible surface water contamination.	Collect one surface water sample.	The surface of any seasonal ponding that may develop at Site 44.	1	TCL VOCs TCL SemiVOCs TAL Metals

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TABLE 8-4

SUMMARY OF SAMPLING PROGRAM
SITE 44 - SOAK OUT AREA
INDIAN HEAD, MARYLAND

Sample Media	Sample ID Number	Sample Depth/ Location	Analysis				
			VOCs	SVOCs	Metals	Pesticides/ PCBs	Explosives
Groundwater	RI44GW01	Existing Monitoring Well 44MW01	•	•	•		•
	RI44GW02	Existing Monitoring Well 44MW02	•	•	•		•
	RI44GW03	Existing Monitoring Well 44MW03	•	•	•		•
Surface Soil	RI44SS01	East of Building 1363 (0-6")			•		•
	RI44SS02	Southwest Building 1273 (0-6")			•		•
	RI44SS03	Northeast Building C-3 (0-6")			•		•
	RI44SS04	East Building C-23 (0-6")			•		•
Surface Water	RI44SW01	At Surface of Seasonal Ponding	•	•	•		

TABLE 8-5

BOTTLEWARE, PRESERVATION, AND HOLDING TIME REQUIREMENTS
SITE 44 - SOAK OUT AREA
INDIAN HEAD, MARYLAND

Media	Analysis	Total Number of Samples	Number of Containers Per sample	Container Type	Preservation	Holding Times
Groundwater	TCL VOCs - CLP OLM03.0	3	2	40 ml glass	HCL pH <2, Cool to 4°C	14 days to analysis
	TCL SVOCs - CLP OLM03.0	3	1	1L amber glass	Cool to 4°C	7 days to extract; 40 days to analysis
	TAL Metals - CLP ILM04.0	3	1	1L plastic	HNO3 pH <2	6 months; Hg 28 days
	Explosives - Modified SW-846-8330*	3	1	1L amber glass	Cool to 4°C	7 days to extract; 40 days to analysis
Surface Water	TCL VOCs - CLP OLM03.0	1	2	40 ml glass	HCL pH <2, Cool to 4°C	14 days to analysis
	TCL SVOCs - CLP OLM03.0	1	1	1L amber glass	Cool to 4°C	7 days to extract; 40 days to analysis
	TAL Metals - CLP ILM04.0	1	1	1L plastic	HNO3 pH <2	6 months; Hg 28 days
Surface Soil	TAL Metals - CLP ILM04.0	4	1	250 ml CWM glass	Cool to 4°C	6 months; Hg 28 days
	Explosives - Modified SW-846-8330*	4	1	250 ml CWM glass	Cool to 4°C	14 days to extract; 40 days to analysis

CWM - Clear Wide Mouth
* - Includes analysis for nitrate esters (nitroglycerin, nitrocellulose, nitroquanidine) in Modified SW-846-8330.

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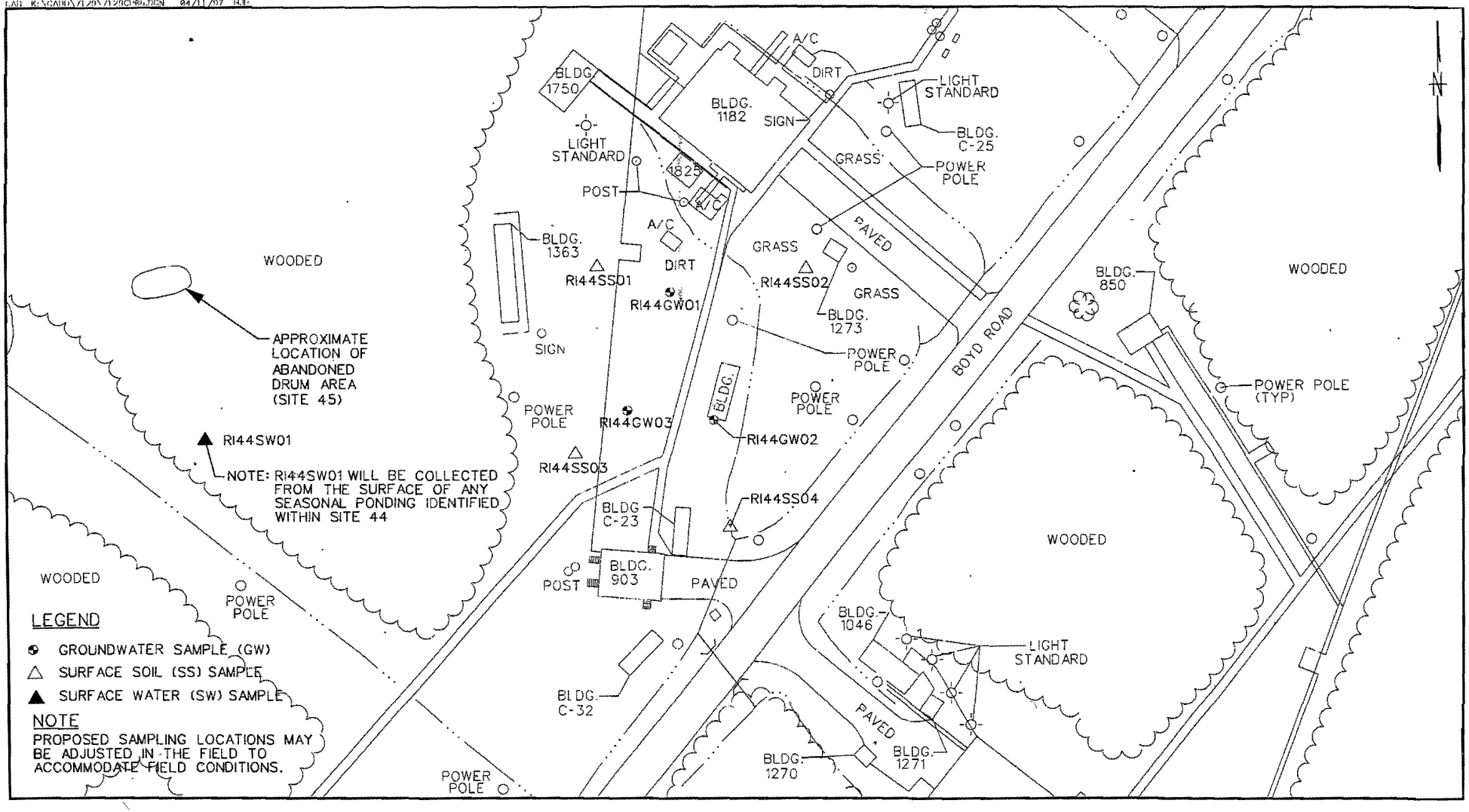

FIGURE 8-3

PROPOSED SAMPLING LOCATION MAP
SITE 44 – SOAK OUT AREA
INDIAN HEAD, MARYLAND

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- Subsurface Soils - No additional sampling proposed.

- Surface Soils - Four additional surface soil samples will be collected at the locations indicated on Figure 8-3 according to station SOP SA-03.

- Surface Water - One surface water sample will be collected from the surface of any seasonal ponds found at Site 44 according to station SOP SA-02.

- Groundwater - The three existing monitoring well will be resampled. The sample shall be collected in accordance with Station SOP SA-01 "Groundwater Sample Acquisition and Onsite Water Quality Testing". These samples will be analyzed for TCL VOCs, TCL SemiVOCs, TAL metals and explosives.

9.0 SITE 45 - ABANDONED DRUMS

9.1 BACKGROUND INFORMATION AND SITE DESCRIPTION

Site 45 - Abandoned Drums is located approximately 300 feet west of Site 44 - Soak Out Area, in the northwest-central portion of the facility. The site is located in a wooded area, approximately 125 feet northeast of Building 674 and 450 feet northwest of Building 1363 as shown in Figure 9-1. The terrain is generally flat with a general slope to the southeast. A drainage ditch is located northeast of the site and is sloped towards the south. The site consisted of approximately 20 empty rusted drums. The drums contained holes and some appeared to have been cut and welded end-to-end similar to the drums identified being used at the soak out area (Site 44). The actual origin and previous contents of the drums was not known, however according to the January 1992 Preliminary Assessment (NEESA, 1992), the drums have been in this area for 15 to 20 years and may have originated from the soak out process at Site 44. The drums have been subsequently removed and the site was staked to identify an area approximately 20' x 10' where the drums previously existed. This area shows no signs of stressed vegetation.

9.2 PREVIOUS ENVIRONMENTAL INVESTIGATIONS

Limited sampling was conducted to determine if surface soils have been contaminated as a result of placing the drums in this area. The samples collected and analyzed are summarized in Table 9-1.

TABLE 9-1
PREVIOUS INVESTIGATION
SITE 45 - ABANDON DRUM
INDIAN HEAD, MARYLAND

Sample Media:	Shallow soil zone (0-1 feet) Soil-gas (3-4 feet)			
Sampling Performed:	**Type**	**Number**	**Sam/Loc**	**Total**
	Shallow soil zone	3	1	3
	Soil-gas Boring	4	1	4
Analyses Performed:	**Media**	**Analyses**		
	Soil	TAL, VOC, BNA		
	Soil-gas	Vapor Analysis-GC/FID, GC/ECD		

Four soil-gas samples were collected in the area surrounding the drums. One soil-gas boring, 45-1, was completed upgradient of the drum area. Two soil-gas borings, 45-2 and 45-3, were placed downgradient of the drum area. The fourth soil-gas boring was completed in the approximate center of the drum area. Also, three surface soil samples were collected along the downgradient side of the drum disposal area. The location of the samples collected are provided in Figure 9-2A. The location of the soil-gas sampling conducted is as shown in Figure 9-2B. Since none of the detected contaminant concentrations exceeded the USEPA Region III screening levels, no contaminant concentrations are indicated on Figure 9-2A and Figure 9-2B.

Based on the sample results, the 1994 Site Inspection reported that low levels of total volatile vapors were detected by GC/FID in all four soil-gas samples (E/A&H, 1994). Low levels of xylenes were detected in sample 45-4 and low levels of tetrachloroethene (PCE) were detected in samples 45-1, 45-3, and 45-4.

Acetone was detected in soil sample 45SA01 at 390 µg/kg, and also in the corresponding laboratory blank. Carbon disulfide was reported at an estimated concentration of 2.0 µg/kg in sample 45SA01. Only one semivolatile organic compound, dimethylphenol, was detected in sample 45SA01 at an estimated concentration of 66.0 µg/kg.

The TAL analysis detected concentrations of metals in the soil samples. The concentration of metals detected were within natural backgrounds levels (E/A&H, 1994) with the exception of cadmium and cobalt. Cadmium was reported at 1.2 mg/kg in sample 45SA01 and at 1.6 mg/kg in sample 45SA03. Cobalt was detected in 43SA03 at 26.8 mg/kg. Beryllium was detected, but at concentrations less-than-background (E/A&H, 1994).

The data collected was evaluated against the EPA Region III RBC screening levels which indicated all levels were below these levels.

9.3 HUMAN HEALTH RISK ASSESSMENT

A human health risk assessment for the site will be performed and documented in the RI Report. Analytical data generated under this work plan, as well as historical data for the site, will be used to determine if measured chemical concentrations pose a significant threat to potential human receptors. The general methodologies which will be used to assess human health risks are contained in Section 3.0 of the Master Work Plan for the Indian Head Division, Naval Surface Warfare Center (B&R Environmental, June 1996). The remainder of this section of the Project-Specific Work Plan identifies preliminary

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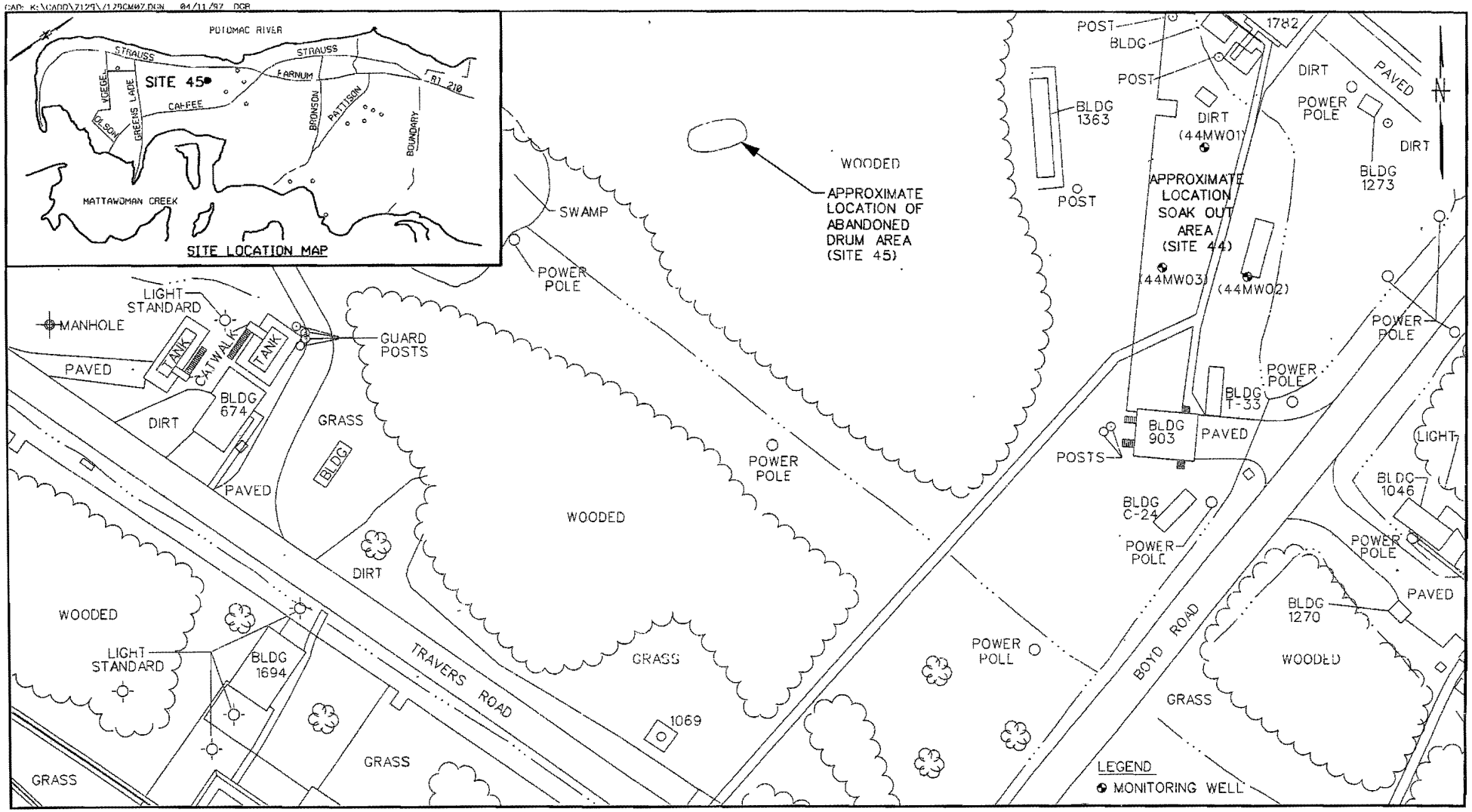

FIGURE 9-1

GENERAL SITE MAP
SITE 45 – ABANDONED DRUMS
INDIAN HEAD, MARYLAND

0 50 100
SCALE IN FEET

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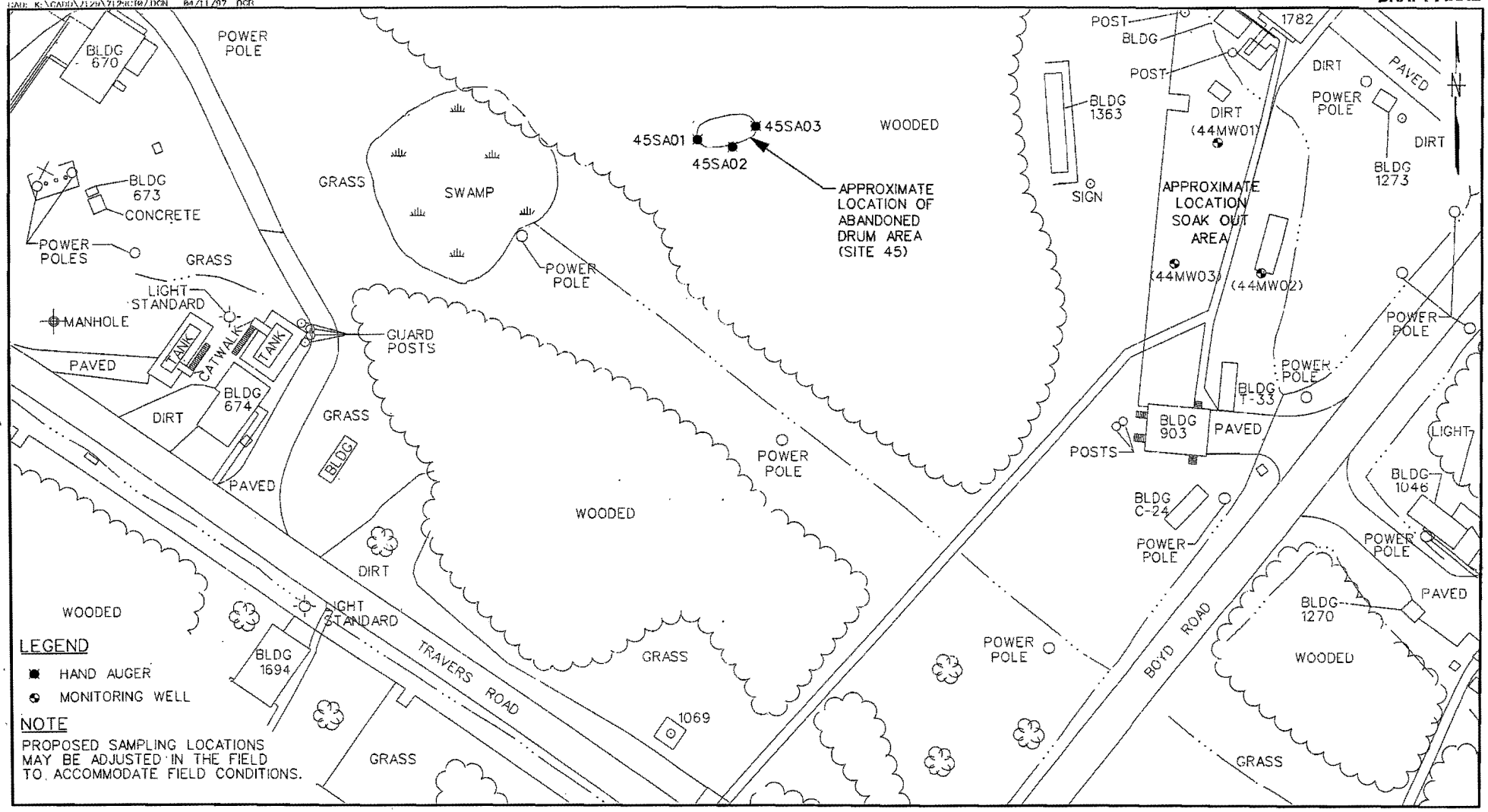

FIGURE 9-2A

PREVIOUS SAMPLING
SITE 45 - ABANDONED DRUMS
INDIAN HEAD, MARYLAND

0 50 100
SCALE IN FEET

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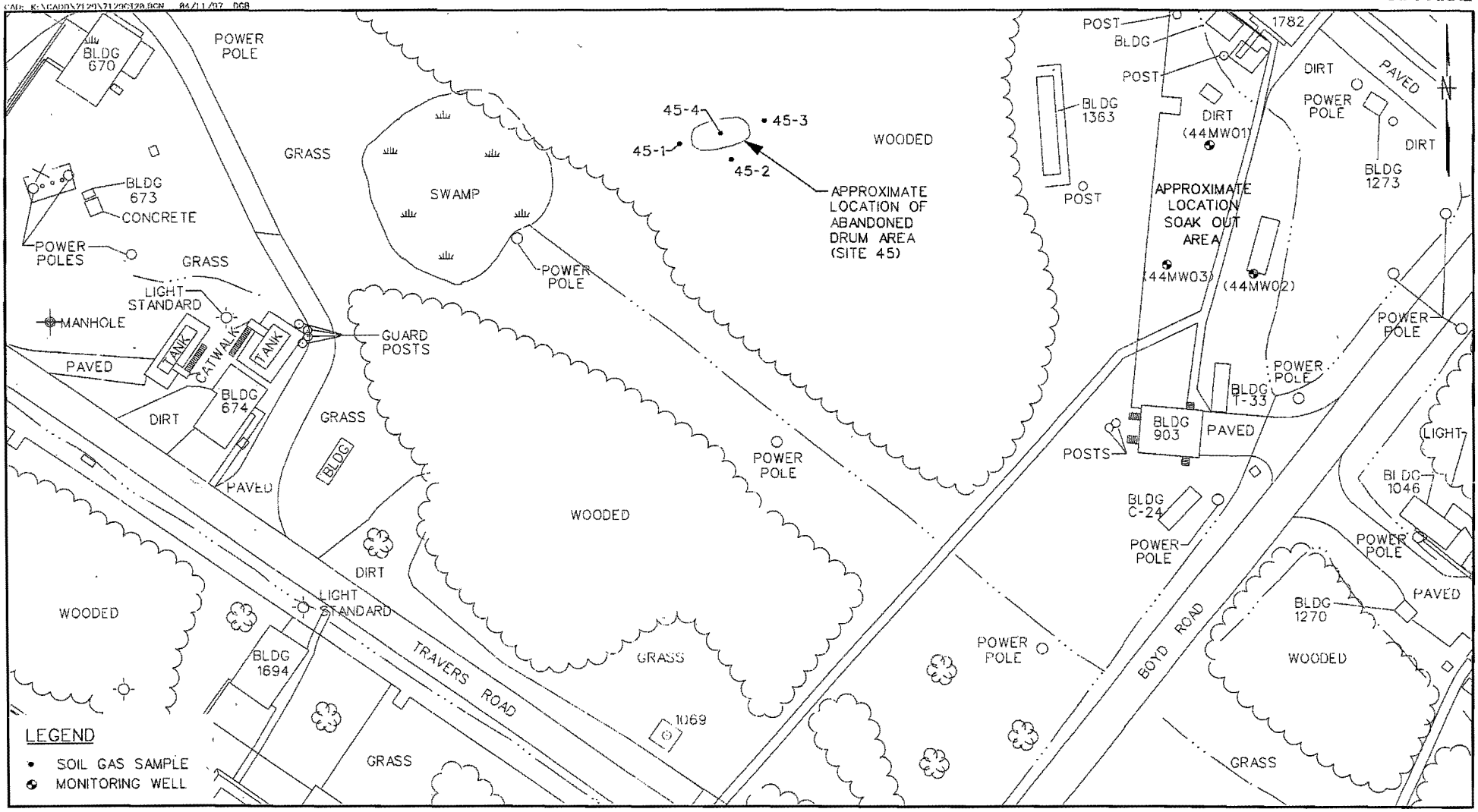

PREVIOUS SOIL GAS SAMPLING
SITE 45 – ABANDONED DRUMS
INDIAN HEAD, MARYLAND

0 50 100
SCALE IN FEET

FIGURE 9-2B

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chemicals of concern (COCs) based on existing site information; screening levels which will be used to identify COCs in the risk assessment, and exposure scenarios to be evaluated.

No chemicals have been preliminarily identified as COCs for the site. USEPA Region III soil COC screening levels for industrial land use will be used to identify site-specific COCs for soil and sediment. For groundwater, USEPA Region III COC screening levels for tap water ingestion will be employed.

The following potential receptor groups will be evaluated in the human health risk assessment:

- Adolescent Trespassers
- Construction Workers

Adolescent trespassers (ages 6 to 16) under current land use will be evaluated since access to the landfill is not physically restricted. These receptors will be assumed to be exposed to surface soil and sediment from seeps. Construction workers, who will be considered to be potential receptors for future land use, will be evaluated for exposure to surface/subsurface soil (to a depth of 10 feet). Pending further review of site-specific information (depth to groundwater, detected groundwater chemicals, etc.), the risks associated with dermal exposure to groundwater may also be evaluated for this receptor group. Potentially complete exposure pathways to be considered in the development of the human health risk assessment are provided in Table 3-2 of the Master Work Plan.

Based on previous project-specific discussions with the Station, NAVY, and USEPA (May 7, 1996), a future residential exposure scenario is not considered to be likely for the site and will not be evaluated in the RI Report since the site is situated in the main production area. If the Station were to close in the future, it is anticipated that the area would be used for industrial/commercial purposes only. Maintenance activities (i.e., mowing, landscaping) or daily occupational duties are not performed at the site, therefore, Station personnel (workers) will not be regarded as potential receptors.

9.4 ECOLOGICAL RISK ASSESSMENT

The site is located in a wooded area that provides upland terrestrial habitat. However, the results of previous investigations indicate that contaminants associated with Site 45 are mostly confined to subsurface soil and groundwater. Some metals and VOCs were detected in surface soils, but at relatively low concentrations. As a result, ecological receptor exposure to these contaminants is expected to be insignificant. Migration of groundwater contaminants to surface water is possible since some small wetland areas are located near the site. Nonetheless, no evidence of groundwater contamination exists,

although it will be further investigated during this RI. Potential risks to ecological receptors most likely are insignificant, and hence, the site will be excluded from quantitative ecological risk assessment. However, if data generated through the proposed groundwater investigation indicates that the wetland area results from groundwater discharge, then subsequent investigations and assessments will be performed to evaluate ecological risk relative to the wetland.

9.5 INVESTIGATIVE SCOPING

The previous investigation which has been summarized in Table 9-1 did not exceed the USEPA Region III RBC screening levels. Evaluation of the various media is as follows:

- Subsurface Soil - Soil gas sampling did not indicate levels which warrant further investigation. No additional sampling is proposed.

- Surface Soil - Previous sampling conducted to evaluate surface soils did not exceed USEPA Region III RBC screening levels. However, two additional surface soil samples are proposed to be collected from within the swamp area to determine if Site 45 contaminants may have migrated offsite.

- Surface Water - Seasonal ponding periodically occurs within the nearby swamp area. As a further check on possible offsite contaminant migration from Site 45, one surface water samples may be collected from any ponded water found in the swamp.

- Groundwater - No groundwater samples were collected in the past investigations. Groundwater needs to be evaluated to determine if a human health or ecological risk exists. Migration of groundwater could impact offsite waters. Three hydropunch samples will be collected from within the Site 45 boundaries.

A summary of the investigative scoping is provided in table 9-2.

9.6 WORK PLAN

The proposed scope for the field investigation is summarized on Table 9-3. The proposed location of the sample to be collected is provided on Figure 9-3. Table 9-4 summarizes the sampling program for Site 45, and Table 9-5 provides sample bottleware, preservation, and holding time requirements. The following provides additional information on the sampling to be conducted:

TABLE 9-2

INVESTIGATION SCOPING
SITE 45 - ABANDONED DRUMS
INDIAN HEAD, MARYLAND

Media/Exposure Pathway	Identified/ Suspected Contamination	Screening Levels	Preliminary Risk Evaluation	Data Gaps/ Investigative Objective	Decision Rule	Potential Remedial Action
Groundwater Transfer from Soil to Groundwater	Three samples were analyzed for VOC, SemiVOC, and Metals. Four soil gas locations had vapor analysis performed.	USEPA Region III RBC Screening Levels	Volatiles detected in low levels in soil gas sampling. Soil contaminants could potentially impact groundwater.	Conduct sampling to determine if contamination exists in the groundwater.	If contamination is detected above the screening levels, the perform additional sampling to determine the extent. If contamination concentrations are below the screening levels, the no further action is required.	Natural Attenuation. Air Sparging. Pump and Treat. Prepare No Further Action document.

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TABLE 9-3

SITE SPECIFIC WORK PLAN
SITE 45 - ABANDONED DRUMS
INDIAN HEAD, MARYLAND

Objective	Investigative Technique	Location	Number of samples	Analysis
Investigate potential contamination in groundwater.	Collect three groundwater samples using hydropunch . If unable to reach groundwater using this technique, then conventional drilling techniques will be employed.	See Figure 9-3.	3	TCL VOCs, TCL SemiVOCs, TAL Metals, Explosives
	If results of analysis above screening levels, install three temporary monitoring wells to investigate groundwater and help identify extent.	Install two monitoring wells downgradient and one upgradient.	3	TCL VOCs, TCL SemiVOCs, TAL Metals, Explosives
	If result of analysis is below screening levels, no further action required.	Not Applicable	---	Not Applicable
Investigate potential surface migration of contaminants offsite.	Collect two surface soil samples from within the swamp boundaries.	See Figure 9-3, and refine according to field evaluation.	2	TCL VOCs, TCL SemiVOCs, TAL Metals, Explosives
Investigate potential surface migration of contaminants offsite.	Collect a maximum of one surface water sample from any seasonal ponded area found within the swamp boundaries.	Determined in field.	1	TCL VOCs, TCL SemiVOCs, TAL Metals, Explosives

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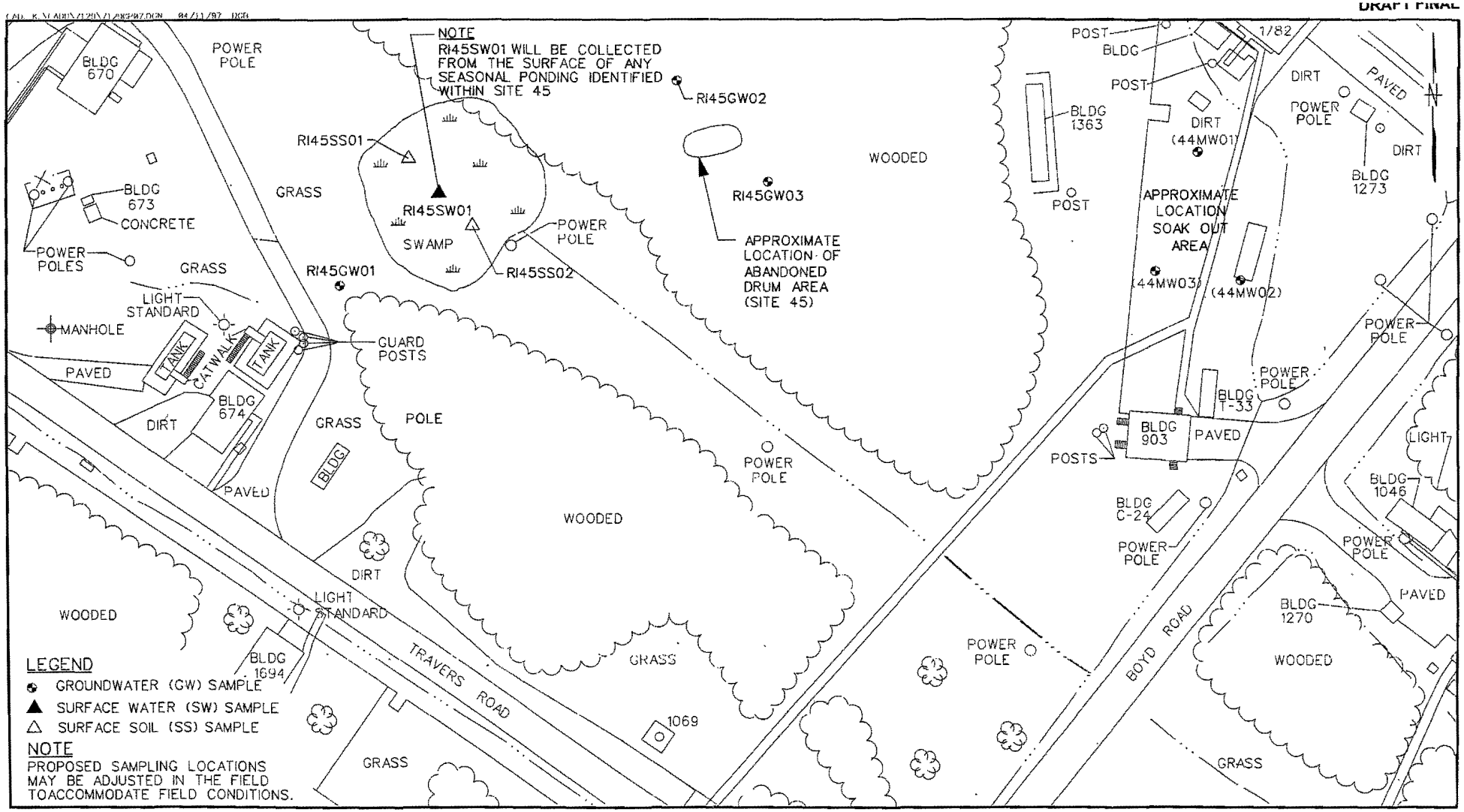

FIGURE 9-3

PROPOSED SAMPLING LOCATIONS MAP
SITE 45 – ABANDONED DRUMS
INDIAN HEAD, MARYLAND

0 50 100
SCALE IN FEET

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TABLE 9-4

SUMMARY OF SAMPLING PROGRAM
SITE 45 - ABANDONED DRUMS
INDIAN HEAD, MARYLAND

Sample Media	Sample ID Number	Sample Depth/ Location	Analysis				
			VOCs	SemiVOCs	Metals	Pesticides/ PCBs	Explosives
Groundwater	RI45GW01	Hydropunch (See Figure 9-3)	•	•	•		•
	RI45GW02	Hydropunch (See Figure 9-3)	•	•	•		•
	RI45GW03	Hydropunch (See Figure 9-3)	•	•	•		•
Surface Soil	RI45SS01	In the northwestern portion of the swamp	•	•	•		•
	RI45SS02	In the southeastern portion of the swamp	•	•	•		•
Surface Water	RI45SW01	Determined in field	•	•	•		•

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TABLE 9-5

BOTTLEWARE, PRESERVATION, AND HOLDING TIME REQUIREMENTS
SITE 45 - ABANDONED DRUMS
INDIAN HEAD, MARYLAND
PAGE 1 OF 2

Media	Analysis	Total Number of Samples	Number of Containers Per sample	Container Type	Preservation	Holding Times
Groundwater	TCL VOCs - CLP OLM03.0	3	2	40 ml glass	HCL pH <2, Cool to 4°C	14 days to analysis
	TCL SemiVOCs - CLP OLM03.0	3	1	1L amber glass	Cool to 4°C	7 days to extract; 40 days to analysis
	TAL Metals - CLP ILM04.0	3	1	1L plastic	HNO_3 pH <2	6 months; Hg 28 days
	Explosives - Modified SW-846-8330*	3	1	1L amber glass	Cool to 4°C	7 days to extract; 40 days to analysis
Surface Water	TCL VOCs - CLP OLM03.0	1	2	40 ml glass	HCL pH <2, Cool to 4°C	14 days to analysis
	TCL SemiVOCs - CLP OLM03.0	1	1	1L amber glass	Cool to 4°C	7 days to extract; 40 days to analysis
	TAL Metals - CLP ILM04.0	1	1	1L plastic	HNO_3 pH <2	6 months; Hg 28 days
	Explosives - Modified SW-846-8330*	1	1	1L amber glass	Cool to 4°C	7 days to extract; 40 days to analysis

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TABLE 9-5

BOTTLEWARE, PRESERVATION, AND HOLDING TIME REQUIREMENTS
SITE 45 - ABANDONED DRUMS
INDIAN HEAD, MARYLAND
PAGE 2 OF 2

Media	Analysis	Total Number of Samples	Number of Containers Per sample	Container Type	Preservation	Holding Times
Surface Soil	TCL VOCs - CLP OLM03.0	2	1	250 ml CWM glass	Cool to 4°C	14 days to analysis
	TCL SemiVOCs - CLP OLM03.0	2	1	250 ml CWM glass	Cool to 4°C	14 days to extract; 40 days to analysis
	TAL Metals - CLP ILM04.0	2	1	250 ml CWM glass	Cool to 4°C	6 months; Hg 28 days
	Explosives - Modified SW-846-8330*	2	1	250 ml CWM glass	Cool to 4°C	14 days to extract; 40 days to analysis

CWM - Clear Wide Mouth
* - Includes analysis for nitrate esters (nitroglycerin, nitrocellulose, nitroquanidine) in Modified SW-846-8330.

- Subsurface Soils - No additional sampling proposed.

- Surface Soils - Two additional surface soil samples will be collected from within the boundaries of the swamp area. Samples will be collected according to Station SOP SA-03 "Soil Sampling". The samples shall be analyzed for TCL VOCs, TCL SemiVOCs, TAL metals and explosives.

- Surface Water - One surface water sample will be collected from any visible ponded areas within the swamp area boundaries. Samples will be collected according to Station SOP SA-01 "Groundwater Sample Acquisition and Onsite Water Quality Testing". The sample shall be analyzed for TCL VOCs, TCL SemiVOCs, TAL metals, and explosives.

- Groundwater - To determine if the groundwater has been impacted, three temporary monitoring wells will be installed and a groundwater sample will be collected. The wells will be installed in accordance with Station SOP SA-06 "Ground Penetrating Sampling Techniques". If use of a hydropunch is unsuccessful then monitoring wells shall be installed according to Station SOP GH-11 "Groundwater Monitoring Point Installation". The samples shall be collected in accordance with Station SOP SA-01 "Groundwater Sample Acquisition and Onsite Water Quality Testing". The sample shall be analyzed for TCL VOCs and TCL SemiVOCs, TAL metals, and explosives.

10.0 SITE 46 - CADMIUM SANDBLAST GRIT AREA

10.1 BACKGROUND INFORMATION AND SITE DESCRIPTION

Site 46 Cadmium Sandblast Grit Area is located in the northwest-central area of the facility in the vicinity of the gravel lot and wooded area immediately southwest of Building 855 as shown in Figure 10-1. The area is generally flat. A drainage ditch which abuts the southeastern edge of the gravel lot flows northeast toward and along Boyd Road. A grassy clearing exists in the woods southeast of the gravel lot immediately behind Buildings 1280 and 1169. Area does not contain any visible signs of stressed vegetation.

Site 46 was reportedly active from the mid-1960's to the mid-1970's when rocket motor catapult tubes were sandblasted in Building 855. Until the mid-1970's, this sandblasting grit, which contained concentrations of cadmium, was sometimes disposed in the gravel area behind Building 855 or in the nearby ditch, east of Building 855. The sandblasting grit was generated by two separate units housed within Building 855. Facility personnel estimated that sandblasting 900 cadmium-plated catapult tubes every 3 months generated approximately 30 gallons of sandblasting grit during the 3-month period (NEESA, 1992). In February 1990, an EPTox grit analysis of the materials generated by the smaller blasting unit housed in Building 855 indicated a 10.6 mg/L concentration of extractable cadmium. A June 1990 analysis of the grit generated by the larger blasting unit produced a value of 69.4 mg/L extractable cadmium (NEESA, 1992).

10.2 PREVIOUS ENVIRONMENTAL SAMPLING

Sampling and analysis was conducted to determine if disposal of sandblast grit from the resurfacing process had contaminated the surface soils at Site 46. The sampling and analysis conducted during the Site Inspection Study is summarized in Table 10-1.

TABLE 10-1
PREVIOUS INVESTIGATION
SITE 46 - CADMIUM SANDBLAST GRIT AREA
INDIAN HEAD, MARYLAND

Sample Media:	Surface soil (0-1 feet)			
Sampling Performed:	**Type**	**Number**	**Sam/Loc**	**Total**
	Soil boring-hand-auger	9	1	9
Analyses Performed:	**Media**	**Analyses**		
	Soil	TAL - Metals		

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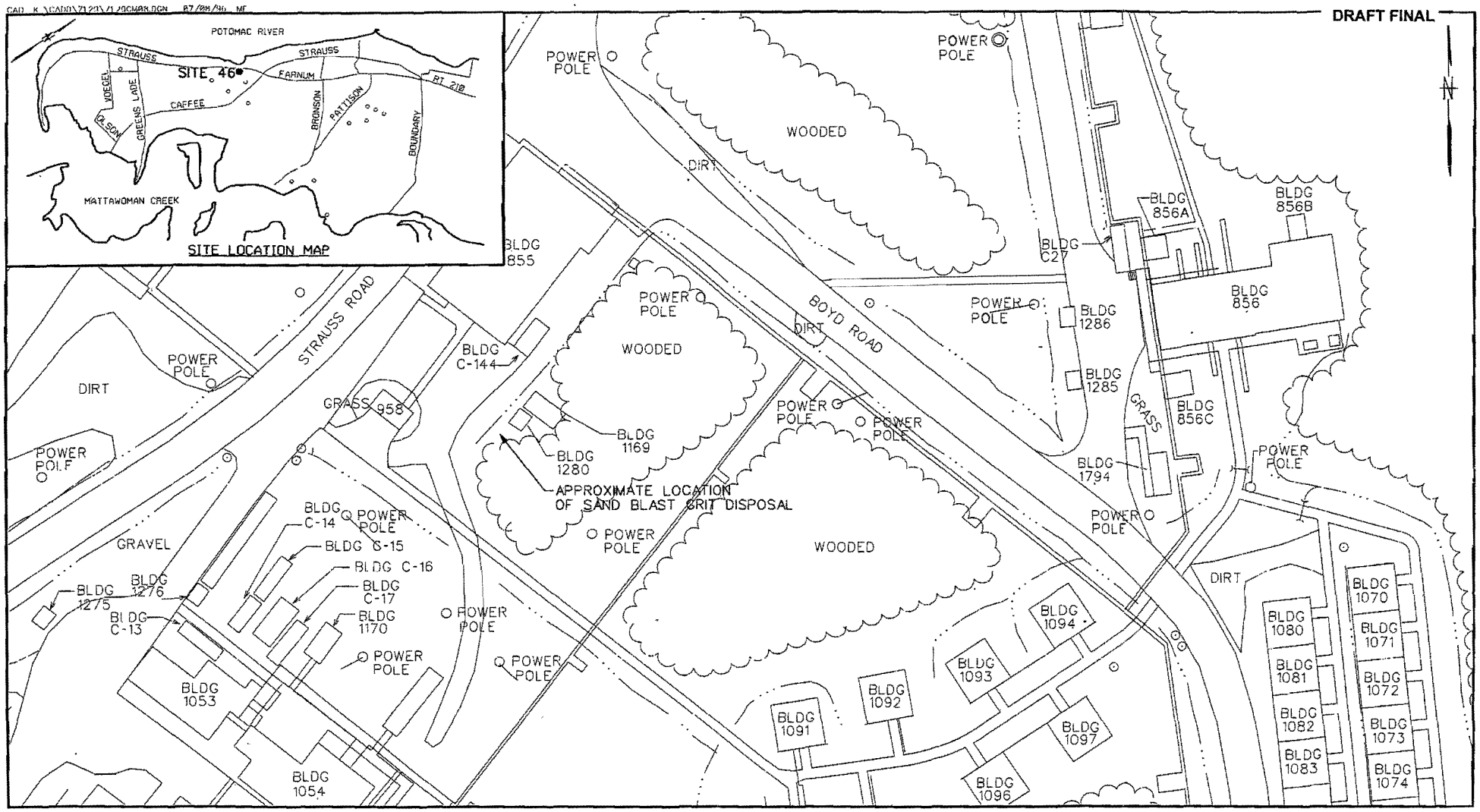

FIGURE 10-1

GENERAL SITE MAP
SITE 46 - CADMIUM SANDBLAST GRIT AREA
INDIAN HEAD, MARYLAND

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Nine surface soil samples were collected from various locations on the site. The location of the samples and analytical results which exceed the USEPA Region III RBC screening levels are as shown in Figure 10-2.

Numerous metals were detected in every collected soil sample (E/A&H, 1994). However, only four were above the background concentrations identified in the Site Inspection Report. These metals were cadmium, lead, mercury, and nickel. Low levels of cadmium were detected in seven of the nine samples. Lead was reported in all nine samples. Mercury was detected in samples 46SA01 and 46SA08 and nickel was detected in only one sample, 46SA05.

Arsenic was detected in two samples, 46SA01 and 46SA09, at a concentration which exceeded the USEPA Region III RBC screening levels. These values only slightly exceed the screening level and do not pose a significant risk. No other constituent exceeded the screening levels.

10.3 HUMAN HEALTH RISK ASSESSMENT

A human health risk assessment for the site will be performed and documented in the No Further Action document. Historical analytical data generated for the site will be used to demonstrate that measured chemical concentrations do not pose a significant threat to potential human receptors. The general methodologies which will be used to assess human health risks are contained in Section 3.0 of the Master Work Plan for the Station. The remainder of this section of the Project Specific Work Plan identifies preliminary COCs based on existing site information, screening levels which will be used to identify COCs in the risk assessment, and exposure scenarios to be evaluated.

Arsenic has been identified as a preliminary COC for the site. USEPA Region III soil COC screening levels for industrial land use will be used to identify site-specific COCs for soil in the risk assessment.

The following potential receptor groups will be evaluated in the human health risk assessment:

- Adolescent Trespassers
- Full-Time Employees
- Construction Workers

Adolescent trespassers (ages 6 to 16) and full-time employees under current site conditions will be evaluated since 1) access to the site is not physically restricted, and 2) the site is located in a high traffic

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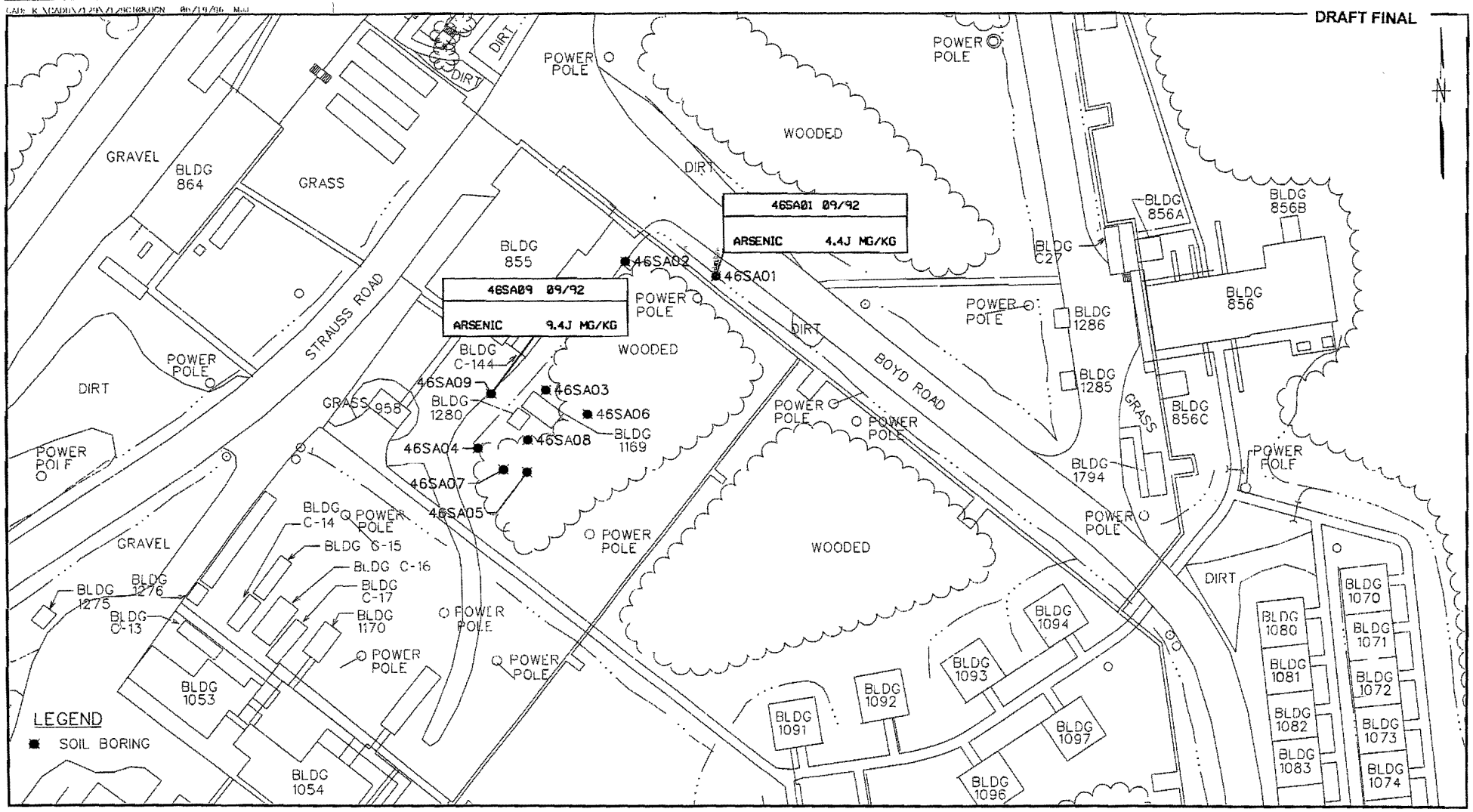

FIGURE 10-2

PREVIOUS SAMPLING
SITE 46 - CADMIUM SANDBLAST GRIT AREA
INDIAN HEAD, MARYLAND

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SCALE IN FEET

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area. These receptors will be assumed to be exposed to surface soil only. Construction workers, who will be considered to be potential receptors for future land use, will be evaluated for exposure to surface/subsurface soil (to a depth of 10 feet). Pending further review of site-specific information (depth to groundwater, detected groundwater chemicals, etc.), the risks associated with dermal exposure to groundwater may also be evaluated for this receptor group. Potentially complete exposure pathways to be considered in the development of the human health risk assessment are provided in Table 3-2 of the Master Work Plan.

Based on previous project-specific discussions with the Station, NAVY, and USEPA (May 7, 1996), a future residential exposure scenario is not considered to be likely for the site and will not be evaluated in the RI Report since the site is situated in the main production area. If the Station were to close in the future, it is anticipated that the area would be used for industrial/commercial purposes only.

10.4 ECOLOGICAL RISK ASSESSMENT

Site 46 constitutes an extremely small area. Wooded areas are located behind the site, but no wetlands are present. No surface waters that contain viable aquatic habitat or aquatic receptors are located within several hundred yards of Site 46. Previous studies indicated the presence of some elevated levels of a few inorganics in some soil samples. Some runoff from the area may occur, but is not extensive. Since the site and the contaminant source is small, and since contaminant migration to upland habitats, aquatic habitats, and the greater watershed are minimal, the site will be excluded from quantitative ecological risk assessment.

10.5 INVESTIGATIVE SCOPING

The previous investigation which has been performed in this area for inorganics indicates that the USEPA Region III RBC screening level for arsenic was slightly exceeded. Only analysis for inorganic was conducted, however historical information does not indicated that organic contamination as a potential concern. Groundwater was not evaluated. This area has not an ecologically sensitive area and human risk factors need only to be considered. Evaluation of the various media is as follows:

- Subsurface Soil - Contamination is not expected to be in the surface (greater than 2' deep) soils based on the method of disposal. No subsurface sampling is proposed.

- Surface Soil / Sediment Soil - Previous sampling conducted to evaluate surface soils only slightly exceed USEPA Region III RBC screening level for arsenic. Because the contaminant cadmium which was expected was not discovered, nor was any other TAL metals. Surface soils do not appear to

present an excessive human health risk. Sufficient number of samples to evaluate this area have been collected. No additional sampling proposed.

- Surface Water - No surface water exists in this area.
- Groundwater - No groundwater samples were collected in the past investigations. There is no indication that groundwater needs to be evaluated based on previous soil sampling and historical information.

A summary of the investigative scoping is provided in table 10-2.

10.6 WORK PLAN

The proposed scope for the field investigation is summarized on Table 10-3 and indicates that no additional sampling to further evaluate this site is appropriate. Figure 10-3 indicates no additional sampling is proposed. The following provides a summary by media of the action proposed at the site:

- Subsurface Soils - No additional sampling proposed.
- Surface Soils / Sediment Soils - No additional soil samples are proposed.
- Surface Water - No surface water exist in this area.
- Groundwater - No groundwater samples are proposed.

TABLE 10-2

INVESTIGATION SCOPING
SITE 46 - CADMIUM SANDBLAST GRIT AREA
INDIAN HEAD, MARYLAND

Media/Exposure Pathway	Identified/ Suspect Contaminates	Screening Levels	Preliminary Risk Evaluation	Data Gaps/ Investigative Objective	Decision Rule	Potential Remedial Action
Soil	Nine (9) soil samples were collected and analyzed for TAL metals.	USEPA Region III RBC screening criteria	Only arsenic was detected slightly above the industrial screening levels for ingestion. There is no indication that groundwater has been impacted.	None	No Further Action	Not Applicable

TABLE 10-3

SITE SPECIFIC WORK PLAN
SITE 46 - CADMIUM SANDBLAST AREA
INDIAN HEAD, MARYLAND

Data Needs	Investigative Technique	Location	Number of samples	Analysis
Surface soils	Not Applicable	Not Applicable	---	---

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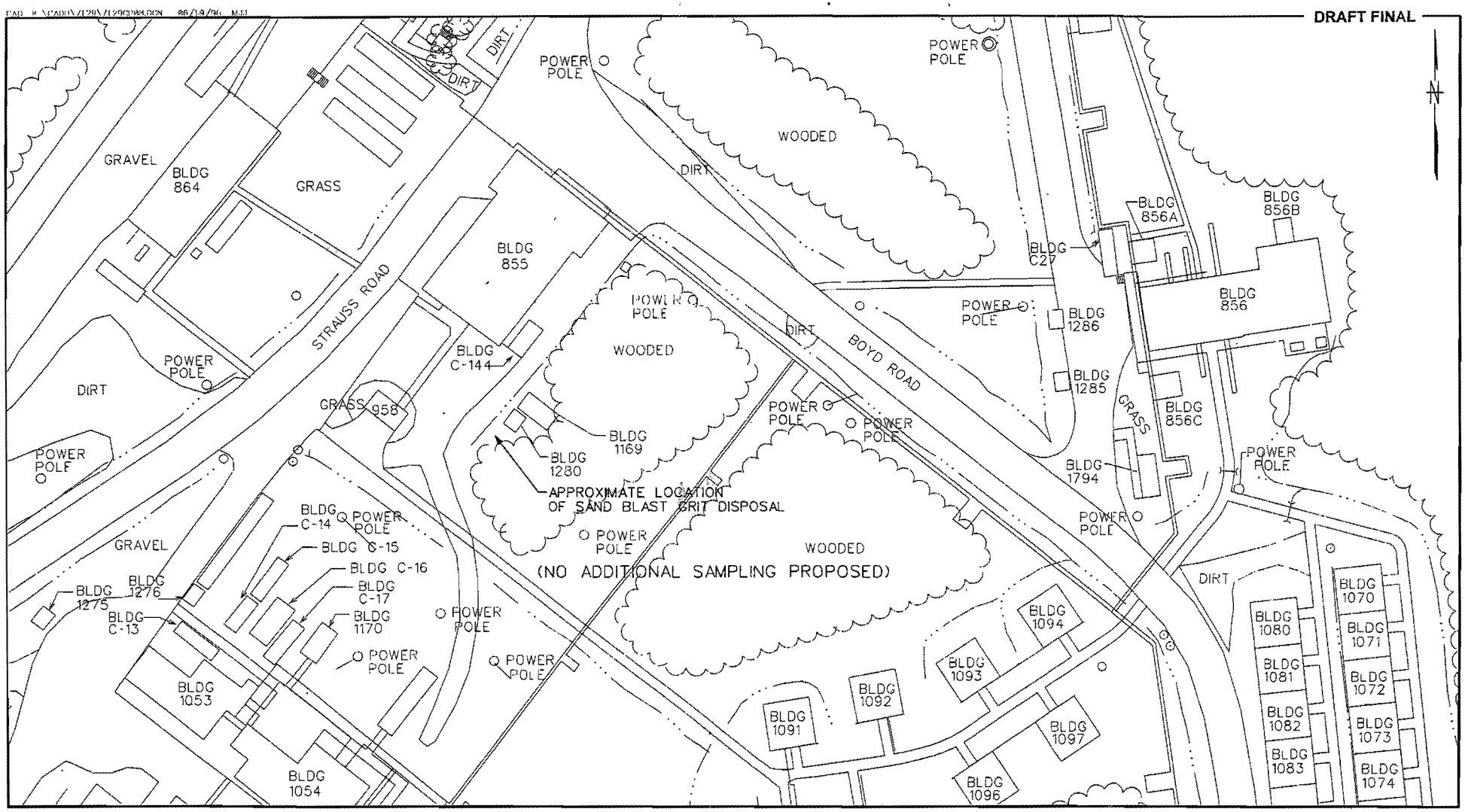

FIGURE 10-3

PROPOSED SAMPLING LOCATION MAP
SITE 46 – CADMIUM SANDBLAST GRIT AREA
INDIAN HEAD, MARYLAND

0 50 100
SCALE IN FEET

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11.0 SITE 47 - MERCURIC NITRATE DISPOSAL AREA

11.1 BACKGROUND INFORMATION AND SITE DESCRIPTION

Site 47 - Mercuric Nitrate Disposal Area is in the northwest central portion of the facility where mercuric nitrate was disposed in an area approximately 24 square feet on the west bank of the drainage ditch south of the concrete pad behind Building 856 as shown in Figure 11-1. The area was covered with limestone chips to provide a neutralizing base disposal area where the workers disposed the spent catalyst. This procedure was carried out between 1957 and 1965. A grassy drainage ditch slopes to the south where it joins a larger grassy swale which drains toward the southeast.

Building 856 produced missile propellants which used mercuric nitrate as a catalyst on the production process. During three 8-hour daily shifts, 55-gallon drums containing one ounce of mercuric nitrate dissolved in 98% nitric acid was poured over this limestone area. These three daily shifts were carried out 7 days per week, 6 months per year, for approximately 8 years (NEESA, 1992). This amounts to approximately 274 pounds of mercuric nitrate being poured onto the limestone bed over the 8-year period.

No signs of the former limestone bed or stressed vegetation were visible. A 5-foot by 10-foot concrete pad constructed at the northern corner of Building 856 may cover the former limestone pad (E/A&H, 1994).

11.2 PREVIOUS ENVIRONMENTAL INVESTIGATIONS

Shallow sampling was conducted during the Site Inspection (SI) Study to determine if past disposal practices caused contamination of the soils at Site 47. A summary of the sampling and analysis performed is provided in Table 11-1:

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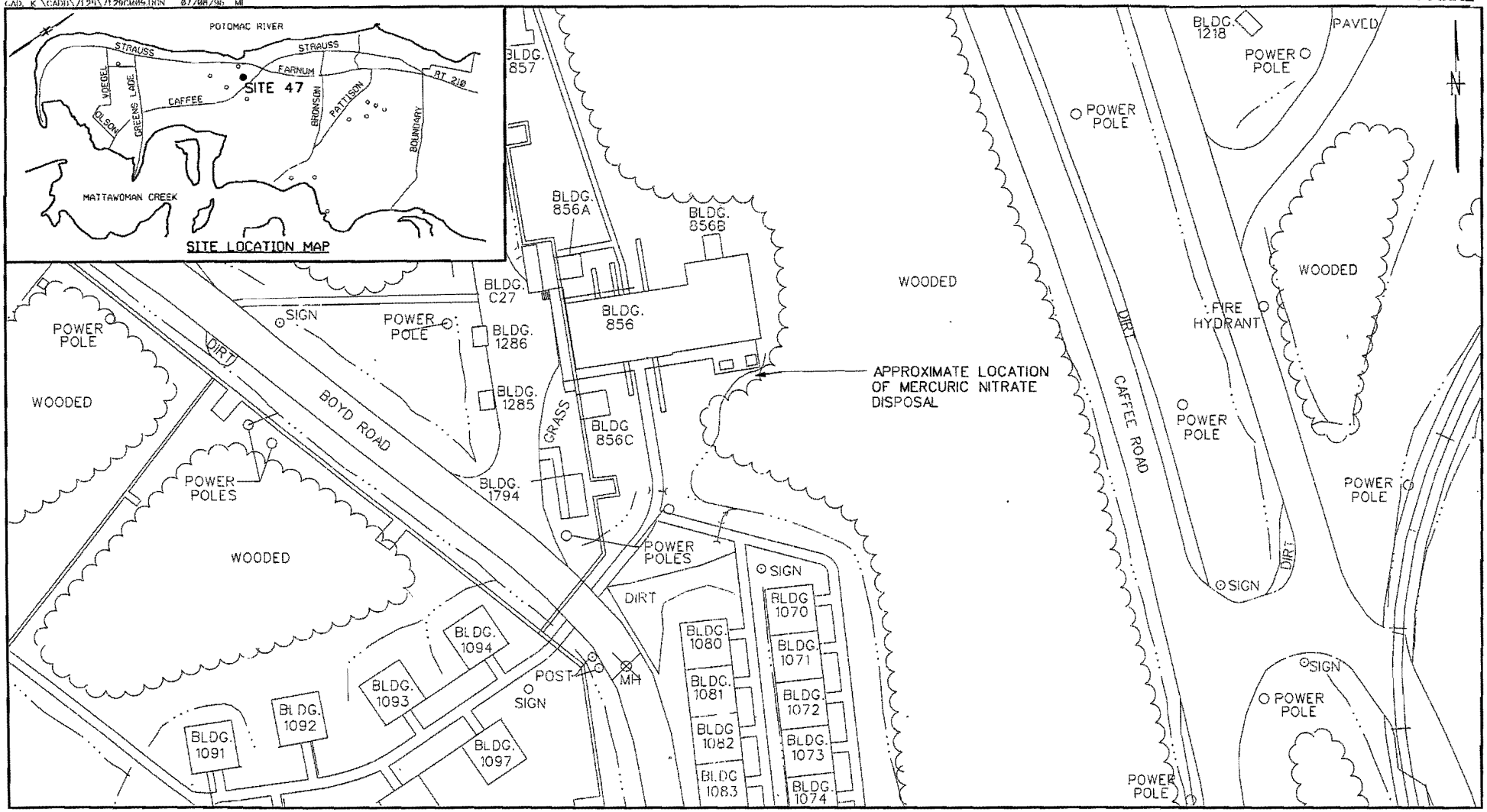

FIGURE 11-1

GENERAL SITE MAP
SITE 47 - MERCURIC NITRATE DISPOSAL AREA
INDIAN HEAD, MARYLAND

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TABLE 11-1

PREVIOUS INVESTIGATION
SITE 47 MERCURIC NITRATE DISPOSAL AREA
INDIAN HEAD, MARYLAND

Sample Media:	Shallow soil zone (0-1 feet) Probe borings (0-8 feet)			
Sampling Performed:	**Type**	**Number**	**Sam/Loc**	**Total**
	Soil boring hand-auger	12	1	12
Analyses Performed:	**Media**	**Analyses**		
	Soil	VOC, BNA, TAL Metals		

A summary of the sample locations and analytical results which exceed EPA Region III screening levels for ecological and human risk is provided in Figure 11-2.

Twelve soil samples were collected during the SI Study. Eight VOCs were detected in soil samples collected from Site 47 (E/A&H, 1994). Tetrachloroethene, carbon tetrachloride, and chloroform were reported at elevated concentrations above the action level established for the Site Inspection Study. These compounds were detected in samples 47SA01, 47SA02, and 47SA12.

Twenty-one semivolatile compounds were detected in the 12 soil samples. Five compounds were detected at concentrations above risk-based criteria (E/A&H, 1994). These compounds were indeno(1,2,3-cd) pyrene, benzo(b)fluoranthene, benzo(a)pyrene, dibenz(a,h)anthracene, and benzo(a) anthracene.

Laboratory analysis detected several metal analytes, however, only four analytes were detected at concentrations exceeding the background levels identified in the Site Inspection Report. These analytes were cadmium, lead, mercury, and silver. Silver was the only analyte detected (65.3 mg/kg) at concentrations that exceeded the action level (20 mg/kg) identified in the Site Inspection Report.

There was no sample evidence in subsurface soils (0 to 3 feet) that indicated the location of the limestone chips (E/A&H, 1994).

11.3 HUMAN HEALTH RISK ASSESSMENT

A human health risk assessment for the site will be performed and documented in the RI Report. Analytical data generated under this work plan, as well as historical data for the site, will be used to

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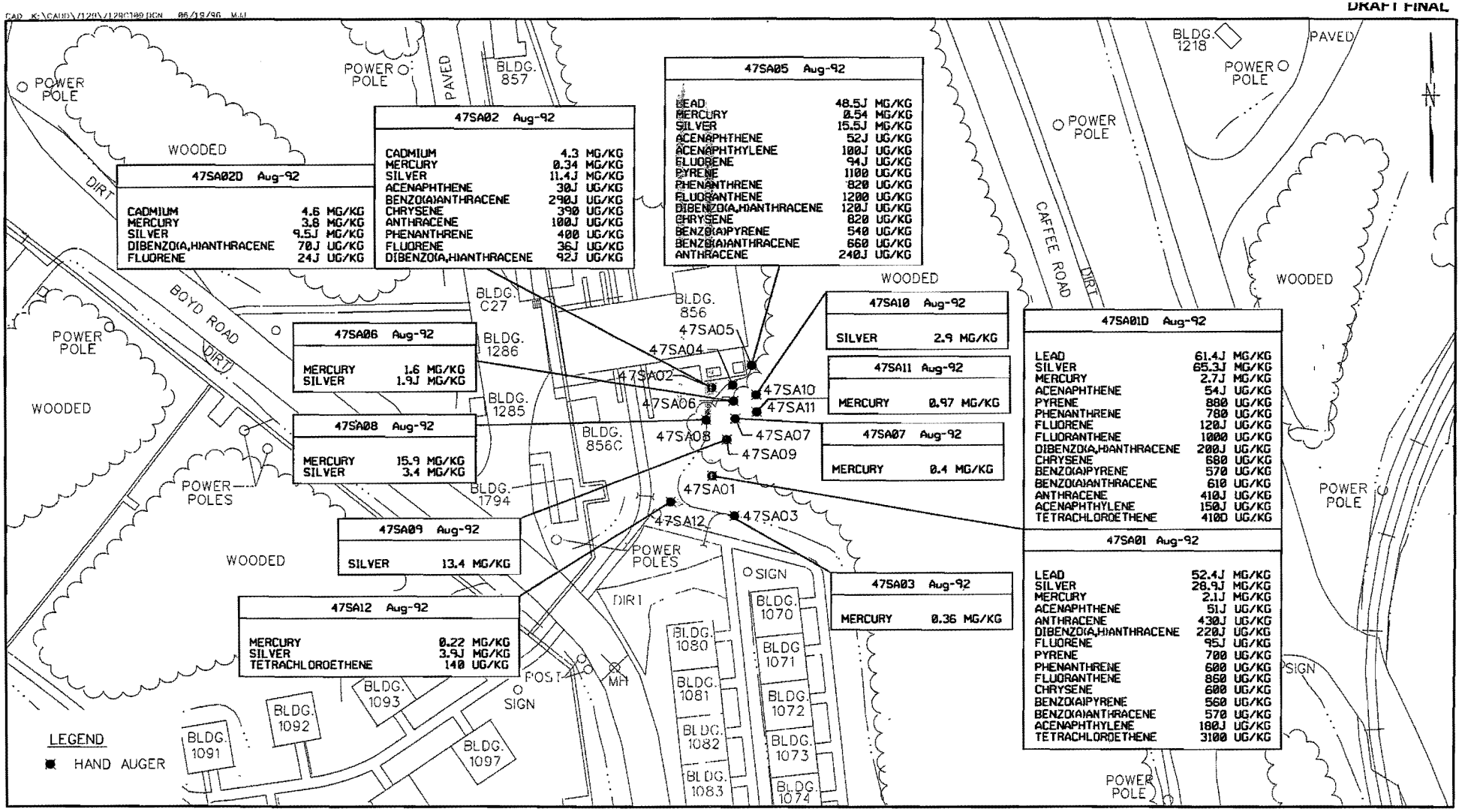

FIGURE 11-2

PREVIOUS SAMPLING
SITE 47 – MERCURIC NITRATE DISPOSAL AREA
INDIAN HEAD, MARYLAND

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determine if measured chemical concentrations pose a significant threat to potential human receptors. The general methodologies which will be used to assess human health risks are contained in Section 3.0 of the Master Work Plan for the Station. The remainder of this section of the project-specific work plan identifies preliminary COCs based on existing site information, screening levels which will be used to identify COCs in the risk assessment, and exposure scenarios to be evaluated.

The chemicals which have been preliminarily identified as COCs for the site are presented in the tags on Figure 11-2. Region III soil COC screening levels for industrial land use will be used to identify site-specific COCs for soil in the risk assessment. For groundwater, Region III COC screening levels for tap water ingestion will be employed.

The following potential receptor groups will be evaluated in the human health risk assessment:

- Adolescent Trespassers
- Maintenance Workers
- Construction Workers

Adolescent trespassers (ages 6 to 16) will be evaluated since access to the site is not physically restricted. Maintenance workers and adolescent trespassers under current land use will be assumed to be exposed to surface soil only. Construction workers, who will be considered to be potential receptors for future land use, will be evaluated for exposure to surface/subsurface soil (to a depth of 10 feet). Pending further review of site-specific information (depth to groundwater, detected groundwater chemicals, etc.), the risks associated with dermal exposure to groundwater may also be evaluated for this receptor group. Potentially complete exposure pathways to be considered in the development of the human health risk assessment are provided in Table 3-2 of the Master Work Plan.

Based on previous project-specific discussions with the Station, NAVY, and USEPA (May 7, 1996), a future residential exposure scenario is not considered to be likely for the site and will not be evaluated in the RI Report since the site is situated in the main production area. If the Station were to close in the future, it is anticipated that the area would be used for industrial/commercial purposes only.

11.4 ECOLOGICAL RISK ASSESSMENT

The results of previous investigations revealed that some metals and several organics were present in elevated concentrations in the drainage swale that flows from the site. The drainage swale flows through the woods to the southeast, it usually exhibits low flow, and provides limited and poor aquatic habitat.

Nonetheless, the drainage swale connects with other drainage ditches south of the site that eventually lead to Mattawoman Creek. Therefore, although the immediate Site 47 area is not of great potential ecological concern, the downstream areas are. Hence, potential off-site contaminant migration is of concern. Data regarding possible downstream migration and related information will be used to conduct an ERA. The general ERA approach is presented in Section 4.0 of the Master RI Work Plan.

Sediment samples (moist soil) to be taken downstream in the drainage ditch will help quantify off-site migration into the watershed. Downgradient sites include Sites 48, 56, and 12 which all drain to the pond formerly known as the Site 8 Pond.

11.5 INVESTIGATIVE SCOPING

The previous investigation which has been performed indicates that the EPA region III RBC screening levels were not exceeded, however ecological screening levels have been exceeded. This area has been evaluated as a potentially ecologically sensitive area. Evaluation of the various media is as follows:

- Subsurface Soil - Contamination is expected to be in the surface soils. No subsurface sampling is proposed.

- Surface Soil - Previous sampling conducted to evaluate surface soils indicates that EPA Region III screening levels have been exceeded. Additional surface soil samples should be collected to determine the extent of surface soil contamination.

- Sediments - Previous sampling conducted to evaluate sediments indicates the EPA Region III ecological screening levels have been exceeded. Additional sediment samples should be collected to determine the extent of sediment contamination.

- Surface Water - No surface water exists in this area.

- Groundwater - No groundwater samples were collected in the past investigations. Groundwater needs to be evaluated to determine if a human health or ecological risk exists. Migration of groundwater could impact adjacent or surface waters. Groundwater samples shall be collected by installing four temporary monitoring wells to evaluate if groundwater has been impacted.

A summary of the investigative scoping is provided in Table 11-2. Because this area has been determined to have an impact on ecologically sensitive areas, an additional evaluation with regards to ecological risk was performed and is summarized in Table 11-3.

11.6 WORK PLAN

The proposed scope for the field investigation is summarized in Table 11-4. Additional scope proposed to further evaluate ecological concerns is summarized in table 11-5. The proposed location of the samples to be collected to address both human and ecological concerns are provided on Figure 11-3. Table 11-6 summarizes the sampling and analysis program and Table 11-7 provides the sample bottleware, preservation, and holding time requirements. The following provides a breakdown by media of the sampling to be conducted:

- Subsurface Soils - No additional sampling proposed.

- Surface Soils - Ten surface soil samples shall be collected in the area of the proposed disposal to evaluate the soils. The sample shall be collected using the techniques identified in Station SOP SA-03 "Soil Sampling". These samples will be analyzed for VOCs, SemiVOCs, TAL metals, and explosives.

- Sediment - Four additional sediment samples will be collected in the Site 47 area and analyzed for VOCs, SemiVOCs, TAL metals and explosives.

- Surface Water - No surface water exist in this area.

- Groundwater - To determine if the groundwater has been impacted, four temporary monitoring wells will be installed and a groundwater sample will be collected from each. The wells will be installed in accordance with Station SOP GH-12 "Groundwater Monitoring Point Installation". The sample shall be collected in accordance with Station SOP SA-01 "Groundwater Sample Acquisition and Onsite Water Quality Testing". The sample shall be analyzed for TCL VOC, TCL SemiVOC, TAL metals, and explosives.

TABLE 11-2

INVESTIGATION SCOPING
SITE 47 - MERCURIC NITRATE DISPOSAL AREA
INDIAN HEAD, MARYLAND

Media/Exposure Pathway	Identified/ Suspected Contaminants	Screening Levels	Preliminary Risk Evaluation	Data Gaps/ Investigative Objective	Decision Rule	Potential Remedial Action
Soil Surface Soil and Transfer from Soil to Groundwater	Twelve (12) soil borings were collected and analyzed for VOC, SemiVOC, and TAL metals.	EPA Region III screening levels	Volatile, SemiVolatile organics and metals exceeded screening levels.	Conduct sampling to determine the extent of contamination.	If extent of contamination is not established, then perform additional sampling to determine extent. If extent is defined, then additional sampling is not required.	Vapor extraction. Soil excavation and disposal/ treatment.
Groundwater	No groundwater samples were taken.	EPA Region III screening levels	Groundwater could impact human health or environment.	Conduct groundwater sampling to determine if contamination exists in the groundwater above the screening levels.	If detected above the screening levels, then perform additional sampling to determine extent. If concentrations are below the screening levels, then no further action is required.	Natural Attenuation. Air Sparging. Pump and Treat. No Further Action Document.

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TABLE 11-3

ECOLOGICAL INVESTIGATION SCOPING
SITE 47 - MERCURIC NITRATE DISPOSAL AREA
INDIAN HEAD, MARYLAND

Media/ Exposure Pathway	Identified/ Suspected Contaminants	Screening Levels	Preliminary Risk Evaluation	Data Gaps/Investigative Objective	Potential Response Actions	Potential Remedial Action
Sediments (moist soils)	Metals (mainly mercury), VOCs, SVOCs, explosives	Region III BTAG Screening Levels	Some concentrations above screening levels.	Fully characterize nature and extent of contamination in sediments and potential for migration/use data to conduct ecological risk assessment.	Determine potential risks to ecological receptors, potential migration, and the need, if any, for additional sediment investigations.	Removal of sediments (moist soils)/Vapor extraction/No further action (natural attenuation).

TABLE 11-4

SITE SPECIFIC WORK PLAN
SITE 47 - MERCURIC NITRATE DISPOSAL AREA
INDIAN HEAD, MARYLAND

Data Needs	Investigative Technique	Location	Number of samples	Analysis
Surface Soil: Investigate extent of contamination in soils.	Collect ten surface soil samples.	See Figure 11-3	10	TCL VOCs, SemiVolatiles, TAL Metals, Explosives
Groundwater: Investigate potential contamination in groundwater.	Collect four groundwater sample using temporary monitoring wells.	See Figure 11-3	4	TCL VOCs, SemiVOCs, TAL Metals, Explosives

TABLE 11-5

ECOLOGICAL SITE-SPECIFIC WORK PLAN
SITE 47 - MERCURIC NITRATE DISPOSAL AREA
INDIAN HEAD, MARYLAND

Data Needs	Investigative Technique	Location	Number of Samples	Analysis
Characterize nature and extent of contamination in drainage sediments (moist soils), and potential for migration.	Collect sediments (moist soils) from drainage area.	In drainage channel near the site and downgradient.	4	TCL VOC, SemiVOC, TAL Metals and Explosives

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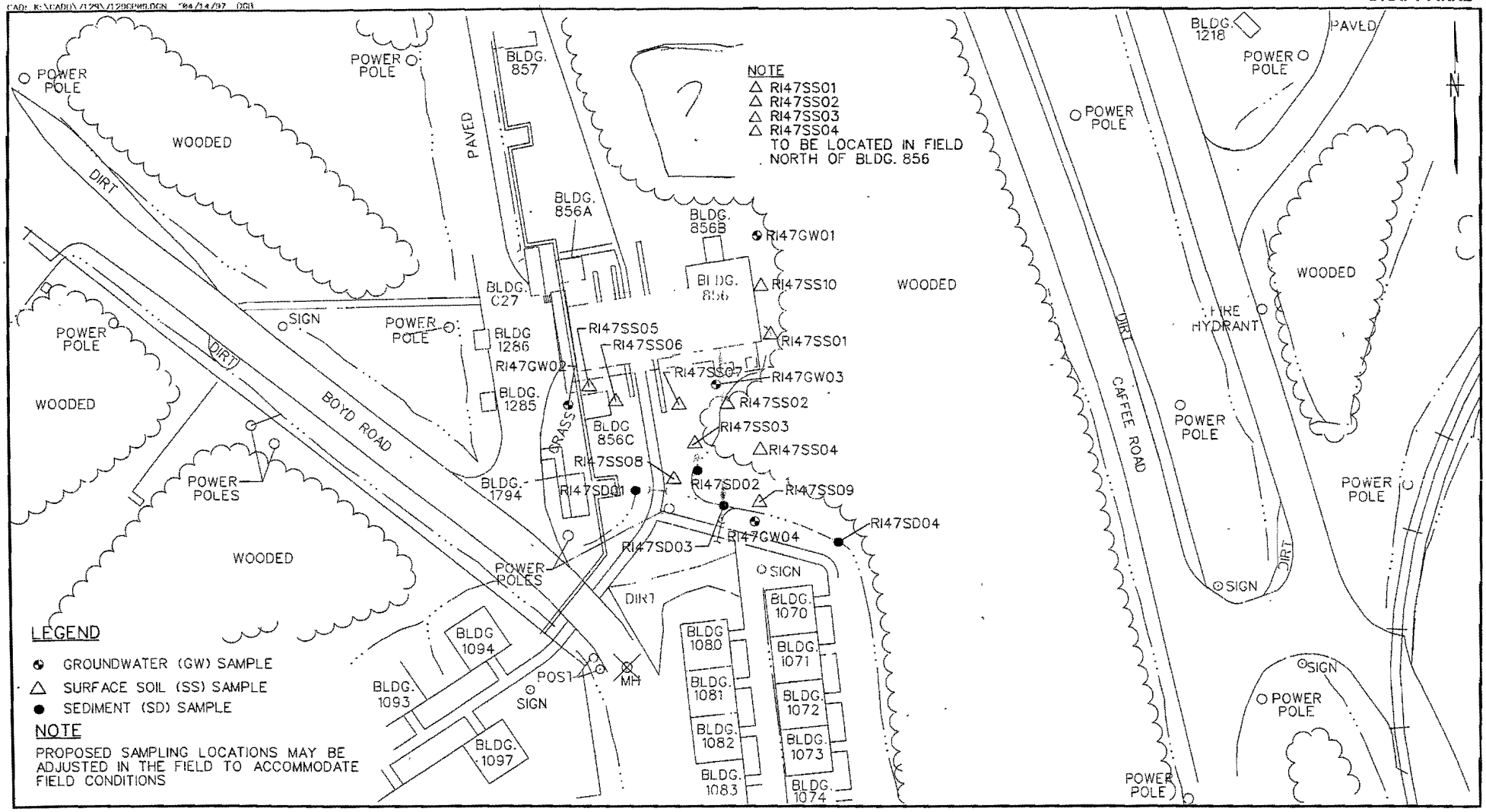

FIGURE 11-3

PROPOSED SAMPLING LOCATION MAP
SITE 47 – MERCURIC NITRATE DISPOSAL AREA
INDIAN HEAD, MARYLAND

0 50 100
SCALE IN FEET

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TABLE 11-6

SUMMARY OF SAMPLING PROGRAM
SITE 47 - MERCURIC NITRATE DISPOSAL AREA
INDIAN HEAD, MARYLAND

Sample Media	Sample ID Number	Sample Depth/ Location	Analysis				
			VOCs	SVOCs	Metals	Pesticides/ PCBs	Explosives
Surface Soil	RI47SS01	0-12" (See Figure 11-3)	•	•	•		•
	RI47SS02	0-12" (See Figure 11-3)	•	•	•		•
	RI47SS03	0-12" (See Figure 11-3)	•	•	•		•
	RI47SS04	0-12" (See Figure 11-3)	•	•	•		•
	RI47SS05	0-12" (See Figure 11-3)	•	•	•		•
	RI47SS06	0-12" (See Figure 11-3)	•	•	•		•
	RI47SS07	0-12" (See Figure 11-3)	•	•	•		•
	RI47SS08	0-12" (See Figure 11-3)	•	•	•		•
	RI47SS09	0-12" (See Figure 11-3)	•	•	•		•
	RI47SS10	0-12" (See Figure 11-3)	•	•	•		•
Groundwater	RI47GW01	Near location of previous soil sample 47SA01	•	•	•		•
	RI47GW02	See Figure 11-3	•	•	•		•
	RI47GW03	See Figure 11-3	•	•	•		•
	RI47GW04	See Figure 11-3	•	•	•		•
Sediment	RI47SD01	See Figure 11-3	•	•	•		•
	RI47SD02	See Figure 11-3	•	•	•		•
	RI47SD03	See Figure 11-3	•	•	•		•
	RI47SD04	See Figure 11-3	•	•	•		•

(1) To be collected if RI47GW01 results above established screening levels.

TABLE 11-7

BOTTLEWARE, PRESERVATION, AND HOLDING TIME REQUIREMENTS
SITE 47 - MERCURIC NITRATE DISPOSAL AREA
INDIAN HEAD, MARYLAND
PAGE 1 OF 2

Media	Analysis	Total Number of Samples	Number of Containers Per sample	Container Type	Preservation	Holding Times
Groundwater	TCL VOCs - CLP OLM03.0	4	2	40 ml glass	HCL pH <2, Cool to 4°C	14 days to analysis
	TCL SVOCs - CLP OLM03.0	4	1	1L amber glass	Cool to 4°C	7 days to extract; 40 days to analysis
	TAL Metals - CLP ILM04.0	4	1	1L plastic	HNO3 pH <2	6 months; Hg 28 days
	Explosives - Modified SW-846-8330*	4	1	1L amber glass	Cool to 4°C	7 days to extract; 40 days to analysis
Sediment	TCL VOCs - CLP OLM03.0	4	1	250 ml CWM glass	Cool to 4°C	14 days to analysis
	TCL SVOCs - CLP OLM03.0	4	1	250 ml CWM glass	Cool to 4°C	14 days to extract; 40 days to analysis
	TAL Metals - CLP ILM04.0	4	1	250 ml CWM glass	Cool to 4°C	6 months; Hg 28 days
	Explosives - Modified SW-846-8330*	4	1	250 ml CWM glass	Cool to 4°C	14 days to extract; 40 days to analysis

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TABLE 11-7

BOTTLEWARE, PRESERVATION, AND HOLDING TIME REQUIREMENTS
SITE 47 - MERCURIC NITRATE DISPOSAL AREA
INDIAN HEAD, MARYLAND
PAGE 2 OF 2

Media	Analysis	Total Number of Samples	Number of Containers Per sample	Container Type	Preservation	Holding Times
Surface Soil	TCL VOCs - CLP OLM03.0	10	1	250 ml CWM glass	Cool to 4°C	14 days to analysis
	TCL SVOCs - CLP OLM03.0	10	1	250 ml CWM glass	Cool to 4°C	14 days to extract; 40 days to analysis
	TAL Metals - CLP ILM04.0	10	1	250 ml CWM glass	Cool to 4°C	6 months; Hg 28 days
	Explosives - Modified SW-846-8330*	10	1	250 ml CWM glass	Cool to 4°C	14 days to extract; 40 days to analysis

CWM - Clear Wide Mouth
* - Includes analysis for nitrate esters (nitroglycerin, nitrocellulose, nitroquanidine) in Modified SW-846-8330.

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12.0 SITE 48 NG PLANT DISPOSAL AREA

12.1 BACKGROUND INFORMATION AND SITE DESCRIPTION

Site 48 - NG Plant Disposal Area is a very small (<1/10 acre) site of unknown origin consisting of miscellaneous debris, including solvent containers, bottles, metal scrap, and refuse. It is located in the wooded area southeast of Building 766 in the central part of NSWC as shown in Figure 12-1. It is unknown whether the containers at the site contained hazardous materials. Some of the glass discarded at the site appears to be common consumer product containers. No signs of stressed vegetation are evident at the site.

The site covers an area approximately 50' x 100' and situated is on the south face of the hillslope across a stream from Building 766. Surface runoff from the site drains into the stream. The stream flows into the pond adjacent to Site 12 - Town Gut Landfill approximately 1/2 mile east of Site 48.

12.2 PREVIOUS ENVIRONMENTAL INVESTIGATIONS

Sampling was conducted to determine if contamination is present as a result of the disposal of what appears to be laboratory contaminants. The sampling performed during the Site Inspection (SI) Study is summarized in Table 12-1.

TABLE 12-1
PREVIOUS INVESTIGATION
NITROGLYCERIN PLANT DISPOSAL AREA
INDIAN HEAD, MARYLAND

Site 48 - Sampling and Analysis Approach				
Sample Media:	Shallow soil zone (0-8 feet)			
Sampling Performed:	**Type**	**Number**	**Sam/Loc**	**Total**
	Soil boring-hand-auger	3	3*	9
Analyses Performed:	**Media**	**Analyses**		
	Soil	VOC, BNA, TAL		

*Samples collected at 0-1 feet, 5-6 feet, and 7-8 feet, depths.

The sample locations are shown in Figure 12-2. None of the samples exceeded the EPA Region III RBC screening levels.

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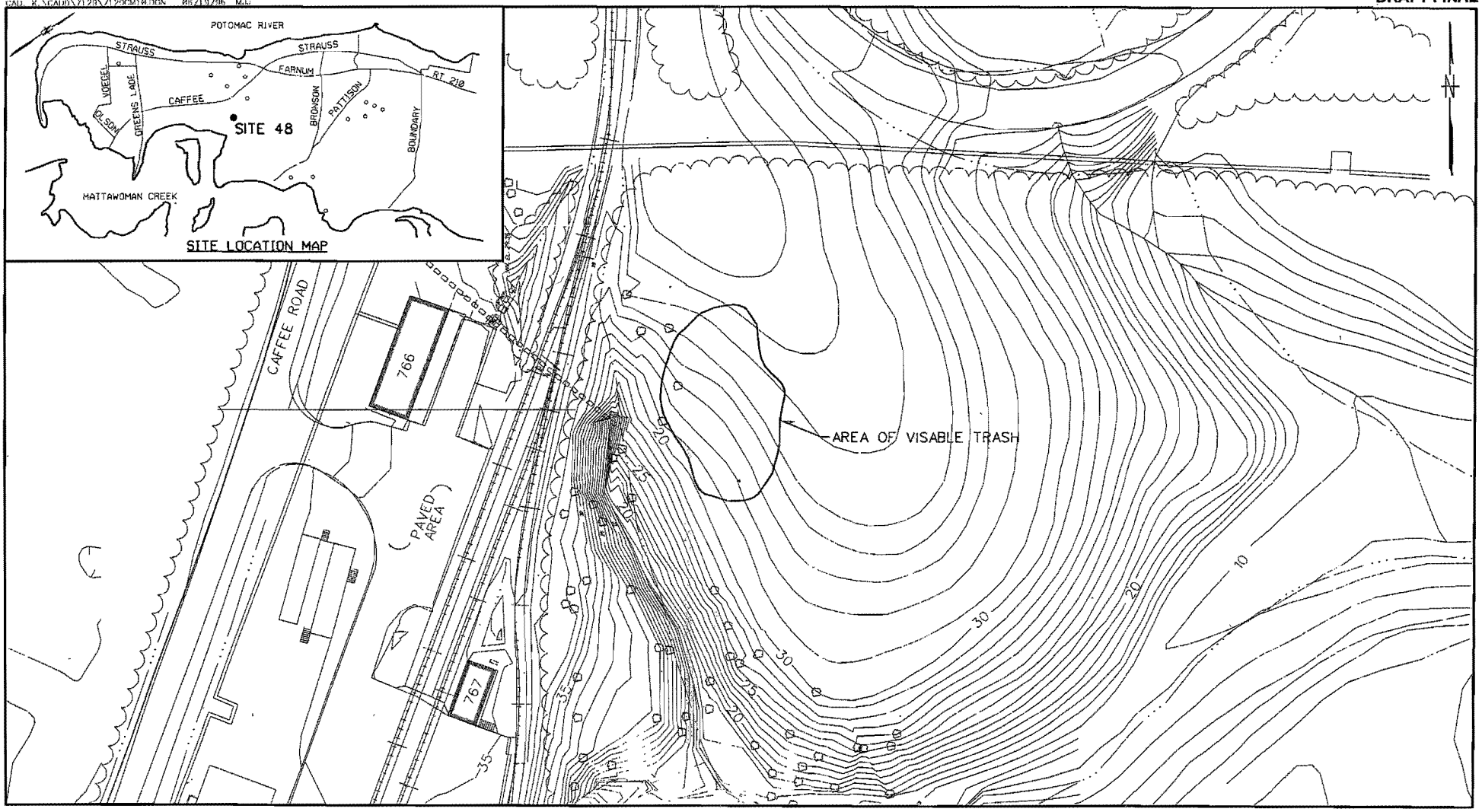

FIGURE 12-1

GENERAL SITE MAP
SITE 48 – NITROGLYCERINE PLANT DISPOSAL AREA
INDIAN HEAD, MARYLAND

0 50 120
SCALE IN FEET

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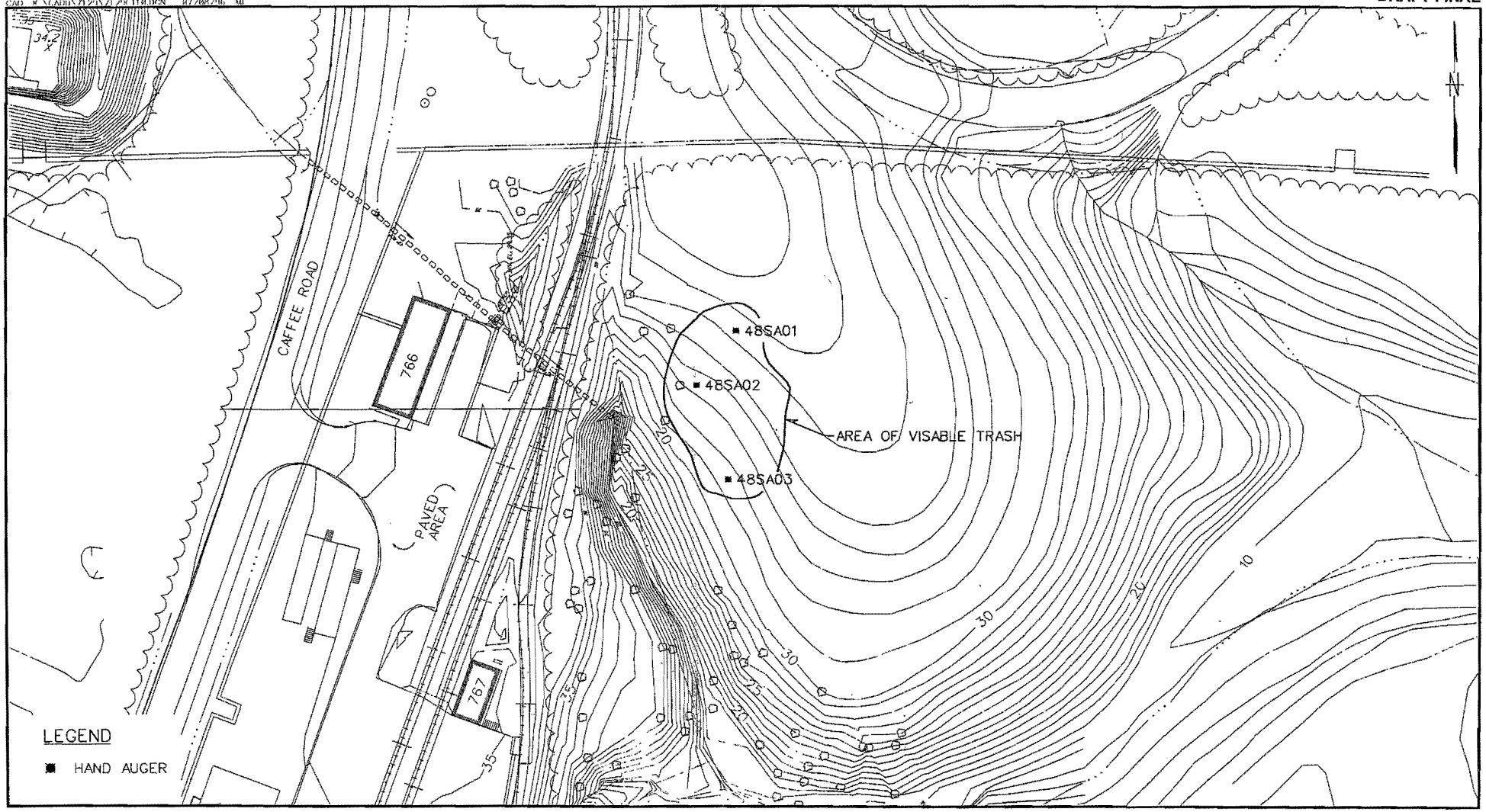

FIGURE 12-2

PREVIOUS SAMPLING RESULTS
SITE 48 – NITROGLYCERINE PLANT DISPOSAL AREA
INDIAN HEAD, MARYLAND

039620/P

Brown & Root Environmental

CTO 0245

No VOCs were detected at significant concentrations exceeding method detection limits. Three semivolatile organic compounds were detected in five soil samples at low concentrations and represent no elevated risk. No metals were detected at concentrations exceeding background levels (E/A&H, 1994). Since none of the detected contaminant concentrations exceeded the USEPA Region III screening levels, no contaminant concentrations are indicated on Figure 12-2.

12.3 HUMAN HEALTH RISK ASSESSMENT

A human health risk assessment for the site will be performed and documented in a No Further Action report. Historical analytical data generated for the site will be used to demonstrate that measured chemical concentrations pose no significant threat to potential human receptors. The general methodologies which will be used to assess human health risks are contained in Section 3.0 of the Master Work Plan for the Station. The remainder of this section of the project-specific work plan identifies preliminary COCs based on existing site information, screening levels which will be used to identify COCs in the risk assessment, and exposure scenarios to be evaluated.

No chemicals have been preliminarily identified as COCs for the site. Region III soil COC screening levels for industrial land use will be used to identify site-specific COCs for soil in the risk assessment.

Exposure to site media is limited because the site is located in a wooded area. Adolescent trespassers (ages 6 to 16) under current land use will be evaluated in the risk assessment since access to the disposal area is not physically restricted. These receptors will be assumed to be exposed to surface soil only. Potentially complete exposure pathways to be considered in the development of the human health risk assessment are provided in Table 3-2 of the Master Work Plan.

Based on previous project-specific discussions with the Station, NAVY, and USEPA (May 7, 1996), a future residential exposure scenario is not considered to be likely for the site and will not be evaluated in the RI Report since the site is situated in the main production area. If the Station were to close in the future, it is anticipated that the area would be used for industrial/commercial purposes only. Maintenance activities are not performed at the site, therefore, Station personnel (workers) will not be regarded as potential receptors.

12.4 ECOLOGICAL RISK ASSESSMENT

The site is located in a wooded area on the central portion of the installation. Runoff from the site enters the adjacent stream which leads to aquatic habitats in the pond next to Town Gut Landfill. However, no

known contaminant source is present at the site, and the results of previous studies found no elevated levels of any contaminants in site soils. As such, Site 48 will be excluded from quantitative ecological risk assessment.

12.5 INVESTIGATIVE SCOPING

The previous investigation which has been performed in this area indicates that the EPA region III RBC screening levels have not been exceeded. Groundwater was not evaluated, however there is no indication that a potential impact to groundwater exists. Evaluation of the various media is as follows:

- Subsurface Soil - Evaluation of the subsurface samples collected indicates they are below the EPA Region III human health screening levels. Three test pits are proposed to be completed during this investigation.
- Surface Soil - Evaluation of the surface samples collected indicates they are below the human health screening levels. No additional surface soil sampling is proposed.
- Surface Water - No surface water flows through or collects in this area.
- Groundwater - No groundwater samples were collected in the past investigations. Two hydropunch samples are proposed to be collected downgradient of the site during this investigation.

A summary of the investigative scoping is provided in Table 12-2.

12.6 WORK PLAN

The proposed scope for the field investigation is summarized on Table 12-3. No additional sampling is proposed as indicated on Figure 12-3. The following summarizes by media the sampling to be conducted.

- Subsurface Soils - Three test pits, each approximately 10 feet long x 10 feet deep, will be excavated according to station SOP SA-03. Any contamination detected through visual inspection will be sampled.
- Surface Soils / Sediment Soils - No additional sampling is proposed

TABLE 12-2

INVESTIGATION SCOPING
SITE 48 - NITROGLYCERIN PLANT DISPOSAL AREA
INDIAN HEAD, MARYLAND

Contaminant Media/Exposure Pathway	Identified/ Suspected Contamination	Screening Levels	Preliminary Risk Evaluation	Data Gaps/ Investigative Objective	Decision Rule	Potential Remedial Action
Subsurface Soil:	Analysis performed on 9 soil samples for VOCs, BNAs, and TAL metals. No contaminants were detected above screening levels.	EPA Region III RBC screening levels	No contaminants detected above screening levels.	Verify the absence of contamination.	If no contamination found: No Further Action. If contamination found, additional investiation requried to define extent.	Excavation.

TABLE 12-3

SITE SPECIFIC WORK PLAN
SITE 48 - NITROGLYCERIN PLANT DISPOSAL AREA
INDIAN HEAD, MARYLAND

Data Needs	Investigative Technique	Location	Number of samples	Analysis
Subsurface Soil: Test Pit Excavation	Excavate three test pits, each 10 feet deep x 10 feet long. Analyze any contamination detected during visual inspection of pits.	See Figure 12-3	3	TCL VOC TCL SemiVOC TAL Metals
Groundwater: Potential contaminant impact on groundwater examined through hydropunch samples.	Collect two hydropunch samples.	Downgradient of Site 48. See Figure 12-3	2	TCL VOC TCL SemiVOC TAL Metals Explosives

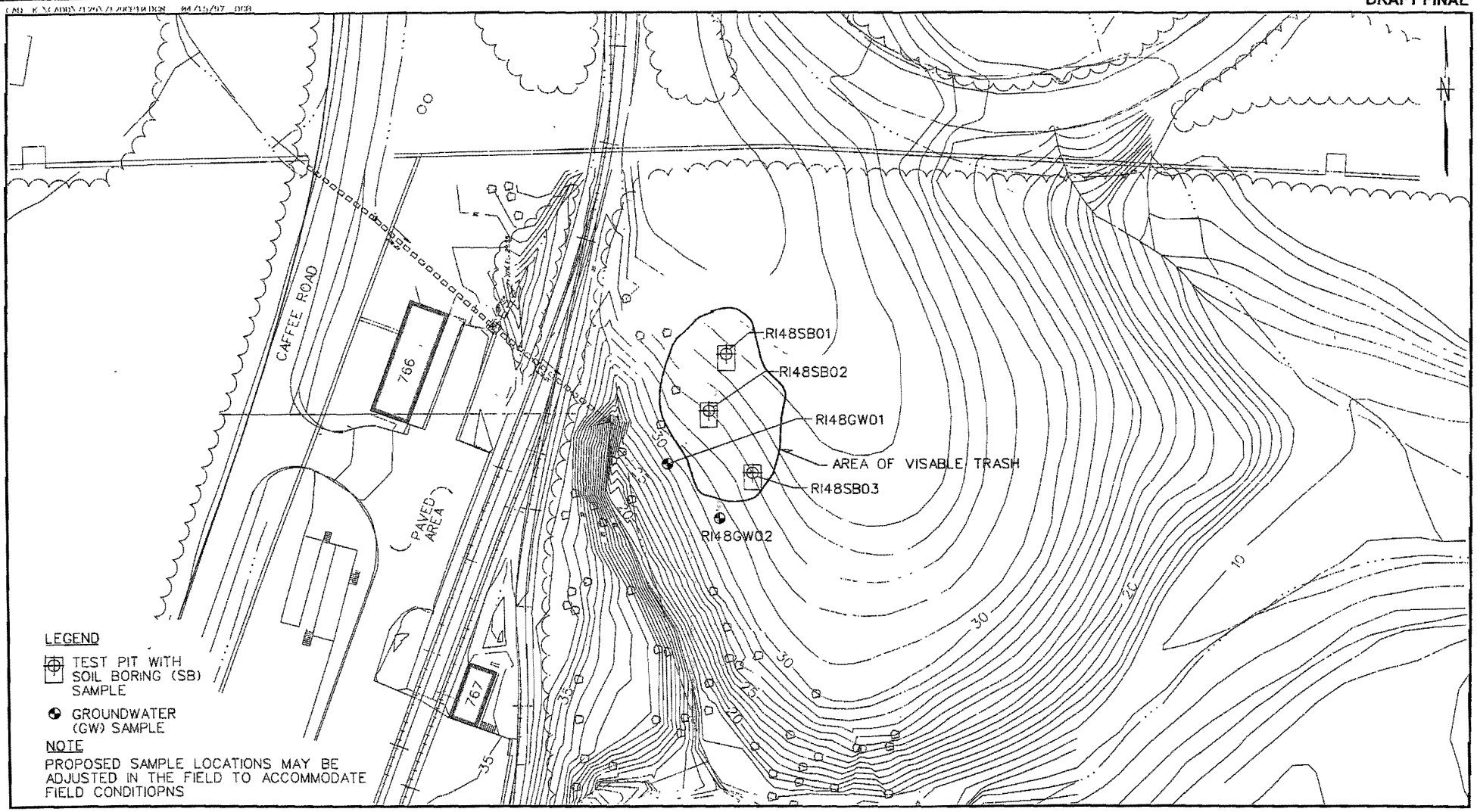

FIGURE 12-3

PROPOSED SAMPLING LOCATION MAP
SITE 48 – NITROGLYCERINE PLANT DISPOSAL AREA
INDIAN HEAD, MARYLAND

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- Surface Water - No surface water flows through or collects in this area.

- Groundwater - Two hydropunch samples will be collected according to station SOP SA-06 and station SOP SA-01.

TABLE 12-4

SUMMARY OF SAMPLING PROGRAM
SITE 48 - NITROGLYCERIN PLANT DISPOSAL AREA
INDIAN HEAD, MARYLAND

Sample Media	Sample ID Number	Sample Depth/ Location	Analysis				
			VOCs	SVOCs	Metals	Pesticides/ PCBs	Explosives
Subsurface Soil	RI48SB01	Test Pit 1 - Visible contamination	•	•	•		
	RI48SB02	Test Pit 2 - Visible contamination	•	•	•		
	RI48SB03	Test Pit 3 - Visible contamination	•	•	•		
Groundwater	RI48GW01	Downgradient Site 48	•	•	•		•
	RI48GW02	Downgradient Site 48	•	•	•		•

TABLE 12-5

BOTTLEWARE, PRESERVATIN, AND HOLDING TIME REQUIREMENTS
SITE 48 - NITROCLYCERINPLANT DISPOSAL AREA
INDIAN HEAD, MARYLAND

Media	Analysis	Total Number of Samples	Number of Containers Per sample	Container Type	Preservation	Holding Times
Groundwater	TCL VOCs - CLP OLM03.0	2	2	40 ml glass	HCL pH <2, Cool to 4°C	14 days to analysis
	TCL SVOCs - CLP OLM03.0	2	1	1L amber glass	Cool to 4°C	7 days to extract; 40 days to analysis
	TAL Metals - CLP ILM04.0	2	1	1L plastic	HNO3 pH <2	6 months; Hg 28 days
	Explosives - Modified SW-846-8330*	2	1	1L amber glass	Cool to 4°C	7 days to extract; 40 days to analysis
Subsurface Soil	TCL VOCs - CLP OLM03.0	3	1	250 ml CWM glass	Cool to 4°C	14 days to analysis
	TCL SVOCs - CLP OLM03.0	3	1	250 ml CWM glass	Cool to 4°C	14 days to extract; 40 days to analysis
	TAL Metals - CLP ILM04.0	3	1	250 ml CWM glass	Cool to 4°C	6 months; Hg 28 days

CWM - Clear Wide Mouth
* - Includes analysis for nitrate esters (nitroglycerin, nitrocellulose, nitroquanidine) in Modified SW-846-8330.

13.0 SITE 49 - CHEMICAL DISPOSAL PIT

13.1 BACKGROUND INFORMATION AND SITE DESCRIPTION

Site 49 - Chemical Disposal Pit is located in the northeastern part of NSWC in the laboratory area. The site consists of a circular concrete pit, approximately 2.5 feet in diameter and 3 feet deep, northwest of Building 444 as shown in Figure 13-1. The pit was designed to dispose of laboratory containers without exposing personnel to the contents. To dispose of laboratory waste in laboratory containers, the containers were placed on a steel grate in the pit. A metal plate was dropped on the containers. The fragments of shattered glass were caught in a wire basket below the steel grate, and the contents of the containers collected in the bottom of the pit and drained from the pit via a drain line to the sanitary sewer system. Reportedly, the pit received limited use until the early 1970's. The concrete pit is still structurally sound with no visible fractures and the hardware has been removed.

According to the Supplemental Preliminary Assessment (NEESA, 1992), a drain line exits the south side of the pit and connects the pit to the sanitary sewer manhole 473. However, during a visual inspection of Site 49 in 1996, another drain line entering the pit from the north was discovered. This line may connect to sanitary sewer manhole 472, as shown on a drawing (Bureau of Yards and Docks, Dwg. No. 15,699, 1964), which was reviewed by NEESA during the Supplemental Preliminary Assessment (1992).

The layout of the sewage system is to be evaluated under Site 53 and it is unknown if any wastes were released to the soil adjacent to the pit or through the drainage lines.

13.2 PREVIOUS ENVIRONMENTAL INVESTIGATION

Sampling was conducted to determine if contamination was present in the solids in the bottom of the pit or in the shallow soil zone adjacent to the pit from past disposal methods. A summary of the sampling conducted during the Site Inspection Study is provided in Table 13-1.

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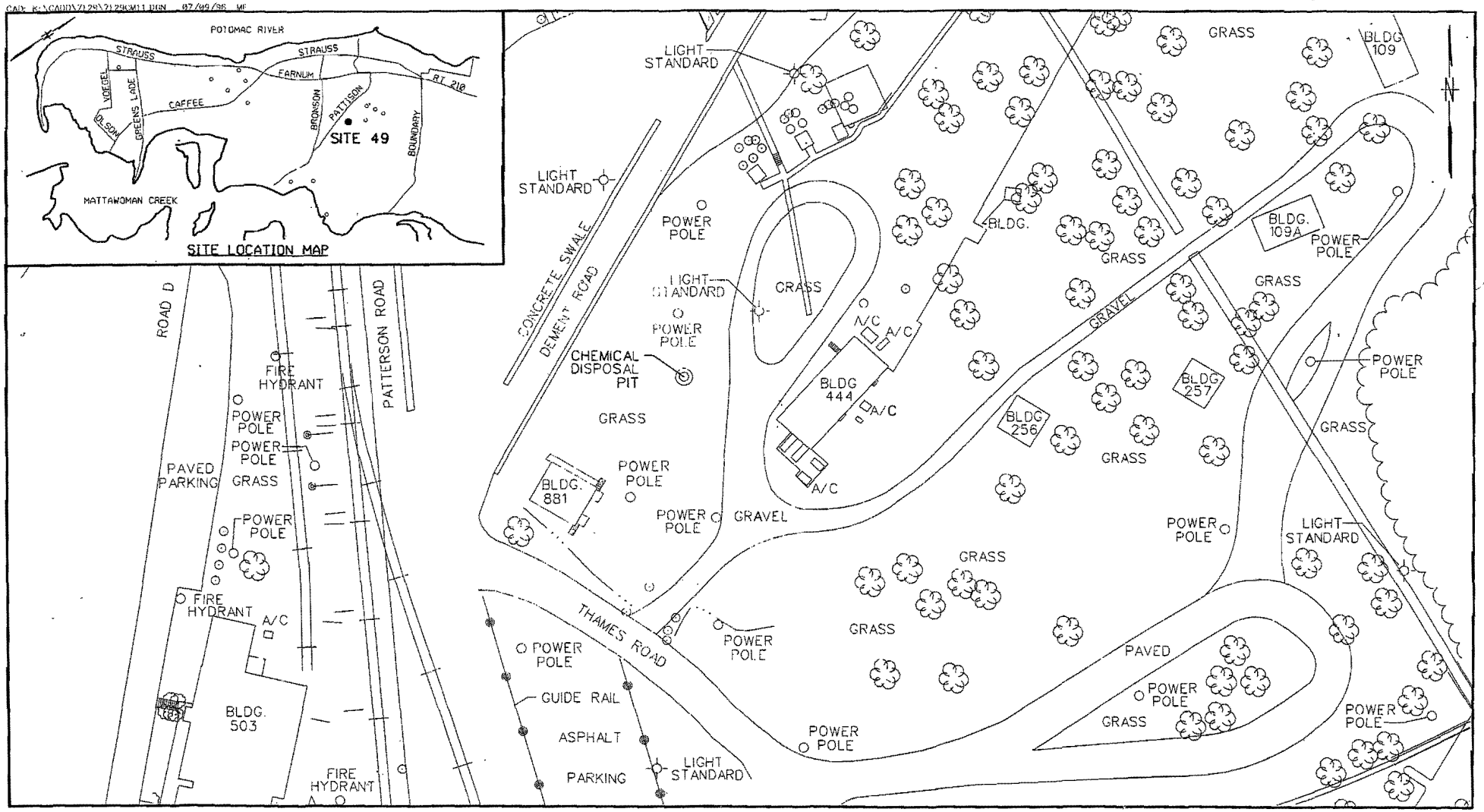

GENERAL SITE MAP
SITE 49 – CHEMICAL DISPOSAL PIT
INDIAN HEAD, MARYLAND

0 50 100
SCALE IN FEET

FIGURE 13-1

Brown & Root Environmental

039620/P

TABLE 13-1
PREVIOUS INVESTIGATION
SITE 49 - CHEMICAL DISPOSAL PIT
INDIAN HEAD, MARYLAND

Sample Media:	Shallow soil zone (0-6 feet) Sediment in pit			
Sampling Performed:	**Type**	**Number**	**Sam/Loc**	**Total**
	Soil boring (2', 4', & 6' depths)	1	3	3
	Sediment Sample (Surface sample)	1	1	1
Analyses Performed:	**Media**	**Analyses**		
	Soil	VOC, BNA, TAL, Nitrate Esters		
	Sediment	VOC, BNA, TAL, Nitrate Esters		

The sample locations and analytical results which exceed the EPA Region III RBC screening levels are provided in Figure 13-2.

Elevated levels of tetrachloroethene were detected at 90.0 µg/kg in the pit solids sample. Six semivolatile organic compounds were detected in this sample at varying concentrations.

Eight metal compounds were detected in the pit solids sample at concentrations exceeding the average background concentration for these soils (E/A&H, 1994). Mercury and cobalt were two of the compounds reported at these elevated concentrations. HMX, the only explosive derivative compound detected, was reported at 2.25 µg/g (E/A&H, 1994).

The data was compared against the EPA Region III RBC levels which indicated arsenic exceeded the screening levels in the pit solids sample and the boring sample at the 4 foot depth. Mercury also exceeded the screening levels for the pit sediment sample.

13.3 HUMAN HEALTH RISK ASSESSMENT

A human health risk assessment for the site will be performed and documented in the RI Report. Analytical data generated under this work plan, as well as historical data for the site, will be used to determine if measured chemical concentrations pose a significant threat to potential human receptors. The general methodologies which will be used to assess human health risks are contained in Section 3.0 of the Master Work Plan for the Station. The remainder of this section of the project-specific work plan identifies preliminary COCs based on existing site information, screening levels which will be used to identify COCs in the risk assessment, and exposure scenarios to be evaluated.

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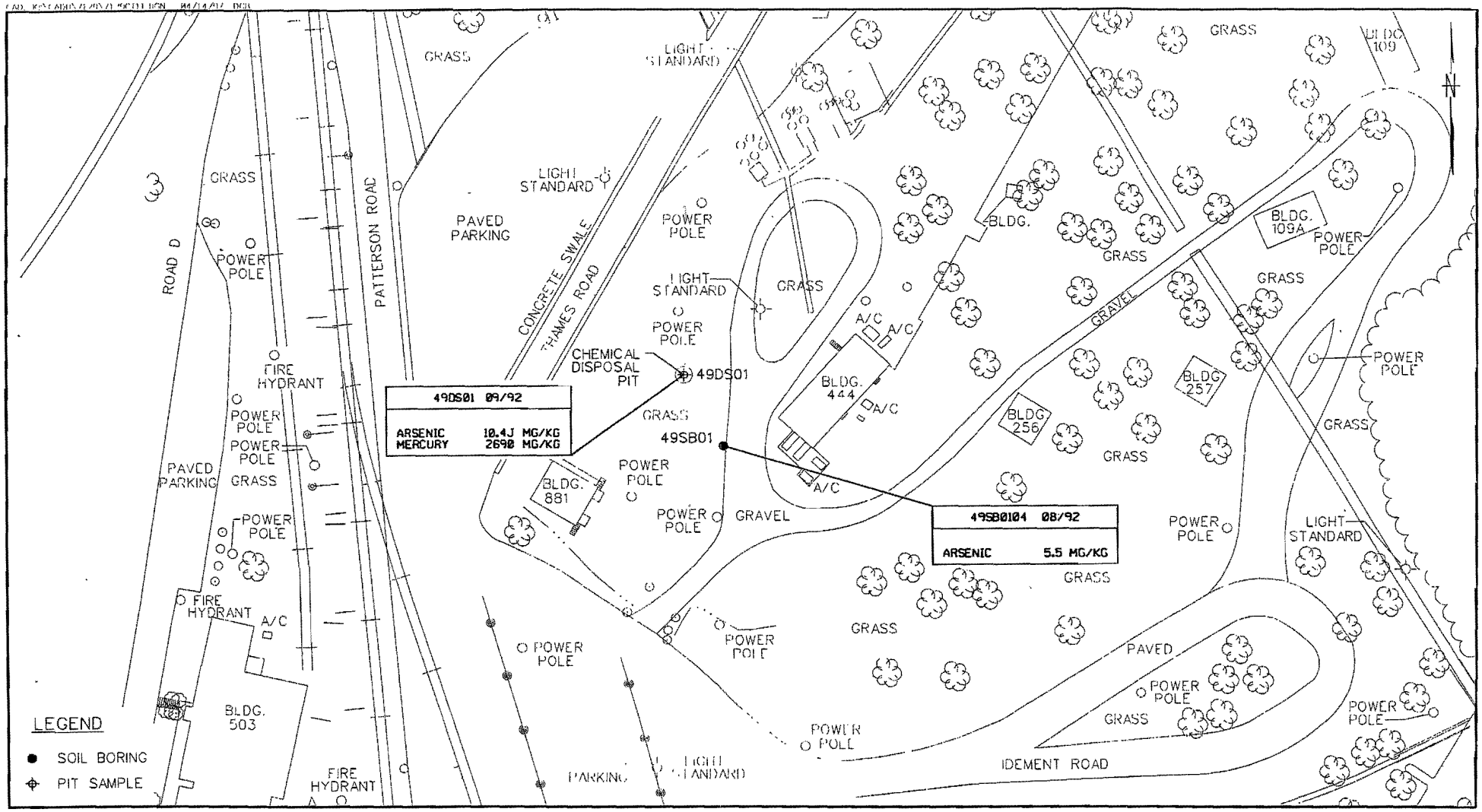

FIGURE 13-2

PREVIOUS SAMPLING RESULTS
SITE 49 - CHEMICAL DISPOSAL PIT
INDIAN HEAD, MARYLAND

0 50 100
SCALE IN FEET

Brown & Root Environmental

039620/P

CTO 0245

Preliminary COCs for the site consist of arsenic and mercury. Region III soil COC screening levels for industrial land use will be used to identify site-specific COCs for soil and the pit solids in the risk assessment. For groundwater, Region III COC screening levels for tap water ingestion will be employed.

The following potential receptor groups will be evaluated in the human health risk assessment:

- Adolescent Trespassers
- Maintenance Workers
- Construction Workers

Adolescent trespassers (ages 6 to 16) will be evaluated since access to the area surrounding the pit is not physically restricted. Maintenance workers and adolescent trespassers under current land use will be assumed to be exposed to surface soil only. Construction workers, who will be considered to be potential receptors for future land use, will be evaluated for exposure to surface/subsurface soil (to a depth of 10 feet). Pending further review of site-specific information (depth to groundwater, detected groundwater chemicals, etc.), the risks associated with dermal exposure to groundwater may also be evaluated for this receptor group. Potentially complete exposure pathways to be considered in the development of the human health risk assessment are provided in Table 3-2 of the Master Work Plan.

Based on previous project-specific discussions with the Station, NAVY, and USEPA (May 7, 1996), a future residential exposure scenario is not considered to be likely for the site and will not be evaluated in the RI Report since the site is situated in the main production area. If the Station were to close in the future, it is anticipated that the area would be used for industrial/commercial purposes only.

13.4 ECOLOGICAL RISK ASSESSMENT

The Chemical Disposal Pit is located in a highly developed area on the installation. Wastes were discarded in the underground sewer system, which does not outfall to any habitats or areas where contaminants could migrate to other habitats. No leaks in the underground system that could lead to surface water are known to exist. As a result, the site is not ecologically relevant and will be excluded from ecological risk assessment in the RI.

13.5 INVESTIGATIVE SCOPING

Analytical results from previous investigations indicate some elevated levels of mercury and arsenic above the screening levels established to address human health risk. Evaluation of the various media is as follows:

- Subsurface Soil - Previous sampling was conducted to evaluate subsurface soils. Subsurface soils only indicate arsenic as being slightly elevated over the screening level. The potential pathways are limited and the potential for subsurface soils to impact groundwater will be evaluated. No subsurface soils are proposed.

- Pit Solids - Pit solids have the potential to migrate off site and have several potential pathways for exposure. Additional sampling is proposed to determine if the potential for contamination outside the pit has been adequately evaluated.

- Surface Water - No surface water exist in this area.

- Groundwater - No groundwater samples were collected in the past investigations.

Because of the potential nature of the contaminants disposed on this area, the samples will be analyzed for TCL VOCs, TCL SemiVOCs, TAL metals, and explosives. A summary of the investigative scoping is provided in Table 13-2.

13.6 WORK PLAN

The proposed scope for the field investigation is summarized on Table 13-3. Table 13-4 summarizes the sampling and analysis program, and Table 13-5 provides the sample bottleware, preservation, and holding time requirements. Location of the samples to be collected are provided on Figure 3-4.

- Smoke Test - A smoke test will be conducted from within the 2.5-foot-diameter by 3-foot-deep concrete disposal pit to identify the locations of the outlets for the drainage lines connected to the concrete pit.

- Sediment - Three sediment samples will be collected from the materials located immediately below the drainage outlets that have been identified during the smoke test.

- Concrete Pit Removal - The concrete disposal pit will be demolished and removed from Site 49.

- Surface Soil - One surface soil sample will be collected from the base of the excavated area exposed by removal of the concrete pit.

- Groundwater - The SI Report described the soils in the Site 49 area as stiff to hard, brown and green, silty clay with little moisture. Blow counts averaged 40 blows per foot. Hydraulic conductivity test results for these soils varied between 7.1 x 10-8 cm/sec and 1 x 10-6 cm/sec. According to the SI migration of metals deposited into these soils would be very limited. For this reason, no groundwater samples are planned for this investigation. Contaminant concentrations will be identified first in the overlying sediments and soils prior to determining if groundwater wells and groundwater samples will be necessary.

1 - field work
- collect
- analysis
2 - REPORT
- DRAFT
- DRAFT FINAL
- FINAL

TABLE 13-2

INVESTIGATION SCOPING
SITE 49 - CHEMICAL DISPOSAL PIT
INDIAN HEAD, MARYLAND

Media/ Exposure Pathway	Identified/ Suspected Contaminants	Screening Levels	Preliminary Risk Evaluation	Data Gaps/ Investigative Objectives	Decision Rule	Potential Remedial Action
Soil	One soil boring was performed and three samples collected which were analyzed for VOCs, SemiVolatiles, TAL metals, and nitrite esters.	EPA Region III screening levels	No contamination was detected exceeding the screening levels for VOC, SemiVOC, and Nitrate esters were detected. Arsenic was detected slightly above the screening level at a depth of 4 feet.	Collect one surface soil sample from the base of the excavated area exposed by removal of the concrete pit.	If contamination is found, then additional sampling will be conducted to determine the extent. If no contamination is detected above the screening levels, then the soils outside the pit will not be included with the pit evaluation.	Removal and disposal. No Further Action.
Disposal Pit Solids	One solids sample was collected from inside the pit and analyzed for VOCs, SemiVOCs, TAL metals, and nitrate esters	EPA Region III screening levels	Mercury and arsenic are present in concentrations which exceed the screening levels.	Collect additional sediment samples to further define nature and extent of solids contamination in pit and the surrounding area.	If pit contamination is found in connecting pipes and outside pit, then establish extent and remediate accordingly. If no additional contamination found, then extent of contamination is established.	Removal of structure, over excavation, steam clean, or remove pipes. Remove structure (pit) and block pipe connections.
Groundwater	Groundwater sampling and analysis was not conducted.	EPA Region III screening levels	Possible groundwater contamination.	Determine if soil contaminants have impacted groundwater.	First, identify the extent and contaminant concentrations in the overlying sediments and soils prior to performing groundwater sampling.	Prepare No Further Action Document.

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TABLE 13-3

SITE SPECIFIC WORK PLAN
SITE 49 - CHEMICAL DISPOSAL PIT
INDIAN HEAD, MARYLAND

Data Needs	Investigative Technique	Location	Number of samples	Analysis
Extent of Sediment/Soil Impact: Determine nature and extent of sediment contamination in and around disposal pit.	Collect samples at outlet to connecting pipes and under pit.	Collect four samples from within the area of the pipe network.	3	TCL VOCs TCL SVOCs TAL Metals Explosives
Presence of contamination under concrete pad.	Collect surface soil sample.	Collect sample from back of the excavated area exposed by removal of the concrete pit.	1	TCL VOCs TCL SVOCs TAL Metals Explosives

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TABLE 13-4

SUMMARY OF SAMPLING PROGRAM
SITE 49 - CHEMICAL DISPOSAL AREA
INDIAN HEAD, MARYLAND

Sample Media	Sample ID Number	Sample Depth/ Location	Analysis				
			VOCs	SVOCs	Metals	Pesticides/ PCBs	Explosives
Surface Soil	RI49SS01	0-6" Base of Excavated Pit	•	•	•		•
Sediment	RI49SD01	At pipe network drainage outlet*	•	•	•		•
	RI49SD02	At pipe network drainage outlet*	•	•	•		•
	RI49SD03	At pipe network drainage outlet*	•	•	•		•

* Smoke test will be used to locate pipe network drainage outlet.

TABLE 13-5

BOTTLEWARE, PRESERVATION, AND HOLDING TIME REQUIREMENTS
SITE 49 - CHEMICAL DISPOSAL AREA
INDIAN HEAD, MARYLAND

Media	Analysis	Total Number of Samples	Number of Containers Per sample	Container Type	Preservation	Holding Times
Sediment	TCL VOCs - CLP OLM03.0	3	1	250 ml CWM glass	Cool to 4°C	14 days to analysis
	TCL SVOCs - CLP OLM03.0	3	1	250 ml CWM glass	Cool to 4°C	14 days to extract; 40 days to analysis
	TAL Metals - CLP ILM04.0	3	1	250 ml CWM glass	Cool to 4°C	6 months; Hg 28 days
	Explosives - Modified SW-846-8330*	3	1	250 ml CWM glass	Cool to 4°C	14 days to extract; 40 days to analysis
Surface Soil	TCL VOCs - CLP OLM03.0	1	1	250 ml CWM glass	Cool to 4°C	14 days to analysis
	TCL SVOCs - CLP OLM03.0	1	1	250 ml CWM glass	Cool to 4°C	14 days to extract; 40 days to analysis
	TAL Metals - CLP ILM04.0	1	1	250 ml CWM glass	Cool to 4°C	6 months; Hg 28 days
	Explosives - Modified SW-846-8330*	1	1	250 ml CWM glass	Cool to 4°C	14 days to extract; 40 days to analysis

CWM - Clear Wide Mouth
* - Includes analysis for nitrate esters (nitroglycerin, nitrocellulose, nitroquanidine) in Modified SW-846-8330.

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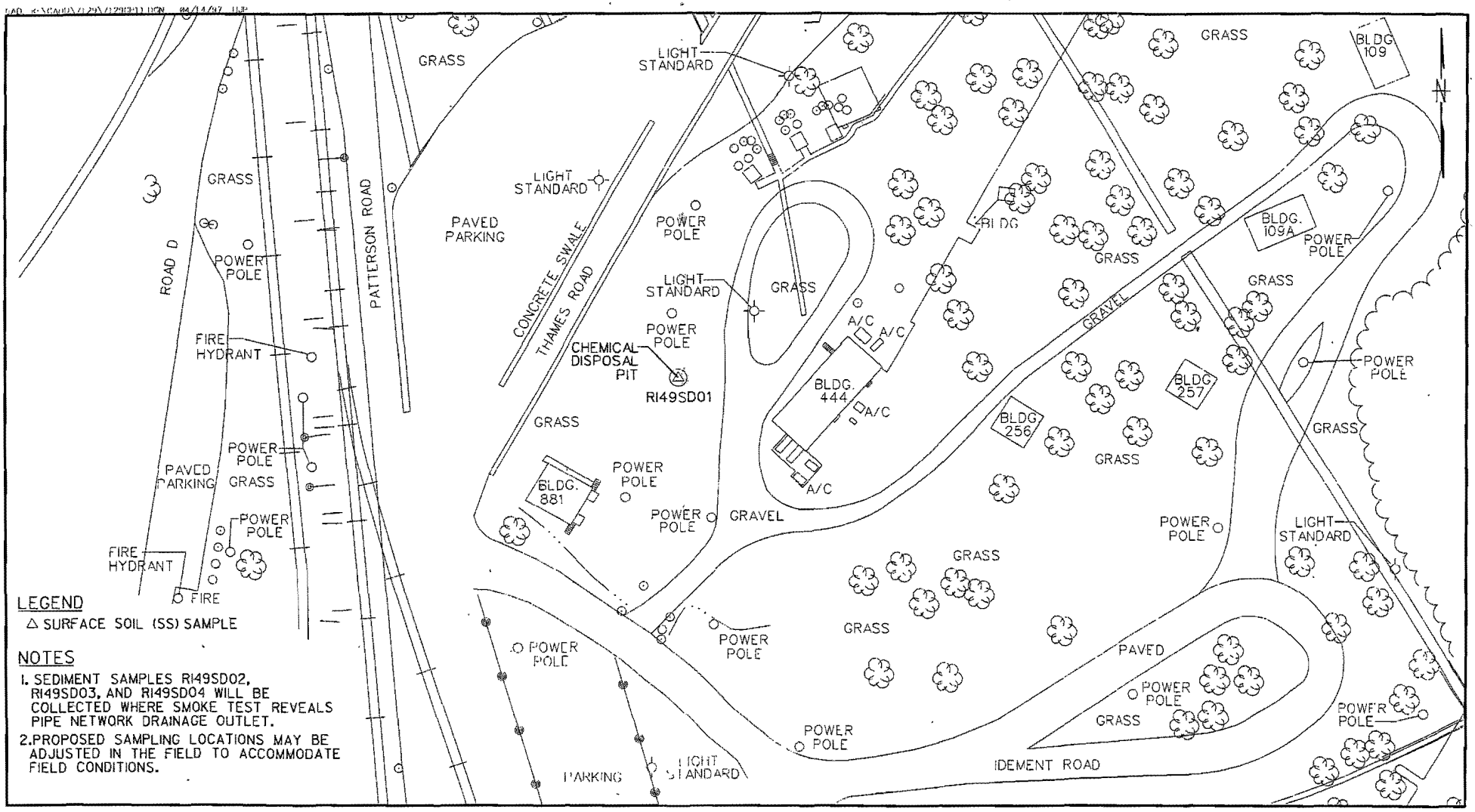

LEGEND

△ SURFACE SOIL (SS) SAMPLE

NOTES

1. SEDIMENT SAMPLES RI49SD02, RI49SD03, AND RI49SD04 WILL BE COLLECTED WHERE SMOKE TEST REVEALS PIPE NETWORK DRAINAGE OUTLET.
2. PROPOSED SAMPLING LOCATIONS MAY BE ADJUSTED IN THE FIELD TO ACCOMMODATE FIELD CONDITIONS.

FIGURE 13-3

PROPOSED SAMPLING LOCATION MAP
SITE 49 – CHEMICAL DISPOSAL PIT
INDIAN HEAD, MARYLAND

0 50 100
SCALE IN FEET

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14.0 SITE 50 - BUILDING 103 CRAWL SPACE

14.1 BACKGROUND INFORMATION AND SITE DESCRIPTION

Site 50 - Building 103 Crawl Space is located in the laboratory area of the northeastern part of the Station as shown in Figure 14-1. Building 103 is a small one story building with a concrete block foundation, built in approximately 1902. Laboratory equipment containing mercury has been reportedly used in Building 103 at different times. The equipment includes nitrometers, pycnometers, talianis, and thermometers.

Spent mercury handling procedures at Building 103 and other buildings in the laboratory area that used mercury consisted of pouring spent mercury into "slop jars" and running tap water into the jar over a sink to remove sulfuric acid from the mercury. Spills often occurred while transferring the spent mercury from nitrometers, and slop jars often broke. In addition, mercury was inadvertently washed out of the jars.

In 1985, while replacing two sinks in Building 103, workers discovered that the two sinks connected to a single drain line discharged directly to the soil beneath the building and did not connect to the storm or sanitary sewer system. After the discovery, a four inch diameter polyvinyl chloride (PVC) pipe was installed from the sink drain line to the manhole west of Building 102 (NEESA, 1992). The quantity of solvents and mercury discharged to the soil from 1902 to 1985 is unknown (EnSafe/Allen & Hoshall, 1994).

The crawl space below Building 103 is divided in half by a central load-bearing wall, running approximately east-west. The ground in the northern part of the crawl space is relatively flat; however, the southern section slopes to the southwest. The entrance to the crawl space is along the southern wall. The drain from the two sinks was located in the southwest corner of the northern section of the crawl space. A small ditch exists along the west wall of the southern section of the crawl space. It drains to a shallow depression in the southwest corner, forming a collection point for runoff.

The area around Building 103 is similar to the ground surface in the crawl space. The topography at the northern end of the building is relatively flat, while the ground slopes to south at the southern end of the building.

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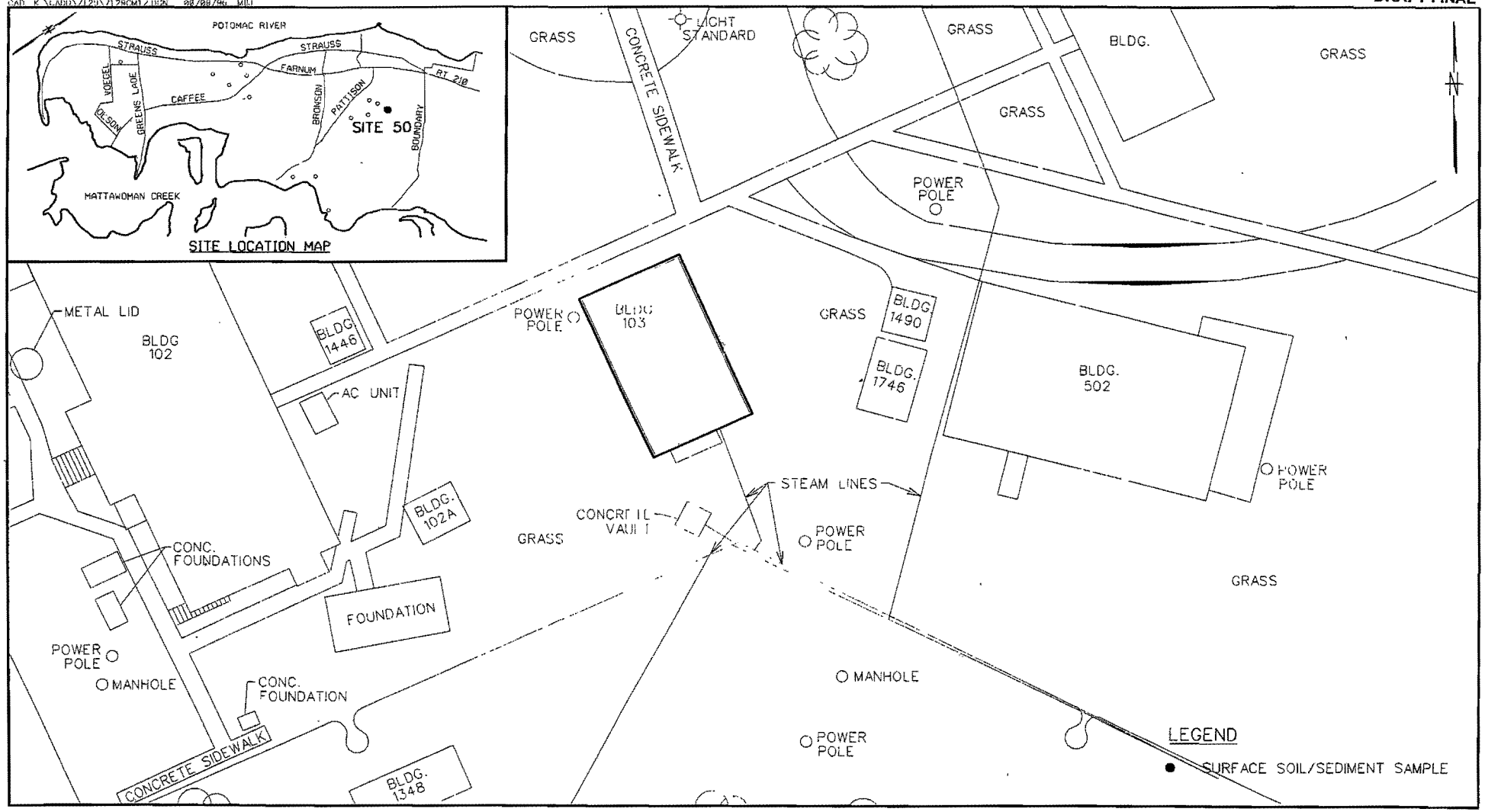

FIGURE 14-1

GENERAL SITE MAP
SITE 50 - BUILDING 103, CRAWL SPACE
INDIAN HEAD, MARYLAND

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CTO 0245

14.2 PREVIOUS ENVIRONMENTAL INVESTIGATIONS

Sampling was conducted during the Site Inspection (SI) Study to determine if contamination was present in the surface samples beneath Building 103. A summary of the samples collected beneath the building is provided in Table 14-1.

TABLE 14-1
SITE 50 - PREVIOUS INVESTIGATION
BUILDING 103 CRAWL SPACE
INDIAN HEAD, MARYLAND

Site 50 - Sampling and Analysis Approach				
Sample Media:	Surface soil			
Sampling Performed:	**Type**	**Number**	**Sam/Loc**	**Total**
	Surface soil	10	1	10
Analyses Performed:	**Media**	**Analyses**		
	Soil	VOC, BNA, TAL, Nitrate Esters		

A total of 10 surface soil samples were collected from beneath Building 103 during the SI Study. The locations of these soil samples and the analytical results which exceed EPA Region III RBC screening levels are provided in Figure 14-2. Arsenic was the only contaminant detected which exceeded the screening levels.

The data also showed two VOCs were reported in soil samples from Site 50. Acetone was detected in sample 50SS10 at 530.0 µg/kg. Acetone was also indicated in the laboratory blank. 1,1,1-Trichloroethane was reported at an estimated concentration of 10.0 µg/kg in sample 50SS05 which is well below screening levels.

Eight metal analytes were reported at concentrations that exceeded the background concentrations. These metals were iron, lead, mercury, silver, arsenic, cadmium, copper, and zinc. Only arsenic was detected above the EPA Region III screening level.

14.3 HUMAN HEALTH RISK ASSESSMENT

A human health risk assessment for the site will be performed and documented in the RI Report. Analytical data generated under this work plan, as well as historical data for the site, will be used to determine if measured chemical concentrations pose a significant threat to potential human receptors. The general methodologies which will be used to assess human health risks are contained in Section 3.0

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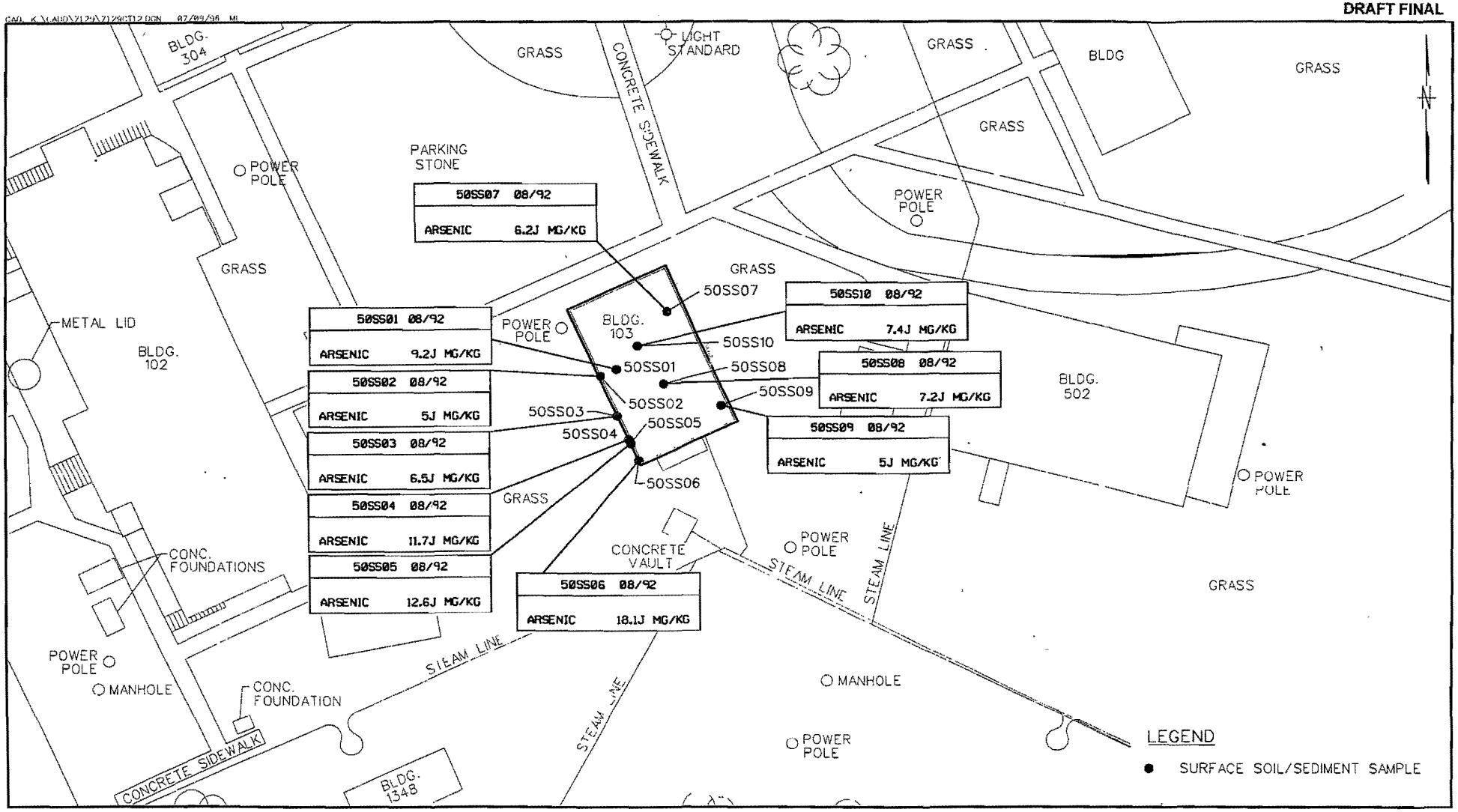

FIGURE 14-2

PREVIOUS SAMPLING
SITE 50 – BUILDING 103, CRAWL SPACE
INDIAN HEAD, MARYLAND

0 20 40
SCALE IN FEET

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of the Master Work Plan for the Station. The remainder of this section of the project-specific work plan identifies preliminary COCs based on existing site information, screening levels which will be used to identify COCs in the risk assessment, and exposure scenarios to be evaluated.

Arsenic has been identified as a preliminary COC for the site. Region III soil COC screening levels for industrial land use will be used to identify site-specific COCs for soil in the risk assessment. For groundwater, Region III COC screening levels for tap water ingestion will be employed.

Exposure to site media is limited because 1) the area is enclosed within a building, 2) the size of the crawl space entrance is small, and 3) all environmental samples were collected from inaccessible locations (i.e., beneath the building). No potential human receptors are identified for current land use. For future land use, a construction worker exposed to surface/subsurface soil (to a depth of 10 feet) will be evaluated in the human health risk assessment. Pending further review of site-specific information (depth to groundwater, detected groundwater chemicals, etc.), the risks associated with dermal exposure to groundwater may also be evaluated for the construction worker. Potentially complete exposure pathways to be considered in the development of the human health risk assessment are outlined in Table 3-2 of the Master Work Plan.

Based on previous project-specific discussions with the Station, NAVY, and USEPA (May 7, 1996), a future residential exposure scenario is not considered to be likely for the site and will not be evaluated in the human health risk assessment since the site is situated in the main production area. If the Station were to close in the future, it is anticipated that the area would be used for industrial/commercial purposes only. Maintenance workers, full-time employees, and adolescent trespassers will not be evaluated as potential receptors because of the aforementioned exposure limitations.

14.4 ECOLOGICAL RISK ASSESSMENT

Site 50 is located within a building, precluding exposure to ecological receptors. No contaminant migration pathways from the building to outside habitats exist. Hence, the site is not ecologically relevant and will be excluded from ecological risk assessment.

14.5 INVESTIGATIVE SCOPING

Analytical results from the previous RI Study were evaluated to address human health risk. Arsenic above the RBC screening level was the only contaminant detected. Evaluation of the various media is as follows:

- Subsurface Soil - No previous subsurface sampling was conducted to evaluate subsurface soils. Historical information indicates surface soils more likely to be impacted than subsurface soils. No samples are proposed

- Surface Soil - The soil in the crawl space under the building were collected and analyzed. Soil exposed to the environment have the potential for transport by erosion and have several pathways for exposure. To determine if contamination is outside of the building, soil samples will be collected around the building.

- Surface Water - No surface water exists in this area.

- Groundwater - No groundwater samples were collected in the past investigations.

Based on previous investigation, soils are potentially contaminated with metals. Soil samples will be analyzed for TAL metals only. The groundwater sample will be analyzed for TCL VOCs, TCL SemiVOCs, TAL metals, and explosives. A summary of the investigative scoping is provided in Table 14-2.

14.6 WORK PLAN

The proposed scope for the field investigation is summarized on Table 14-3. The proposed location of the sample to be collected is provided on Figure 14-3. Table 14-4 summarizes the sampling and analysis program and Table 14-5 provides the sample bottleware, preservation, and holding time requirements. The following provides additional information by media to be sampled.

- Subsurface Soils - Subsurface soils are not proposed.

- Surface Soils - Six surface soils will be collected around the outside of the building using the techniques identified in Station SOP SA-03 "Soil Sampling".

- Surface Water - No surface water exist in this area.

- Groundwater - If the surface soils are contaminated, then groundwater samples will be located and collected.

TABLE 14-2

INVESTIGATION SCOPING
SITE 50 - BUILDING 103 CRAWL SPACE
INDIAN HEAD, MARYLAND

Media/ Exposure Path	Identified/ Suspected Contaminants	Screening Levels	Preliminary Risk Evaluation	Potential Remedial Objectives	Potential Response Actions	Potential Remedial Action
Surface Soil	Ten surface samples were collected and analyzed for VOCs, SemiVolatiles, TAL metals, and Nitrate Esters	EPA Region III RBC screening levels	Arsenic was detected above the screening level	Determine if contamination extends beyond foundation of building. Evaluate the site to determine if arsenic presents a threat to human health.	If contamination detected outside foundation, then continue to expand area of sampling to determine extent of soil contamination. If no contamination detected outside foundation, then extent of contamination has been identified.	Conduct a human health risk evaluation. Soil removal and off-site disposal. Conduct a human health risk evaluation. Soil removal and off-site disposal.
Groundwater	No groundwater samples have been collected	EPA Region III RBC screening levels	No groundwater samples were collected.	No groundwater samples will be collected unless soil contamination is present.	First, identify the content and contaminant concentrations in the overlying surface soils. If the surface soils are contaminated, then groundwater samples will be located and collected.	No Further Action

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TABLE 14-3

SITE SPECIFIC WORK PLAN
SITE 50 - BUILDING 103 CRAWL SPACE
INDIAN HEAD, MARYLAND

Data Needs	Investigative Technique	Location	Number of samples	Analysis
Determine if soil contamination extends beyond foundation of building	Collect surface soil samples from 0-3 feet depth with hand augers.	Collect one sample at the northern and southern ends of Building 103 and two samples along both the eastern and western sides.	6	TAL Metals, Explosives

TABLE 14-4

SUMMARY OF SAMPLING PROGRAM
SITE 50 - BUILDING 103 CRAWL SPACE
INDIAN HEAD, MARYLAND

Sample Media	Sample ID Number	Sample Depth/ Location	Analysis				
			VOCs	SVOCs	Metals	Pesticides/ PCBs	Explosives
Soil	RI50SS01	0-3'/Northern end of Building 103			•		•
	RI50SS02	0-3'/Southern end of Building 103			•		•
	RI50SS03	0-3'/Eastern side of Building 103			•		•
	RI50SS04	0-3'/Eastern side of Building 103			•		•
	RI50SS05	0-3'/Western side of Building 103			•		•
	RI50SS06	0-3'/Western side of Building 103			•		•

TABLE 14-5

BOTTLEWARE, PRESERVATION, AND HOLDING TIME REQUIREMENTS
SITE 50 - BUILDING 103 CRAWL SPACE
INDIAN HEAD, MARYLAND

Media	Analysis	Total Number of Samples	Number of Containers Per sample	Container Type	Preservation	Holding Times
Soil	TAL Metals - CLP ILM04.0	6	1	250 ml CWM glass	Cool to 4°C	6 months; Hg 28 days
	Explosives - Modified SW-846-8330*	6	1	250 ml CWM glass	Cool to 4°C	14 days to extract; 40 days to analysis

CWM - Clear Wide Mouth
* - Includes analysis for nitrate esters (nitroglycerin, nitrocellulose, nitroquanidine) in Modified SW-846-8330.

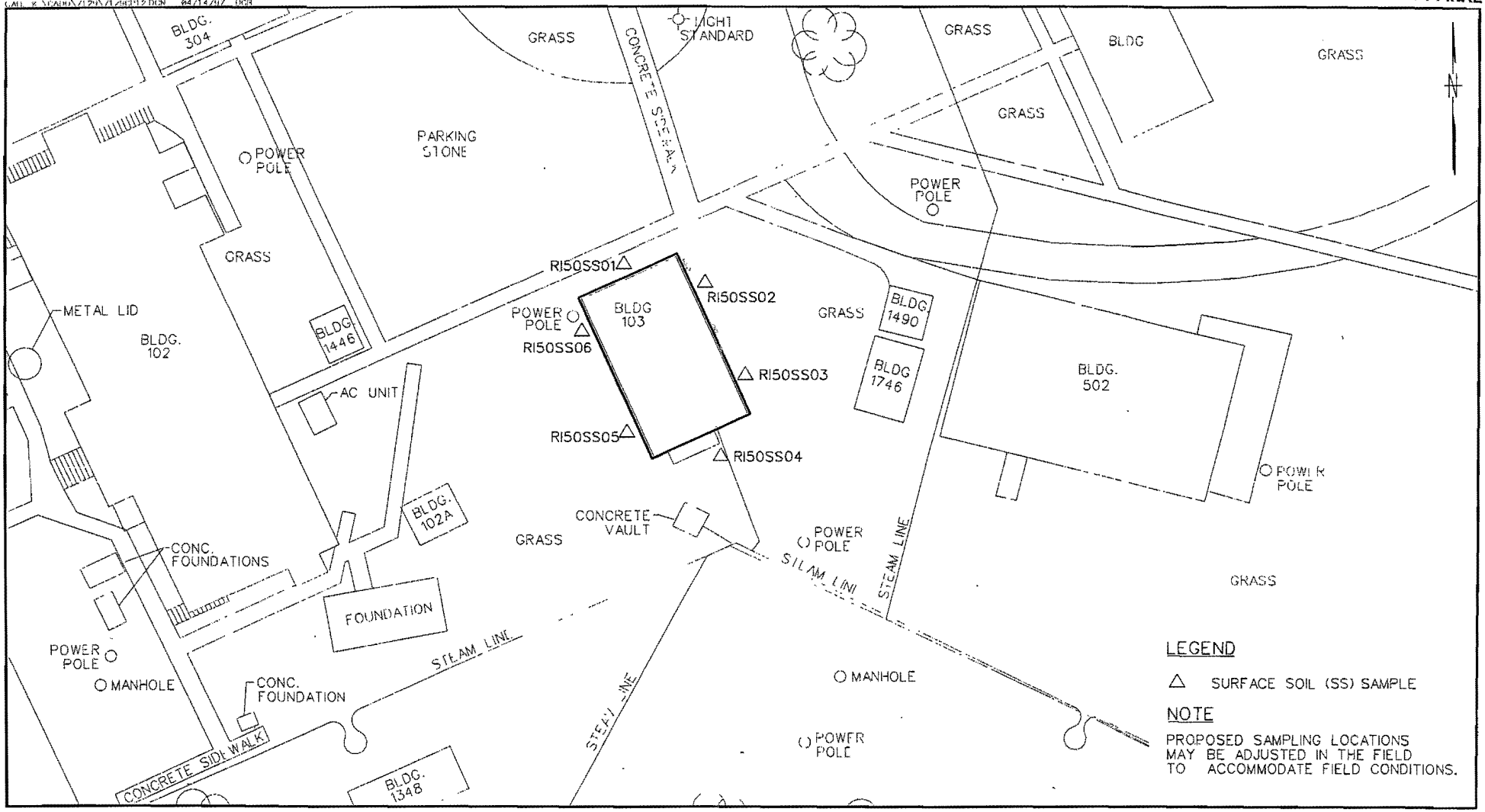

FIGURE 14-3

PROPOSED SAMPLING LOCATION MAP
SITE 50 – BUILDING 103, CRAWL SPACE
INDIAN HEAD, MARYLAND

0 20 40
SCALE IN FEET

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15.0 SITE 53 - MERCURY CONTAMINATION IN THE SEWAGE SYSTEM

15.1 BACKGROUND INFORMATION AND SITE DESCRIPTION

Site 53 - Mercury Contamination in the Sewage System consists of the sewage system for the general laboratory in the northeastern part of the Station. The sewage system consists of the storm sewer lines and the sanitary sewer lines from several buildings in the area as shown in Figure 15-1. The following maps illustrate the layout of the storm sewer and sanitary sewer lines in the general laboratory area. The general laboratory area has the highest local topographic elevation for the area.

Laboratory workers from Building 102 reported that approximately a liter of mercury was lost per month down the sinks. Over the 77-year period that the Building 102 laboratory operated without mercury traps on the sinks (1909-1986), it is estimated that 28,000 pounds of mercury were discharged to the drain lines (NEESA, 1992). Additional large quantities of mercury may have been disposed down the drain lines from similar mercury handling and disposal procedures practiced at the other laboratory buildings.

In 1969, approximately 10 pounds of mercury were recovered from a storm sewer manhole located south of Building 103. In early 1989, approximately 1 pound of mercury was recovered from the sanitary storm sewer manhole located east of Building 102 (NEESA, 1992). Both of these manholes have drain line connections to Building 102.

After mercury was discovered in the manhole east of Building 102 in 1989, other manholes in the vicinity and down-line of the laboratory buildings were inspected for mercury. No visible mercury contamination was discovered. Since then, the manholes in the vicinity and down line of the laboratory facilities have been regularly inspected for signs of visible mercury. In addition, the sewer lines in the area of Building 102 were blocked off with sandbags, and mercury traps were installed on the lines (NEESA, 1992).

In late 1988, a video survey was performed to determine the condition of the gravity sewer lines in the laboratory area. The sewer lines "in the vicinity of the laboratory buildings" were found to be in poor condition and in need of repair or replacement (NEESA, 1992). The vitrified clay and terra-cotta pipes were either broken, cracked, sagging, separated, or, in some cases, collapsed. Therefore, the concern exists that mercury has contaminated the soils surrounding the sewer lines.

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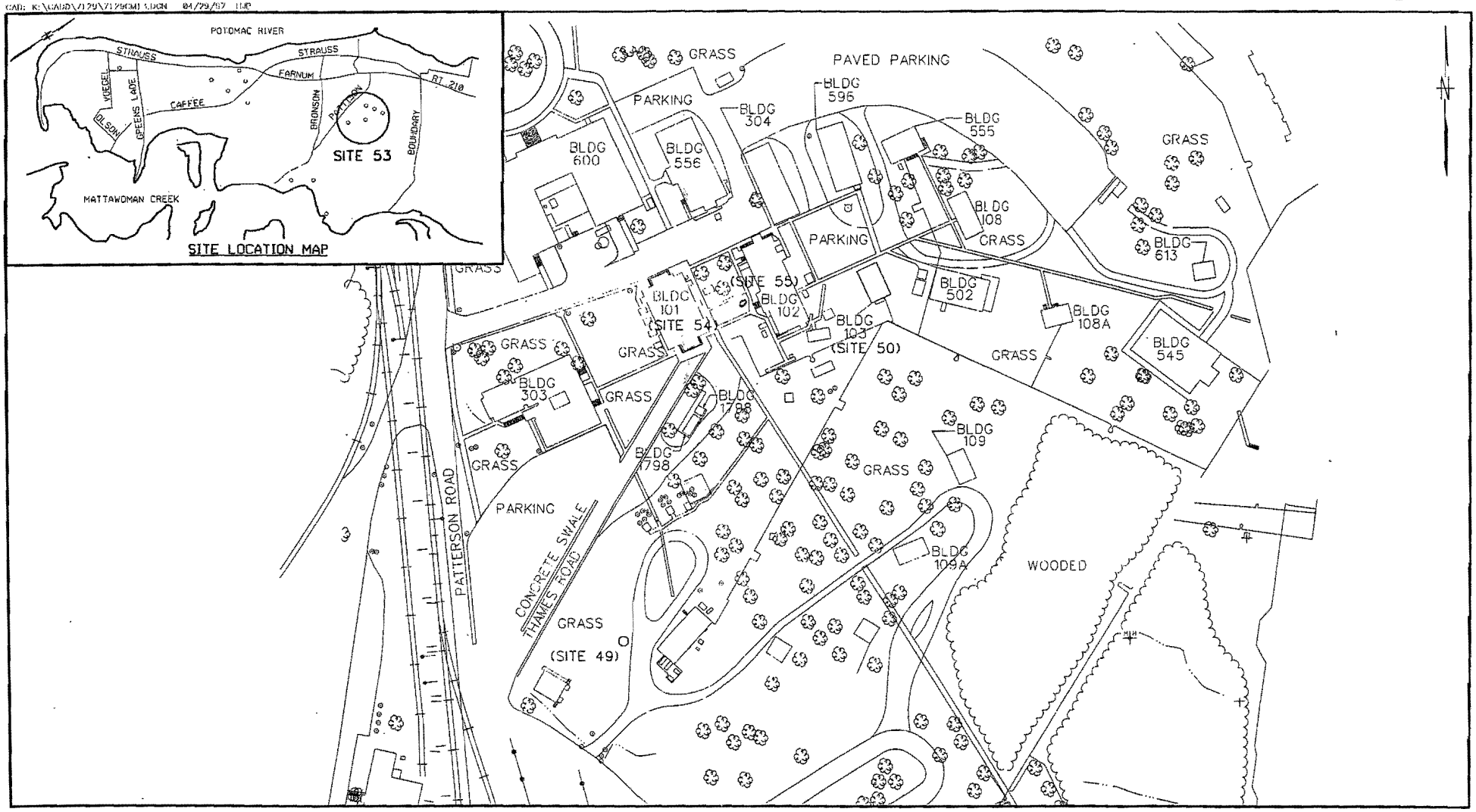

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GENERAL SITE MAP
SITE 53 – MERCURY CONTAMINATION OF THE SEWAGE SYSTEM
INDIAN HEAD, MARYLAND

FIGURE 15-1

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In late 1988, mercury levels in the sanitary sewage sludge measured at levels up to 150 ppm (NEESA, 1992). The maximum allowable amount of mercury in Class I sanitary sewage sludge is 10 ppm (memorandum, NAVORDSTA Indian Head, Code 0411C, Investigation of Mercury Hazard in Building 102, January 28, 1988).

The sanitary sewage of the laboratory area leaves the area via manhole 472 to the lift station. The sewage is then pumped to the Station treatment facility. The storm water sewage of the area flows to manhole 474 and then flows to a discharge outfall.

15.2 PREVIOUS ENVIRONMENTAL INVESTIGATIONS

Sampling was conducted during the Site Inspection (SI) Study (E/A&H, 1994) to determine if contamination exists as a result of disposal procedures in conjunction with a faulty sanitary sewer system. The sampling and analysis conducted during the SI Study is provided in Table 15-1.

TABLE 15-1
PREVIOUS INVESTIGATION
SITE 53 - MERCURY CONTAMINATION IN THE SEWAGE SYSTEM
INDIAN HEAD, MARYLAND

Sample Media:	Shallow soil profile (0-12 feet) Sludge (sewer lines)			
Sampling Performed:	**Type**	**Number**	**Sam/Loc**	**Total**
	Shallow soil borings (adjacent to sewer lines)	13	1	13
	Sludge (from sewer manholes)	4	1	4
Analyses Performed:	**Media**	**Analyses**		
	Soil (adjacent to sewer lines)	SB01 - TCL, BNA, TAL, TPH		
		SB02-SB15 - Mercury, Nitrate Esters		
	Sludge (sewer manhole)	Mercury, Nitrate Esters		

Sludge samples were collected from within the identified manholes in the area of Buildings 102 and 103. The locations of the sludge samples and soil borings along with the analytical results which exceed the EPA Region III RBC screening levels are shown on Figure 15-2.

Although it was planned to install monitoring wells during the SI Study (E/A&H, 1994), no monitoring wells were installed because groundwater was not encountered. During the field work, 13 borings were installed, 10 at a depth of 12 feet, and 3 at depths of 30 to 40 feet. No shallow water-bearing zone was encountered in any of the borings. One of the deep borings (53SB02) was located near the southeastern

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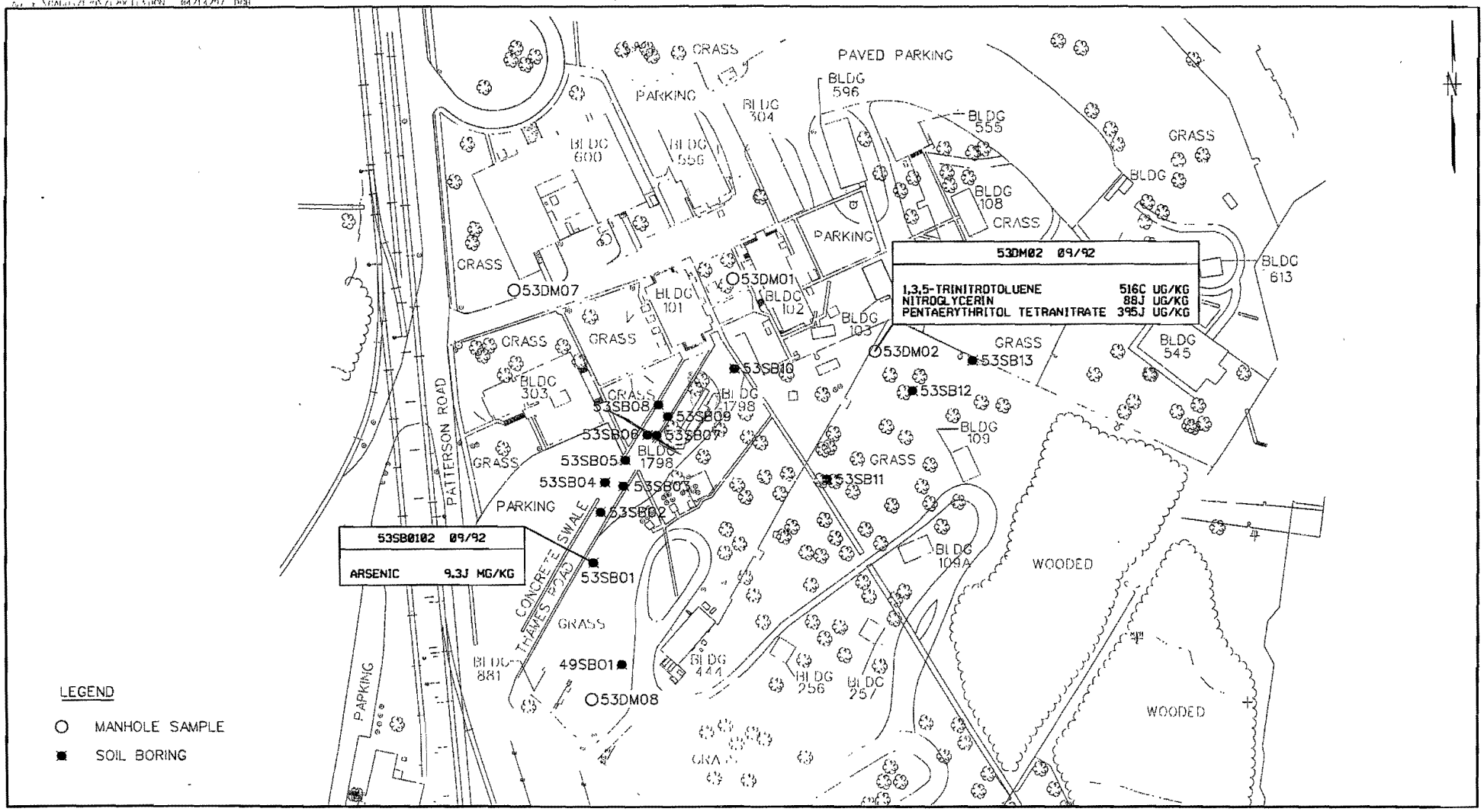

FIGURE 15-2

PREVIOUS SAMPLING
SITE 53 - MERCURY CONTAMINATION OF THE SEWAGE SYSTEM
INDIAN HEAD, MARYLAND

0 100 200
SCALE IN FEET

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edge of Thames Road, northwest of Building 444. The SI Report described the occurrence of a marker bed at 41 feet deep in that boring, indicating the bottom of the Lowland Deposits, and suggesting that no shallow water-bearing zone should be expected. The same marker bed was found in a boring located between Buildings 881 and 444 (49SB01) at a depth of 32 feet. (Note that the ground surface at 53SB01 is topographically 6 to 7 feet higher than 49SB01.) A third boring (53SB13), located approximately 60 feet south of the southeastern corner of Building 502, encountered the marker bed at 35 feet deep.

The SI Report described the marker bed as a unit of the Tertiary Brandywine Formation. The unit is a medium to fine-grained reddish to white quartz sand; is moderately cemented and very hard; and was impenetrable by split-spoon sampling.

Soil samples during the SI field work were uniform throughout the site, and consisted of stiff to hard brown and green silty clay with little moisture. Blow counts averaged 40 blows per foot. Test results from two Shelby Tube samples indicated hydraulic conductivities of 7.1×10^{-8} cm/sec and 1×10^{-6} cm/sec.

The SI Report concluded that, "If contamination, particularly mercury, had entered the soil system via the sewer lines, the extent of contamination would be limited to the soil in contact with joints and/or fractures in the pipes by the natural soil properties."

Soil samples collected from boring 53SB01 were analyzed for volatile and semivolatile organic contaminants, TAL, and TPH. No volatile or semivolatile organic contaminants, or TPHs were reported above method detection limits (E/A&H, 1994). Arsenic was detected in soil sample 53SB0102 at 9.3 mg/kg. This concentration is slightly above the published average background in soil of 7.1 mg/kg; however, not above current action levels and is probably naturally occurring (E/A&H, 1994).

Soil samples collected from borings 53SB02 through 53SB15 were analyzed for mercury and nitrate esters; no target compounds were detected.

Sludge samples were collected from manholes and were analyzed for mercury and nitrate esters. Mercury was detected in three of four samples ranging from 2.5 to 81.4 mg/kg, with an average concentration of 45.3 mg/kg. Eight nitrate ester compounds were detected in sample 53DM07.

Soil borings 53SB0103 and 53SB1303 were analyzed for cation exchange capacity (CEC) and total organic carbon (TOC). The CEC values (milli-equivalence per 100 grams) are within the typical range for silty clays (10 to 40 meq/l00g) (Drever, 1988, E/A&H, 1994). A higher CEC value indicates that more sites are available for bonding. A high number of bonding sites increases the potential for adsorption of

contaminants and a retarded rate of contamination migration (E/A&H, 1994). CEC values are affected by several factors, including composition of clay minerals, pH, and the nature of the cations present. TOC concentrations are average in range for silty clays (Drever, 1988; E/A&H, 1994). The potential for a contaminant to partition to or become adsorbed to the soil particles increases as TOC content increases. In other words, the potential distance for contaminant migration through the soil profile decreases with increasing TOC (E/A&H, 1994).

15.3 HUMAN HEALTH RISK ASSESSMENT

A human health risk assessment for the site will be performed and documented in the RI Report. Analytical data generated under this work plan, as well as historical data for the site, will be used to determine if measured chemical concentrations pose a significant threat to potential human receptors. The general methodologies which will be used to assess human health risks are contained in Section 3.0 of the Master Work Plan for the Station. The remainder of this section of the project-specific work plan identifies preliminary COCs based on existing site information, screening levels which will be used to identify COCs in the risk assessment, and exposure scenarios to be evaluated.

Arsenic, and three select Nitrate Esters, has been identified as a preliminary COC for the site. Region III soil COC screening levels for industrial land use will be used to identify site-specific COCs for soil and sludge in the risk assessment. For groundwater, Region III COC screening levels for tap water ingestion will be employed.

Exposure to site media is limited because of the inaccessible nature of the storm and sanitary sewer system. An occasional site visitor (i.e., a worker inspecting the sewer lines) under current site conditions will be evaluated in the human health risk assessment. This receptor will be assumed to be intermittently exposed to soil and sediment from the sewer system. Potentially complete exposure pathways for the occasional worker are similar to those for the maintenance worker, which are outlined in Table 3-2 of the Master Work Plan.

Exposure to groundwater is not expected to occur under current and/or future potential land use. This medium will be evaluated qualitatively in the RI Report via a comparison of detected groundwater concentrations to COC screening values and other health-based criteria (i.e., Federal and State drinking water standards).

Based on previous project-specific discussions with the Station, NAVY, and USEPA (May 7, 1996), a future residential exposure scenario is not considered to be likely for the site and will not be evaluated in

the RI Report since the site is situated in the main production area. If the Station were to close in the future, it is anticipated that the area would be used for industrial/commercial purposes only. Full-time employees and adolescent trespassers will not be evaluated as potential receptors because of the aforementioned exposure limitations.

15.4 ECOLOGICAL RISK ASSESSMENT

Mercuric wastes are potentially present in the underground sewage system, which does not outfall to habitats or areas where contaminants could migrate to habitats. Previous investigations have found that the soil existing in the Site 53 area is very impermeable, and that if mercury has leaked from the sewers, it is unlikely that the contamination has migrated beyond the soil immediately surrounding the sewer. As a result, the site is not ecologically relevant and will be excluded from quantitative ecological risk assessment.

15.5 INVESTIGATIVE SCOPING

Past remedial efforts and reports of past investigations from this site indicate that the gross mercury contamination has been removed from the sewer system, the depth to groundwater exceeds 30 to 40 feet, and soil conditions at the site will inhibit the migration of contamination (especially mercury). Determining what, if any, additional environmental samples should be collected from the site reuqires a better understanding of the sewer collection system. Thus, the immediate investigative activites described in this work plan do not include the collection of environmental samples, but rather describe the initial steps for a phased approach to the Site 53 investigation.

The initial investigation activities for Site 53 shall include the following:

- Records Search - Identify and examine existing facility drawings showing existing utilities to gather information regarding the layout of the sewer system layout.

- Video Survey - Secure a copy of and view the 1988 gravity sewer line survey to identify locations where the most significant potential opportunity exists for exfiltration from the sewers.

- Data Comparison - Compare the locations identified as points of potential sewer leakage with the sampling locations and analytical results described in past investigative reports (e.g., the Phase II Final Site Investigation Report dated March 4,1994).

- Develop Sampling Scheme - Based on the assembled data, determine if the need exists for additional sampling, and if appropriate, define the media, locations and analytes for the samples.

15.6 WORK PLAN

The proposed scope for the field investigation is summarized on Table 15-2.

TABLE 15-2

SITE SPECIFIC WORK PLAN
SITE 53 - MERCURY SEWER SYSTEM
INDIAN HEAD, MARYLAND

Data Needs	Investigative Technique	Location	Number of Samples	Analysis
Determine sewer system layout, determine the condition of the sewer system, and compare to the location of contamination found by past investigations.	Search existing records for information on the location of existing sewers. View the 1988 video of the gravity sewer line survey. Compare contamination found during past investigations to the configuration of the existing sewer system. Determine what, if any, additional environmental sampling is necessary.	Not Applicable	0	None

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16.0 SITE 54 - BUILDING 101 MERCURY CONTAMINATION

16.1 BACKGROUND INFORMATION AND SITE DESCRIPTION

Building 101 is located in the Northeastern part of the Station as shown in Figure 16-1. In the mid-1980's, an NSWC employee in Building 101 detected mercury droplets and an organic solvent odor in the basement office when solvents were discharged through the pipe system (NEESA, 1992) suggesting a potential leaky drainage pipe. In January 1990, several droplets of mercury were discovered resting on the insulation of a steam pipe located in the southeast corner room of the basement in Building 101 (NEESA, 1992). When NSWC Safety Office personnel began removing the drop ceiling tiles, mercury vapors were detected in the breathing zone, but no visible signs of mercury on the ceiling tile tracks were observed (NEESA, 1992).

16.2 PREVIOUS ENVIRONMENTAL INVESTIGATIONS

During Site Inspection Study sampling conducted in August 1992, the carpeted basement floor appeared to be stained in the northwest corner. Several ceiling tiles and the sheet rockwall also appeared stained. There were no visible mercury droplets on the horizontal surfaces sampled. Mercury vapors were monitored during the sampling process (E/A&H, 1992). There were two brief intervals when mercury vapors were as high as 0.33 mg/m^3. No significant levels of mercury vapors were detected during the remainder of the sampling process.

Sampling was conducted to determine if select horizontal surfaces, bulk building materials, and the concrete floor had been contaminated by mercury spills and release. A summary of the sampling and analysis conducted during the SI Study is provided in Table 16-1.

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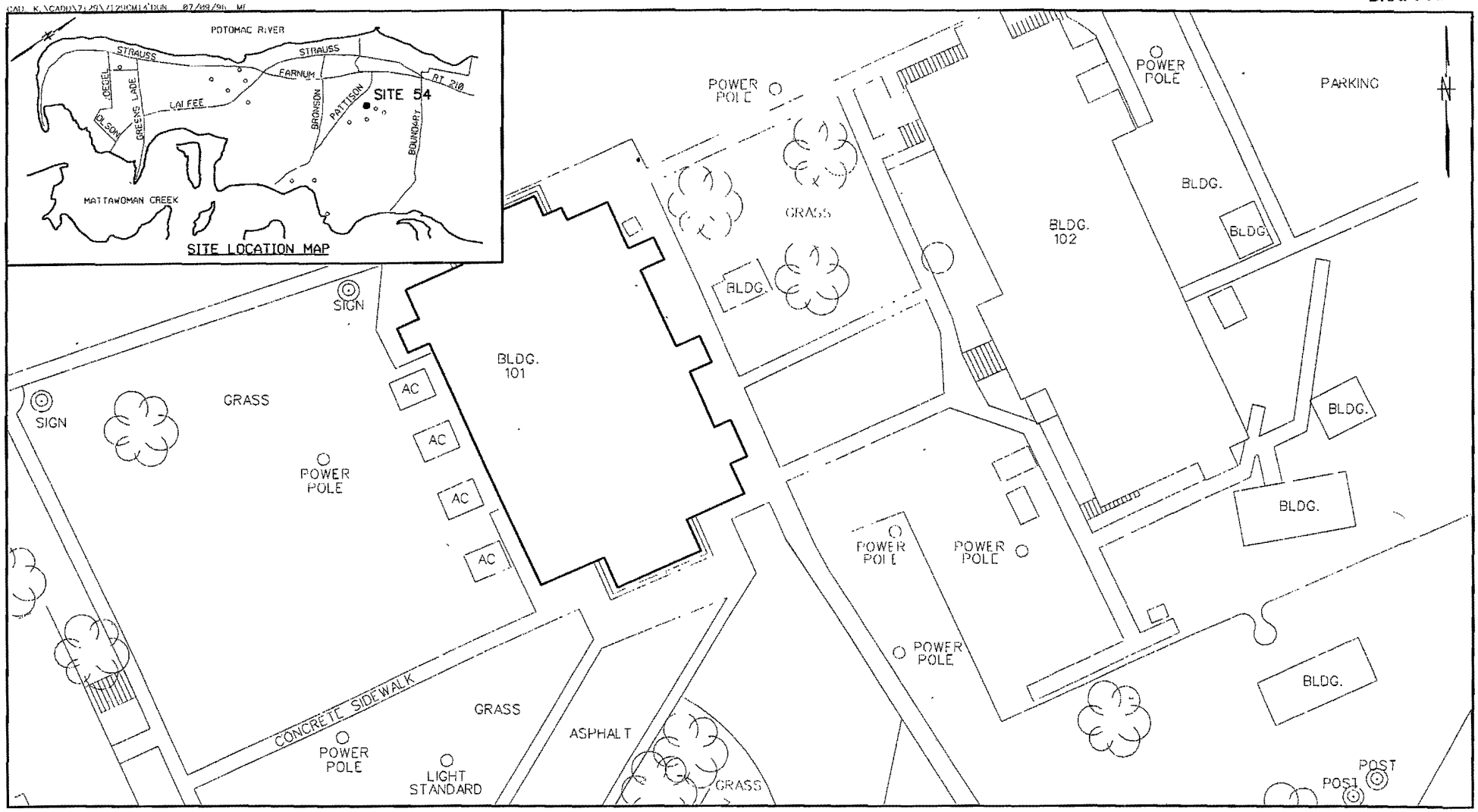

GENERAL SITE MAP
SITE 54 – BUILDING 101
INDIAN HEAD, MARYLAND

0 20 40
SCALE IN FEET

FIGURE 16-1

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TABLE 16-1
SITE 54 - PREVIOUS INVESTIGATION
BUILDING 101 MERCURY CONTAMINATION
INDIAN HEAD, MARYLAND

Sample Media:	Horizontal surfaces Building materials Concrete Floor			
Sampling Performed:	**Type**	**Number**	**Sam/Loc**	**Total**
	Wipe (horizontal surfaces)	5	1	5
	Bulk building materials	5	1	5
	Concrete	5	1	5
Analyses Performed:	**Media**	**Analyses**		
	Wipe	Mercury		
	Build building materials	Mercury		
	Concrete	Mercury, Nitrate Esters		

Five wipe samples, five bulk materials samples, and five concrete samples collected from the basement floor were used to characterize this site (E/A&H, 1994). The sample locations and the analytical result which exceed the EPA Region III RBC screening levels are shown in Figure 16-2.

The mercury concentrations detected from wipe tests ranged from 0.53 to 75.4 µg/100 cm^2 (E/A&H, 1994). The overall range of mercury concentrations detected in the bulk materials samples was 0.45 to 776 mg/kg. The highest reported level of mercury for wipe and bulk material samples was detected in samples collected adjacent to one another. This may suggest a local "hot spot (E/A&H, 1994)."

The range of mercury detected in concrete samples was from 0.21 mg/kg to 0.59 mg/kg, with an average concentration of approximately 0.46 mg/kg. No nitrate esters were detected in concrete samples (E/A&H, 1994).

According to the 1994 Site Inspection (E/A&H, 1994), this area should remain closed to personnel. Nonimpervious materials, (metal pipes and other metal materials, only) could possibly be decontaminated and reused. Other porous building materials, (ceiling tiles, sheet rock, floor tile, etc.) will likely require removal and disposal.

16.3 HUMAN HEALTH RISK ASSESSMENT

A human health risk assessment for the site will be performed and documented in the RI Report. Analytical data generated under this work plan, as well as historical data for the site, will be used to determine if measured chemical concentrations pose a significant threat to potential human receptors. The general methodologies which will be used to assess human health risks are contained in Section 3.0 of the Master Work Plan for the Station. The remainder of this section of the project-specific work plan identifies preliminary COCs based on existing site information, screening levels which will be used to identify COCs in the risk assessment, and exposure scenarios to be evaluated.

Mercury has been identified as a preliminary COC for the site. Because of the lack of applicable standards, Region III soil COC screening levels for industrial land use will be used to conservative identify site-specific COCs for various sampled building materials (i.e., concrete).

Exposure to site media is limited because 1) the site is enclosed within a building, and 2) employee access to the areas under investigation is currently restricted. No potential receptors are identified under current land use. A full-time employee will be evaluated in the human health risk assessment in case the buildings become fully operational under future land use. This receptor will be assumed to be exposed to site media on a daily basis. Potentially complete exposure pathways for the full-time employee to be considered in the development of the human health risk assessment are outlined in Table 3-2 of the Master Work Plan.

Based on previous project-specific discussions with the Station, NAVY, and USEPA (May 7, 1996), a future residential exposure scenario is not considered to be likely for the site and will not be evaluated in the RI Report since the site is situated in the main production area. If the Station were to close in the future, it is anticipated that the area would be used for industrial/commercial purposes only. Maintenance workers and adolescent trespassers will not be evaluated as potential receptors because of the aforementioned exposure limitations.

16.4 ECOLOGICAL RISK ASSESSMENT

Site 54 is located within a building, precluding exposure to ecological receptors. No contaminant migration pathways from the building to outside habitats exist. Hence, the site is not ecologically relevant and will be excluded from ecological risk assessment.

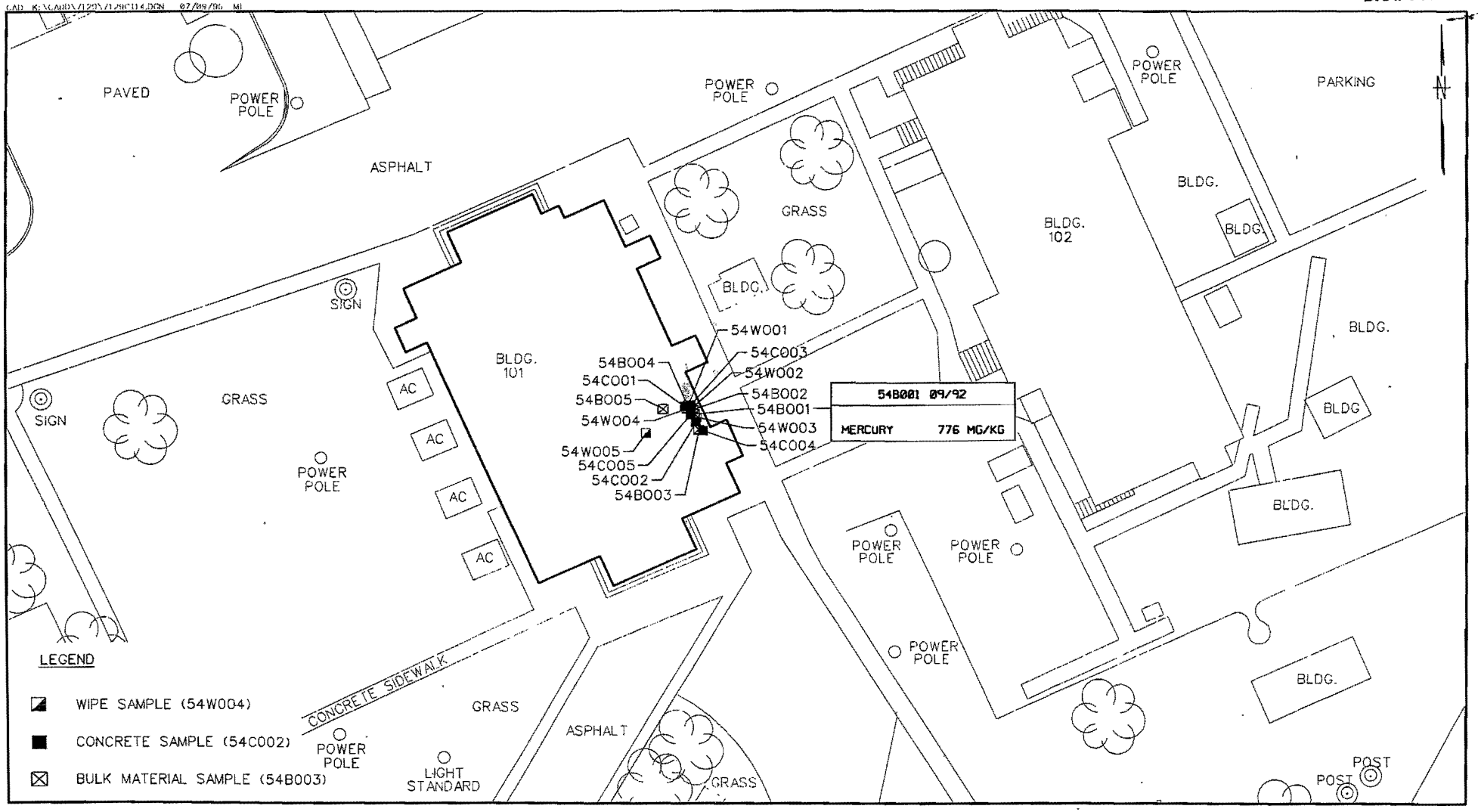

FIGURE 16-2

PREVIOUS SAMPLING RESULTS
SITE 54 - BUILDING 101
INDIAN HEAD, MARYLAND

0 20 40
SCALE IN FEET

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16.5 INVESTIGATIVE SCOPING

Analytical results from previous investigations were evaluated to address human health risk. Contamination above the RBC screening levels was detected in one of the previous samples collected. Evaluation of the various media is as follows:

- Bulk material sampling will be conducted in additional locations to determine if mercury contamination exists. Concrete cores will be made in the floor and the soil between will be sampled. No contamination outside the building is suspected, therefore no soil or water sampling is proposed outside the building.

A summary of the investigative scoping is provided in Table 16-2.

16.6 WORK PLAN

The proposed scope for the field investigation is summarized on Table 16-3. Table 16-4 summarizes the sampling and analysis program and Table 16-5 provides the sample bottleware, preservation, and holding time requirements. The proposed location of the sample will be determined during the field sampling activity as indicated on Figure 16-3.

TABLE 16-2

INVESTIGATION SCOPING
SITE 54 - BUILDING 101
INDIAN HEAD, MARYLAND

Media/ Exposure Pathway	Identified/ Suspected Contaminants	Screening Levels	Preliminary Risk Evaluation	Data Gaps/Investigation Objective	Decision Rule	Potential Remedial Action
Building Materials	Five wipe and five bulk material samples were collected and analyzed for mercury.	EPA Region III screening levels.	Mercury was detected in one sample above the industrial ingestion screening level and in six samples above the protection of groundwater screening level.	Determine extent of mercury contamination Test for asbestos	If mercury detected in porous building material, then material will be removed. If mercury detected in nonporous building material, then material will be decontaminated and reused. If asbestos detected, then asbestos removal or encapsulation will be conducted.	Removal of contaminated building materials and off-site disposal Steam cleaning and/or similar decontamination process with confirmational wipe sampling. Removal of asbestos and off-site disposal. Encapsulation of asbestos.
Concrete Floor	Five concrete samples were analyzed for mercury and nitrate esters.	EPA Region III screening levels	Worker exposure	Determine extent of mercury contamination within concrete and nature of metals contamination in underlying soil.	If mercury detected in concrete floor, then the contaminated area of concrete will be removed.	Removal of contaminated concrete with confirmational sampling and off-site disposal of removed concrete.

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TABLE 16-3

SITE SPECIFIC WORK PLAN
SITE 54 - BUILDING 101
INDIAN HEAD, MARYLAND

Media	Data Needs	Investigative Technique	Location	Number of samples	Analysis
Building Materials	Determine extent of mercury contamination	Collect wipe samples on impervious materials (metal pipes and ducts).	Collect samples from 5 surfaces not tested during Phase II SI.	5	Mercury
		Collect samples of bulk materials.	Collect 2 bulk samples from each material tested during Phase II SI (ceiling tile, pipe insulation, floor tile, pipe mortar, and sheet rock)	10	Mercury
	Test for asbestos	Collect bulk sample of suspected asbestos material.	Collect 1 bulk sample of suspected material.	1	Asbestos
Concrete Floor	Determine extent of mercury contamination	Collect core samples of concrete.	Collect 3 concrete core samples from area of Phase II SI sample 54CO04.	3	Mercury
Surface Soil	Determine extent of mercury contamination	Collect surface soil samples from beneath concrete core locations.	Collect 3 samples from beneath concrete core locations.	3	TAL Metals, Explosives

TABLE 16-4

SUMMARY OF SAMPLING PROGRAM
SITE 54 - BUILDING 101
INDIAN HEAD, MARYLAND
PAGE 1 OF 2

Sample Media	Sample ID Number	Sample Depth/ Location	Analysis			
			Mercury	TAL Metals	Asbestos	Explosives
Building Materials	RI54WS01	Wipe sample on inpervious surface not previously tested.	•			
	RI54WS02	Wipe sample on inpervious surface not previously tested.	•			
	RI54WS03	Wipe sample on inpervious surface not previously tested.	•			
	RI54WS04	Wipe sample on inpervious surface not previously tested.	•			
	RI54WS05	Wipe sample on inpervious surface not previously tested.	•			
	RI54BM01	Bulk sample of ceiling tile	•			
	RI54BM02	Bulk sample of ceiling tile	•			
	RI54BM03	Bulk sample of pipe insulation	•			
	RI54BM04	Bulk sample of pipe insulation	•			
	RI54BM05	Bulk sample of floor tile	•			
	RI54BM06	Bulk sample of floor tile	•			
	RI54BM07	Bulk sample of pipe mortar	•			
	RI54BM08	Bulk sample of pipe mortar	•			
	RI54BM09	Bulk sample of sheet rock	•			
	RI54BM010	Bulk sample of sheet rock	•			
	RI54BM11	Bulk sample of suspected asbestos material			•	
Concrete Floor	RI54CO01	Core sample in area of 54CO04	•			
	RI54CO02	Core sample in area of 54CO04	•			
	RI54CO03	Core sample in area of 54CO04	•			

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TABLE 16-4

SUMMARY OF SAMPLING PROGRAM
SITE 54 - BUILDING 101
INDIAN HEAD, MARYLAND
PAGE 2 OF 2

Sample Media	Sample ID Number	Sample Depth/ Location	Analysis			
			Mercury	TAL Metals	Asbestos	Explosives
Soil	RI54SS01	Beneath RI54CO01		•		•
	RI54SS02	Beneath RI54CO02		•		•
	RI54SS03	Beneath RI54CO03		•		•

TABLE 16-5

BOTTLEWARE, PRESERVATION, AND HOLDING TIME REQUIREMENTS
SITE 54 - BUILDING 101
INDIAN HEAD, MARYLAND

Media	Analysis	Total Number of Samples	Number of Containers Per Sample	Container Type	Preservation	Holding Times
Wipe Samples	MERCURY	5	1	250 ml CWM glass	None	28 days
Bulk Material Samples	MERCURY	10	1	250 ml CWM glass	None	28 days
	ASBESTOS	1	1	250 ml CWM glass	None	28 days
Concrete	MERCURY	3	1	250 ml CWM glass	Cool to 4°C	28 days
Surface Soils	TAL METALS MODIFIED SW-846-8330*	3	1	250 ml CWM glass	Cool to 4°C	6 months; Hg 28 days
	EXPLOSIVES	3	1	250 ml CWM glass	Cool to 4°C	14 days to extract; 40 days to analysis

CWM - Clear wide-mouth
* - Includes analysis for nitrate esters (nitroglycerin, nitrocellulose, nitroquanidien) in Modified SW-846-8330.

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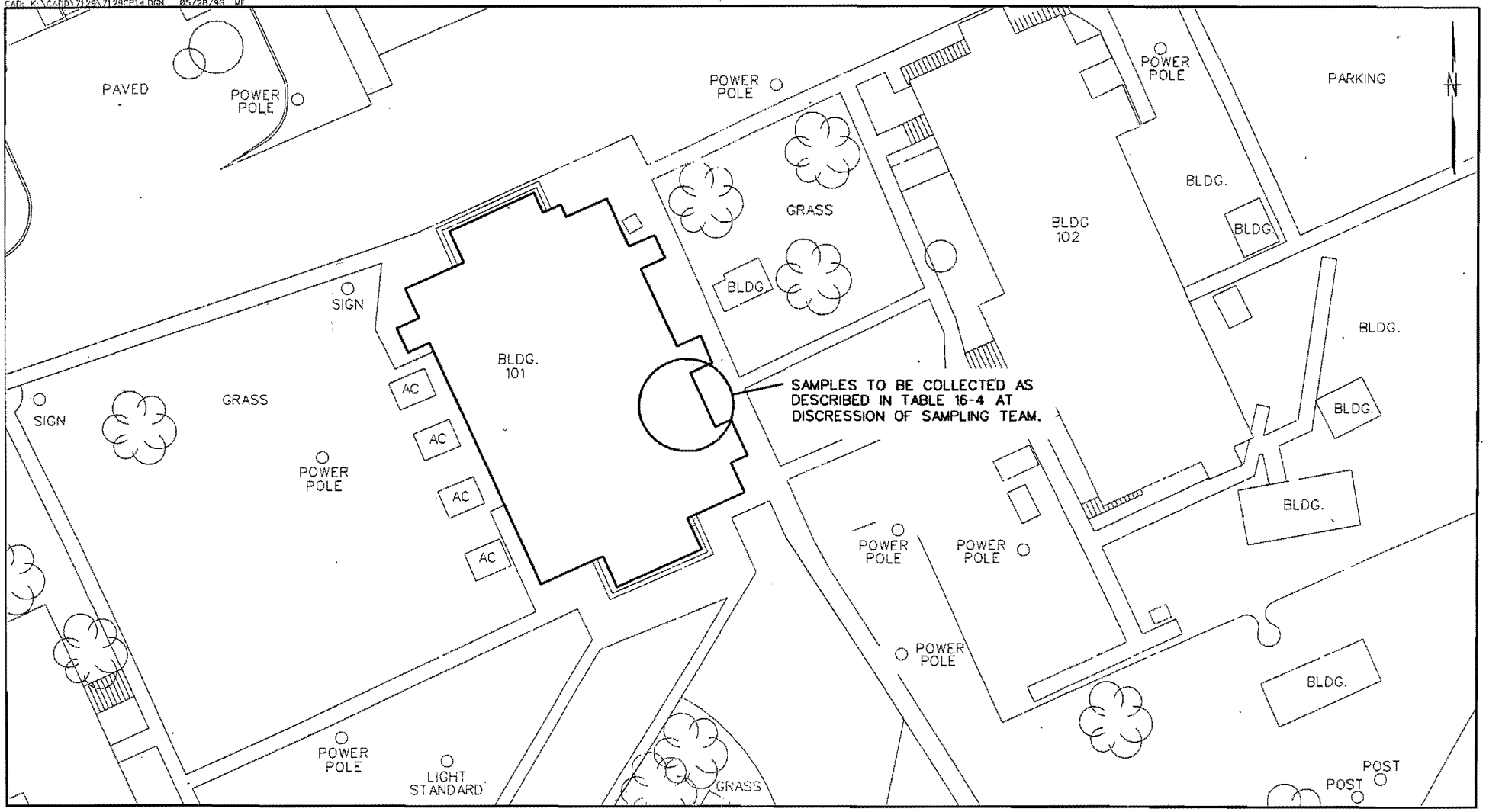

FIGURE 16-3

PROPOSED SAMPLING LOCATION MAP
SITE 54 - BUILDING 101
INDIAN HEAD, MARYLAND

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SCALE IN FEET

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17.0 SITE 55 - BUILDING 102

17.1 BACKGROUND INFORMATION AND SITE DESCRIPTIONS

Building 102 is located in the Northeastern part of the station as shown in Figure 17-1. Building 102, constructed in 1909, was used as a laboratory for testing nitrocellulose by the nitrometer method. Other mercury-containing equipment including pycnometers, talianis, vacuum stability testing equipment, and thermometers, were used to determine the densities and sensitivity of propellants throughout the 80 years of laboratory operations in Building 102.

On October 6, 1987, metallic mercury was discovered dripping from the ceiling onto the sink table top of the coffee mess, located in the northern end of the basement of Building 102. The source of the mercury was believed to be the equipment located on the first floor (NEESA, 1992). Ceiling tiles were removed, revealing the original tongue and groove wood flooring. A layer of asbestos sheeting was found beneath this wood flooring. Plastic sheeting was placed under the ceiling to capture the mercury leaking from the wooden floor above. An estimated 2 ounces of mercury leaked onto the plastic sheeting from the wooden floor, necessitating the closure of the northern end of the building to protect the health of employees (NEESA 1992). Building 102 was abandoned in February 1989 and the water supply to Building 102 was terminated to help alleviate high mercury levels in the sanitary sewage sludge (NEESA, 1992).

Interviews with past facility employees as to the historical operations of Building 102 revealed that the wooden floor was not sealed with an impervious surface until the early 1960s (NEESA, 1992). According to employee interviews, a major spill occurred upstairs in Building 102 in the early 1960s before the impervious concrete floor was installed.

In the mid-1970s the nitrometer was moved to the southern room in the basement of Building 102 (NEESA, 1992). The floor drains in the basement were plugged in the early 1980s to prevent the release of mercury in case of a spill (NEESA, 1992).

In 1986 mercury traps were installed in the sinks where mercury was handled. When the U-joints were removed to install the traps, the plumber reported "about a teaspoon" of mercury in each U-joint (NEESA, 1992). After the building was closed, the sinks were salvaged for use in other buildings. Additional mercury was found in the piping and U-joints when the sinks were removed (NEESA, 1992).

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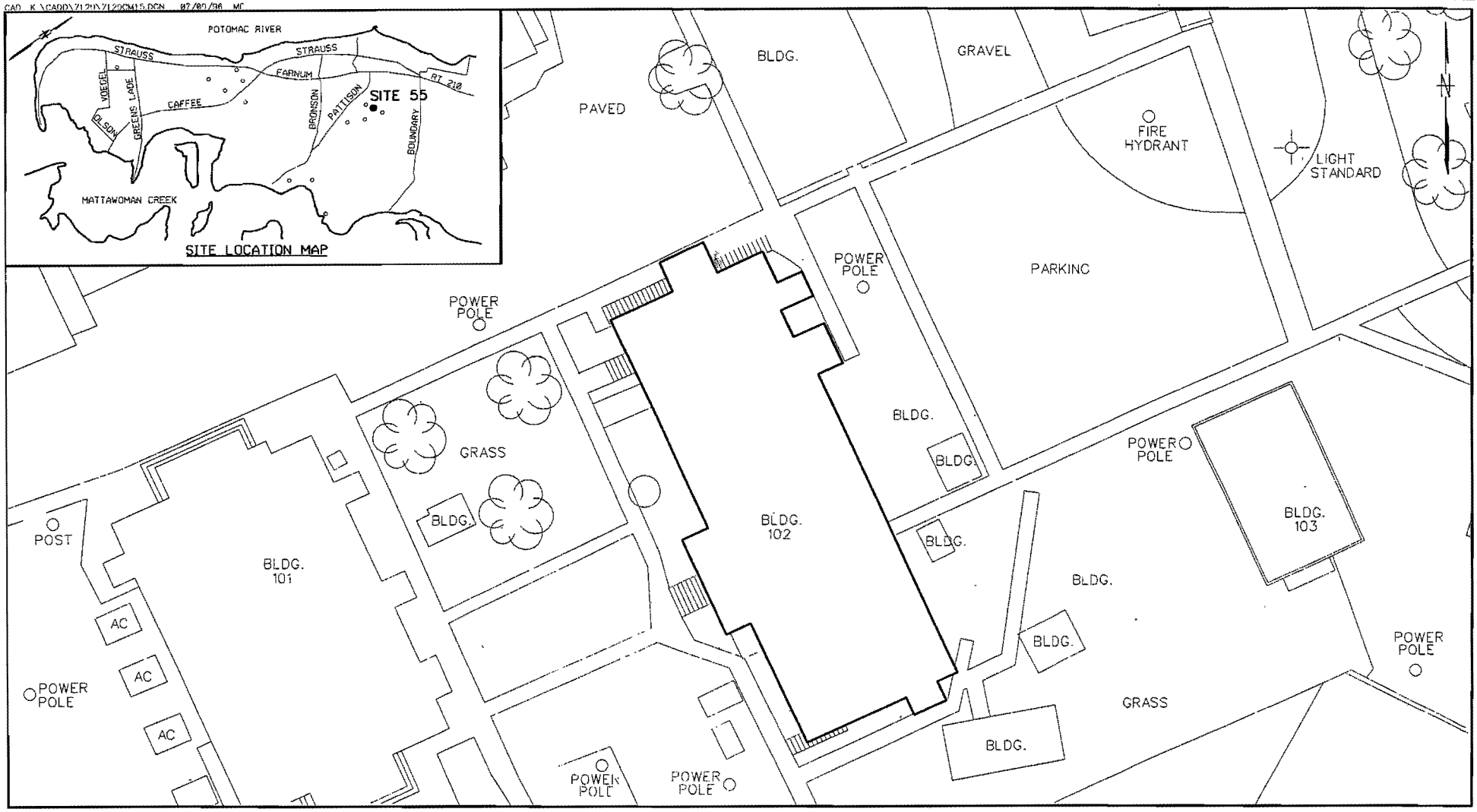

GENERAL SITE MAP
SITE 55 - BUILDING 102
INDIAN HEAD, MARYLAND

0 20 40
SCALE IN FEET

FIGURE 17-1

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Visual inspection and the record search for Building 102 revealed that friable and nonfriable asbestos containing materials (ACM) are present throughout the structure (NEESA, 1992). Possible sources include thermal system insulation (TSI) on the steam and hot water lines, asbestos mud on the steam and hot water pipe elbows, transite wall board, ceiling tiles, asphalt-asbestos floor tiles, floor glue, batt insulation in the ceiling and walls, flooring felts, and heating, ventilation, and air conditioning (HVAC) system insulation. The ACMs observed during the 1992 site visit were deteriorated and friable, creating a possible fiber release hazards (NEESA, 1992).

17.2 PREVIOUS ENVIRONMENTAL INVESTIGATIONS

Sampling was conducted to determine if select horizontal surfaces, bulk building materials, and the concrete floor have been contaminated by mercury spills and released. A summary of the sampling and analysis performed during the SI Study is provided in Table 17-1.

TABLE 17-1
SITE 55 - PREVIOUS INVESTIGATION
BUILDING 102
INDIAN HEAD, MARYLAND

Sample Media:	Horizontal surfaces Building materials Concrete floor			
Sampling Performed:	**Type**	**Number**	**Sam/Loc**	**Total**
	Wipe (horizontal surfaces)	5	1	5
	Bulk building materials	5	1	5
	Concrete	5	1	5
Analyses Performed:	**Media**	**Analyses**		
	Wipe	Mercury		
	Bulk building materials	Mercury		
	Concrete	Mercury, Nitrate Esters		

The location of the sample collected are provided in Figure 17-2. None of the analytical results exceed the EPA Region III RBC screening levels. For this reason, no concentrations are indicated on Figure 17-2.

A wide range of mercury concentrations were detected in the wipe samples: 0.10 to 368 µg/100 cm^2 (E/A&H, 1994). Analytical results of wipe sample 5W002 suggest a local "hot spot" where mercury was indicated at 368 µg/100 cm^2.

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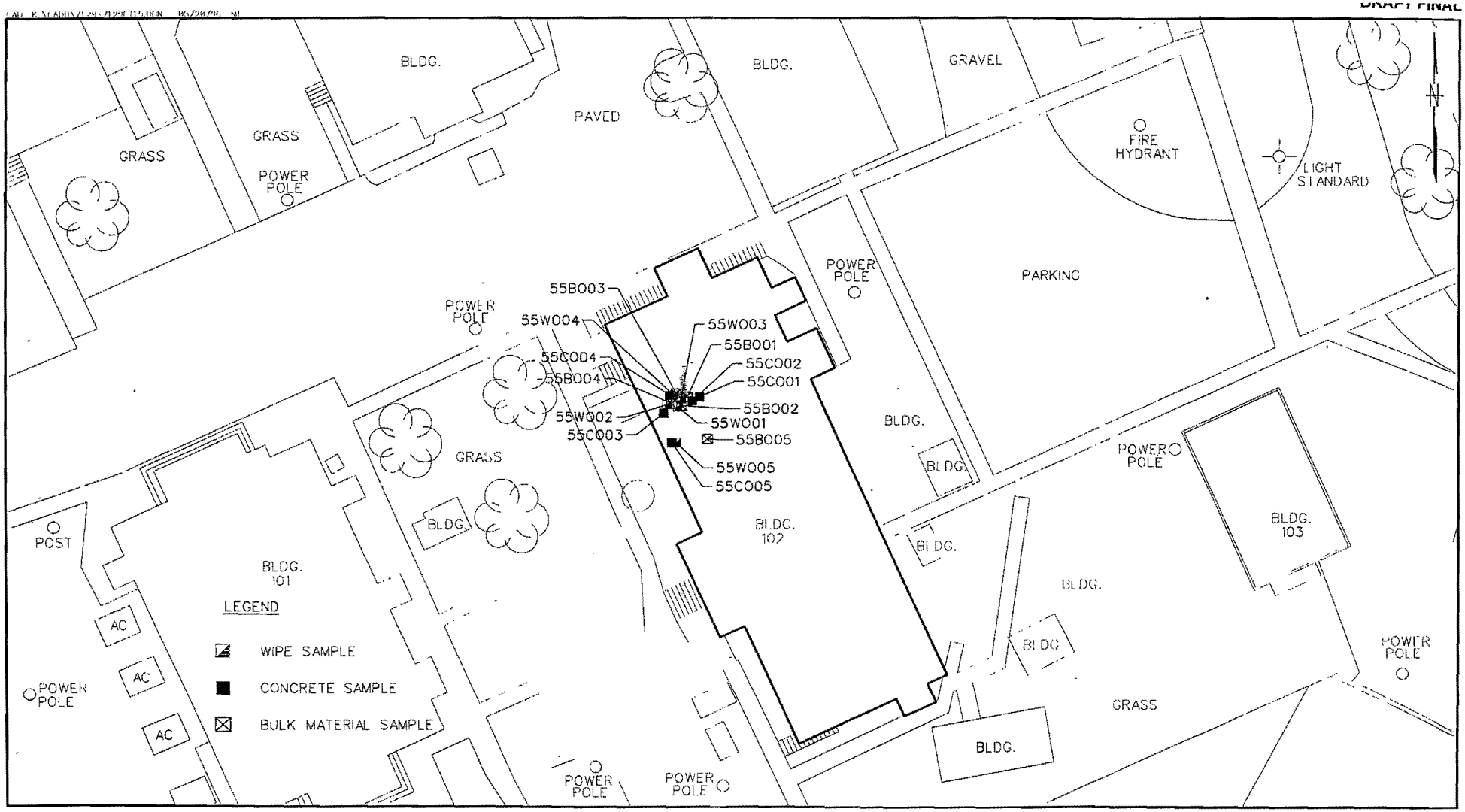

PREVIOUS SAMPLING
SITE 55 – BUILDING 102
INDIAN HEAD, MARYLAND

0 20 40
SCALE IN FEET

FIGURE 17-2

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Mercury concentrations detected in the bulk material samples ranged from 0.16 to 30.4 mg/kg (E/A&H, 1994). The highest levels were detected in samples collected from locations 55B001 and 55B002. No mercury was detected in the sample collected from location 55B004.

The range of mercury concentrations detected in the concrete samples was from 2.5 mg/kg to 86.8 mg/kg (E/A&H, 1994). Mercury was detected in samples 55C001 (55C001D), 55C002, and 55C003 at concentrations of 35.2, 21.4, and 86.8 mg/kg, respectively.

The nitrate ester compound, HMX, was detected in concrete samples 55C001, 55C01D, and 55C002 at 1.94, 2.58, and 3.83 µg/g, respectively.

According to the 1994 Site Inspection (E/A&H, 1994), Building 102 should remain closed to area personnel. Further investigation should include collection of bulk materials samples from all building materials (E/A&H, 1994). Nonimpervious materials, (metal pipes and other metal materials, only) could possibly be decontaminated and reused. Other porous building materials, (ceiling tiles, sheet rock, floor tile, etc.) likely will require removal and disposal.

17.3 HUMAN HEALTH RISK ASSESSMENT

A human health risk assessment for the site will be performed and documented in the RI Report. Analytical data generated under this work plan, as well as historical data for the site, will be used to determine if measured chemical concentrations pose a significant threat to potential human receptors. The general methodologies which will be used to assess human health risks are contained in Section 3.0 of the Master Work Plan for the Station. The remainder of this section of the project-specific work plan identifies preliminary COCs based on existing site information, screening levels which will be used to identify COCs in the risk assessment, and exposure scenarios to be evaluated.

No chemicals have been preliminarily identified as COCs for the site. Because of the lack of applicable standards, Region III soil COC screening levels for industrial land use will be used to conservative identify site-specific COCs for various sampled building materials (i.e., concrete).

Exposure to site media is limited because the site is enclosed within an abandoned building. No potential receptors are identified under current land use. A full-time employee will be evaluated in the human health risk assessment in case the building become fully operational under future land use. This receptor will be assumed to be exposed to site media on a daily basis. Potentially complete exposure pathways to be

considered in the development of the human health risk assessment are outlined in Table 3-2 of the Master Work Plan.

Based on previous project-specific discussions with the Station, NAVY, and USEPA (May 7, 1996), a future residential exposure scenario is not considered to be likely for the site and will not be evaluated in the RI Report since the site is situated in the main production area. If the Station were to close in the future, it is anticipated that the area would be used for industrial/commercial purposes only. Maintenance workers and adolescent trespassers will not be evaluated as potential receptors because of the aforementioned exposure limitations.

17.4 ECOLOGICAL RISK ASSESSMENT

Site 55 is located within a building, precluding exposure to ecological receptors. No contaminant migration pathways from the building to outside habitats exist. Hence, the site is not ecologically relevant and will be excluded from ecological risk assessment.

17.5 INVESTIGATIVE SCOPING

Analytical results from previous investigations were evaluated to address human health risk. Mercury contamination was detected, however the levels were below the RBC screening levels. Evaluation of the various media is as follows:

- Bulk materials inside Building 102 will be evaluated to determine if levels of mercury or explosives exceed the human health risk screening levels. Sampling under Building 102 is proposed.

Based on the historical information and PAH sampling results, the samples to be collected will be analyzed for metals and explosives only. A summary of the investigative scoping is provided in Table 17-2.

17.6 WORK PLAN

The proposed scope for the field investigation is summarized on Table 17-3. Table 17-4 summarizes the sampling program for Site 55, and Table 17-5 provides the sample bottleware, preservation, and holding time requirements. The proposed location of the sample to be collected is provided on Figure 17-3.

TABLE 17-2

INVESTIGATION SCOPING
SITE 55 - BUILDING 102
INDIAN HEAD, MARYLAND

Media/Exposure Pathway	Identified/ Suspected Contaminants	Screening Levels	Preliminary Risk Evaluation	Data Gaps/ Investigation Objective	Decision Rule	Potential Remedial Action
Building Materials	Five wipe and five bulk material samples were collected and analyzed for mercury.	EPA Region III screening levels	Mercury was detected	Determine extent of mercury contamination	If mercury detected in porous building material, then material will be removed. If mercury detected in nonporous building material, then material will be decontaminated and reused.	Removal of contaminated building materials and off-site disposal Steam cleaning and/or similar decontamination process with confirmational wipe sampling.
Concrete Floor	Five concentration samples were collected and analyzed for mercury and HMX	EPA Region III screening levels	Mercury and HMX was detected	Determine extent of mercury and explosives contamination within concrete and nature of metals contamination under concrete	If mercury and/or explosives detected below concrete floor, then the contaminated area of concrete and soil will be removed.	Removal of contaminated concrete and soil with confirmational sampling and off-site disposal of removed concrete.

TABLE 17-3

SITE SPECIFIC WORK PLAN
SITE 55 - BUILDING 102
INDIAN HEAD, MARYLAND

Media	Data Needs	Investigative Technique	Location	Number of samples	Analysis
Building Materials	Determine extent of mercury contamination	Collect wipe samples on impervious materials (metal pipes and ducts).	Collect samples from 5 surfaces in Room 2.	5	Mercury, Explosives
		Collect samples of bulk materials.	Collect 2 bulk samples from each material tested during Phase II SI (ceiling tile, pipe insulation, floor tile, pipe mortar, and sheet rock) in Room 1 and 2 bulk samples from each material in Room 2.	20	Mercury, Explosives
Concrete Core	Determine extent of mercury contamination	Collect core samples of concrete.	Collect 2 concrete core samples from area of Phase II SI sample 55CO03 in Room 1 and 2 concrete core samples in Room 2 adjacent to divider wall.	4	Mercury, Explosives
Surface Soil	Determine extent of mercury contamination	Collect surface soil samples.	Collect 4 samples from beneath concrete core locations.	4	TAL Metals, Explosives

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TABLE 17-4

SUMMARY OF SAMPLING PROGRAM
SITE 55 - BUILDING 102
INDIAN HEAD, MARYLAND
PAGE 1 OF 2

Sample Media	Sample ID Number	Sample Depth/Location	Analysis	
			Mercury	Explosives
Building Materials	RI55WS01	Wipe sample on inpervious surface not previously tested.	•	•
	RI55WS02	Wipe sample on inpervious surface not previously tested.	•	•
	RI55WS03	Wipe sample on inpervious surface not previously tested.	•	•
	RI55WS04	Wipe sample on inpervious surface not previously tested.	•	•
	RI55WS05	Wipe sample on inpervious surface not previously tested.	•	•
	RI55BM01	Bulk sample of ceiling tile in Room 1	•	•
	RI55BM02	Bulk sample of ceiling tile in Room 1	•	•
	RI55BM03	Bulk sample of pipe insulation in Room 1	•	•
	RI55BM04	Bulk sample of pipe insulation in Room 1	•	•
	RI55BM05	Bulk sample of floor tile in Room 1	•	•
	RI55BM06	Bulk sample of floor tile in Room 1	•	•
	RI55BM07	Bulk sample of pipe mortar in Room 1	•	•
	RI55BM08	Bulk sample of pipe mortar in Room 1	•	•
	RI55BM09	Bulk sample of sheet rock in Room 1	•	•
	RI55BM10	Bulk sample of sheet rock Room 1	•	•
	RI55BM11	Bulk sample of ceiling tile in Room 2	•	•
	RI55BM12	Bulk sample of ceiling tile in Room 2	•	•
	RI55BM13	Bulk sample of pipe insulation in Room 2	•	•
	RI55BM14	Bulk sample of pipe insulation in Room 2	•	•
	RI55BM15	Bulk sample of floor tile in Room 2	•	•
	RI55BM16	Bulk sample of floor tile in Room 2	•	•
	RI55BM17	Bulk sample of pipe mortar in Room 2	•	•
	RI55BM18	Bulk sample of pipe mortar in Room 2	•	•
	RI55BM19	Bulk sample of sheet rock in Room 2	•	•
	RI55BM20	Bulk sample of sheet rock Room 2	•	•

TABLE 17-4 (Continued)
SUMMARY OF SAMPLING PROGRAM
SITE 55 - BUILDING 102
INDIAN HEAD, MARYLAND
PAGE 2 OF 2

Sample Media	Sample ID Number	Sample Depth/Location	Analysis		
			TAL Metals	Mercury	Explosives
Concrete Floor	RI55CO01	Core sample from area of 55CO03 in Room 1		•	•
	RI55CO02	Core sample from area of 55CO03 in Room 1		•	•
	RI55CO03	Core sample adjacent to divider wall in Room 2		•	•
	RI55CO04	Core sample adjacent to divider wall in Room 2		•	•
Surface Soil	RI55SS01	Beneath RI55SS01	•		•
	RI55SS02	Beneath RI55SS02	•		•
	RI55SS03	Beneath RI55SS03	•		•
	RI55SS04	Beneath RI55SS04	•		•

TABLE 17-5

BOTTLEWARE, PRESERVATION, AND HOLDING TIME REQUIREMENTS
SITE 55 - BUILDING 102
INDIAN HEAD, MARYLAND

Media	Analysis	Total Number of Samples	Number of Containers Per sample	Container Type	Preservation	Holding Times
Surface Soil	TAL Metals - CLP ILM04.0	4	1	250 ml CWM glass	Cool to 4°C	6 months; Hg 28 days
	Explosives - Modified SW-846-8330*	4	1	250 ml CWM glass	Cool to 4°C	14 days to extract; 40 days to analysis
Wipe Samples	Mercury - ILMO4.0	5	1	250 ml CWM glass	Cool to 4°C	28 days
	Explosives - Modified SW-846-8330*	5	1	250 ml CWM glass	Cool to 4°C	28 days
Bulk Samples	Mercury - ILMO4.0	20	1	250 ml CWM glass	Cool to 4°C	28 days
	Explosives - Modified SW-846-8330*	20	1	250 ml CWM glass	Cool to 4°C	28 days
Concrete Samples	Mercury - ILMO4.0	4	1	250 ml CWM glass	Cool to 4°C	28 days
	Explosives - Modified SW-846-8330*	4	1	250 ml CWM glass	Cool to 4°C	28 days

CWM - Clear Wide Mouth
* - Includes analysis for nitrate esters (nitroglycerin, nitrocellulose, nitroquanidine) in Modified SW-846-8330.

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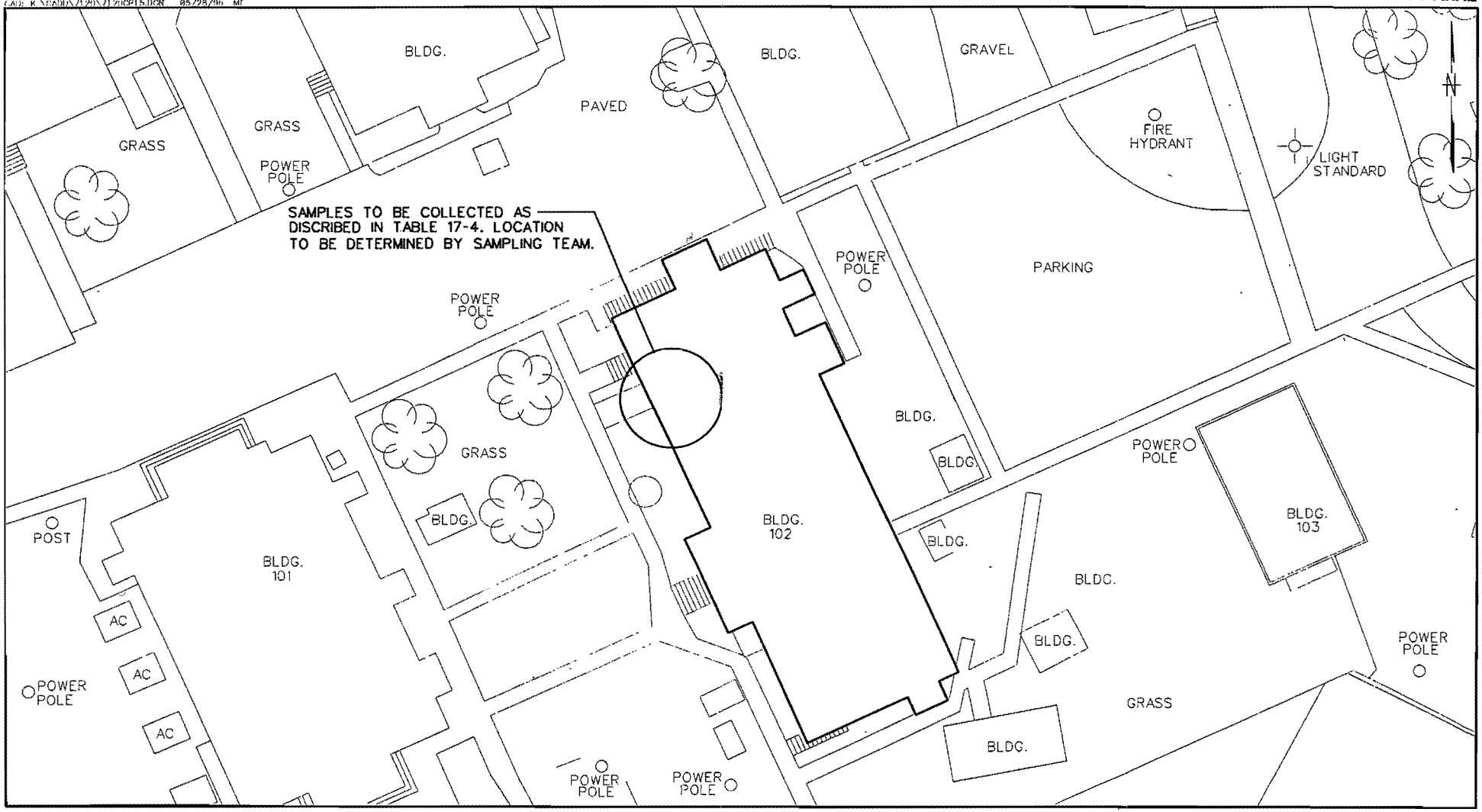

PROPOSED SAMPLING LOCATION MAP
SITE 55 – BUILDING 102
INDIAN HEAD, MARYLAND

0 20 40
SCALE IN FEET

FIGURE 17-3

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18.0 SITE 56 - IW87 LEAD CONTAMINATION

18.1 BACKGROUND INFORMATION AND SITE DESCRIPTIONS

The outfall for Site 56 also known as NPDES sampling point IW87 is located in the central part of the station along the small stream which discharges to a pond as shown in Figure 18-1. Site 56 is composed of three distinct areas: the Biazzi Nitration Plant, Building 279, and IW87. The Biazzi Nitration Plant was constructed in 1953 to provide a continuous process for the manufacture of nitroglycerin (NG). In 1963, the facility was expanded to include the production of Otto fuel, which contains propylene glycol dinitrate, a nitrate ester similar to NG. Additional nitrate esters can be and are produced at the Biazzi Nitration Plant.

Building 790 is located in the Biazzi Nitration Plant and is used for the storage of spent nitric and sulfuric acid from the production of nitrate esters. The building is part of the original nitration facility and was constructed in 1953.

All explosives operating buildings, including Building 790, are constructed following the Navy Explosive Safety Instruction, OP-5 (NSWC, 1995). OP-5 requires these buildings be equipped with conductive floors to eliminate the possibility of static electricity discharges which may cause an explosion. In the past, the floors in these buildings were lined with lead to provide a conductive surface. Sulfuric and nitric acids, which are used in the building, are very strong acids and have a tendency to generate fumes. The acidic fumes, in combination with periodic washdown of the walls and floor, caused lead to go into solution in the washdown water and be transported through the floor drain to IW87. It is also possible that particulate lead was washed to IW87 via the floor drain (NSWC, 1994).

The majority of the water discharging from IW87 is from stormwater runoff. However, some sources are from plant operations, such as equipment cooling water and maintenance washwater. A majority of these sources enter a pit outside Building 790, which discharges through an underground pipe to IW87. In addition, a large volume of water flows overland to IW87 from a sump pump at Building 1463 (NSWC, 1995). The sump pump runs almost continuously in wet months and pumps groundwater away from the buildings, which is located partially underground, similar to Building 790. In drier months, the pump runs less frequently, but is still required to keep water out of the building

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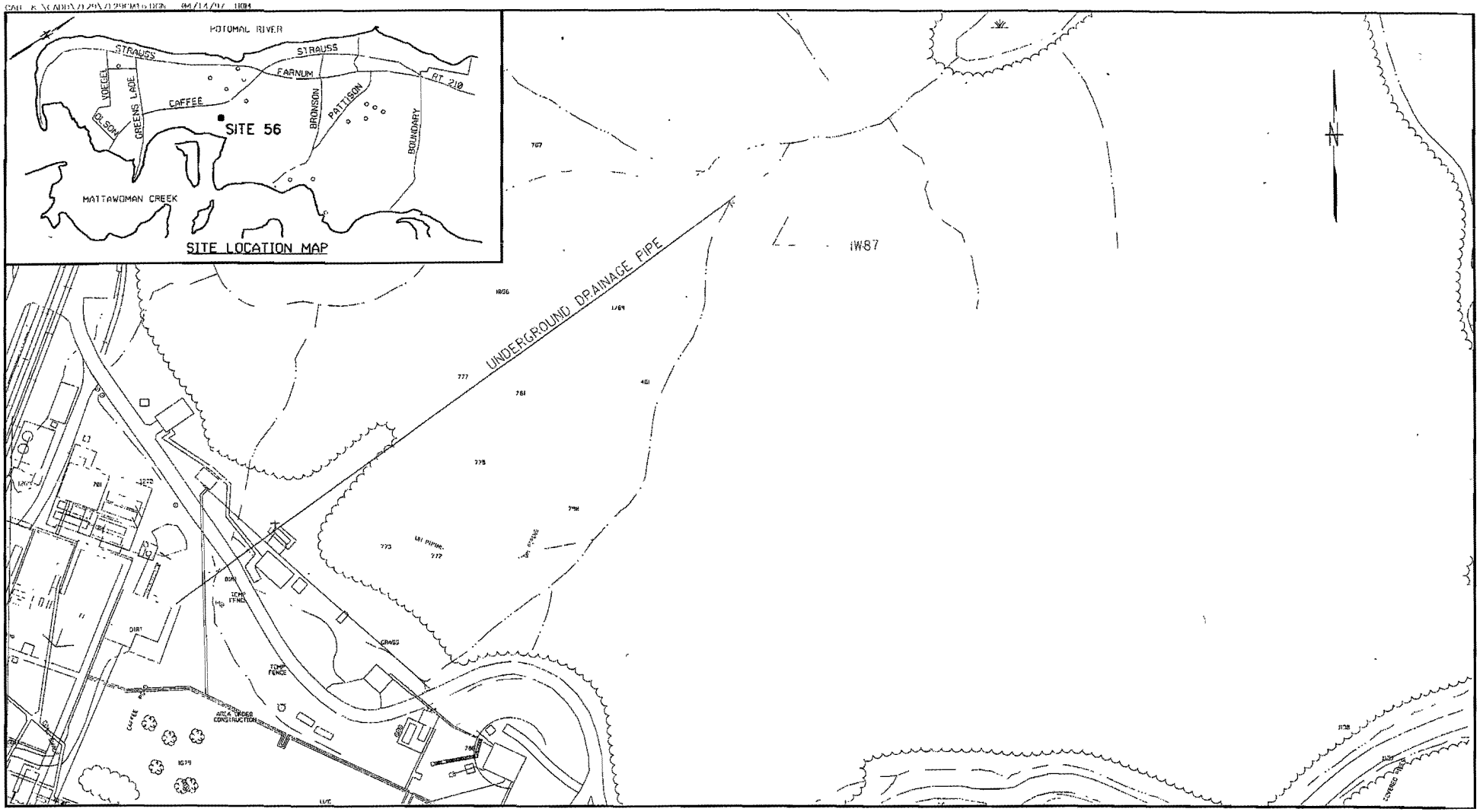

FIGURE 18-1

GENERAL SITE MAP
SITE 56 – IW87 – LEAD PIPE OUTFALL
INDIAN HEAD, MARYLAND

039620/P

Brown & Root Environmental

CTO 0245

18.2 PREVIOUS ENVIRONMENTAL INVESTIGATIONS

Industrial wastewater (IW) outfall monitoring limits were established at IHDIV-NSWC in 1985, as a result of the National Pollutant Discharge Elimination System (NPDES) regulation, 40 CFR 122. IW87 drainage has been monitored for lead concentrations since 1988.

The level of 82 micrograms of lead per liter (µg/L) has been exceeded in 16 monthly monitoring rounds since May 1990 (NSWC, 1995). More recently, the limit, 82 µg/L of lead, has been exceeded in 8 monthly monitoring rounds since the limit was made effective on June 4, 1992 (NSWC, 1994). The drain leading to the pit from inside the building was sealed in October 1992, because of these exceedances.

Beginning June 1993, the lead limit of 82 µg/L at IW87 was exceeded almost every month (NSWC, 1994). These increased NPDES exceptions revealed a problem with the drainage area from the pit outside the building, since all sources of lead to the outfall from current operations and buildings had been eliminated (NSWC, 1994).

Sediment sampling conducted and presented in the EE/CA, (NSWC, 1995), indicated that the lead had settled in the sediment in the pit outside of Building 790. The lead-contaminated sediment had also settled in the 700-foot-long, 24-inch terra-cotta pipe which flows to IW87.

Based on these analytical results, the proposed removal action boundary for Site 56 include the pit located at the corner of Building 790, and the downgradient area marked on Figure 18-2. The 1995 EE/CA established 35 mg/kg to be the action level for removal of sediment containing lead. Also, 82 µg/L was the lead concentration established as the action level for surface water. It is estimated that a total of 51 cubic yards of sediment and 25,000 gallons of lead-contaminated surface water must be remediated through this proposed activity (NSWC, 1995).

18.3 HUMAN HEALTH RISK ASSESSMENT

A human health risk assessment for the site will be performed and documented in the RI Report. Analytical data generated under this work plan, as well as historical data for the site, will be used to determine if measured chemical concentrations pose a significant threat to potential human receptors. The general methodologies which will be used to assess human health risks are contained in Section 3.0 of the Master Work Plan for the Station. The remainder of this section of the project-specific work plan identifies preliminary COCs based on existing site information, screening levels which will be used to identify COCs in the risk assessment, and exposure scenarios to be evaluated.

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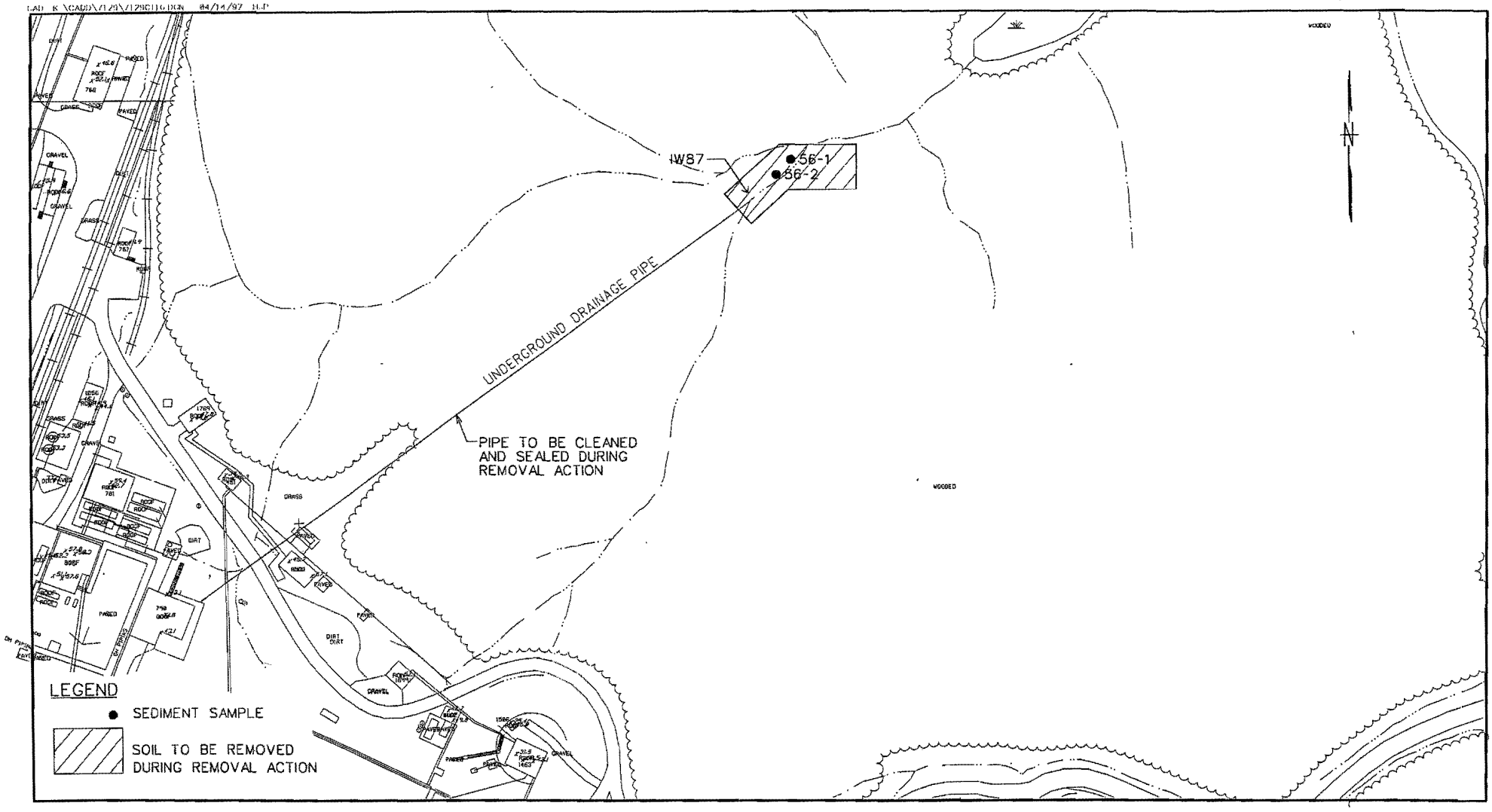

FIGURE 18-2

PREVIOUS SAMPLING
SITE 56 - IW87 - LEAD PIPE OUTFALL
INDIAN HEAD, MARYLAND

0 100 200
SCALE IN FEET

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Preliminary COCs for the site consist of bis(2-ethylhexyl)phthalate, iron, and manganese. Region III soil COC screening levels for industrial land use will be used to identify site-specific COCs for sediment in the risk assessment. For surface water, Region III COC screening levels for tap water ingestion will be employed.

Adolescent trespassers (ages 6 to 16) exposed to surface water and sediment under current land use will be evaluated since access to the site is not physically restricted. Potentially complete exposure pathways to be considered in the development of the human health risk assessment are provided in Table 3-2 of the Master Work Plan.

Based on previous project-specific discussions with the Station, NAVY, and USEPA (May 7, 1996), a future residential exposure scenario is not considered to be likely for the site and will not be evaluated in the RI Report since the site is situated in the main production area. If the Station were to close in the future, it is anticipated that the area would be used for industrial/commercial purposes only.

18.4 ECOLOGICAL RISK ASSESSMENT

The removal action in the stream will occur approximately 900 feet upstream of Site 12, the Town Gut Landfill. Thus, the site is a potential source of lead to the pond, which contains viable aquatic habitat. Sediments and surface soil samples will be taken to evaluate the efficacy of the removal action. The ecological concern for Site 56 is lead migration to the pond, rather than the presence of lead in the stream. Thus, Site 56 data will be used qualitatively in connection with the evaluation of potential ecological impacts on the pond adjacent to the Town Gut Landfill.

18.5 INVESTIGATIVE SCOPING

Evaluation of this site will be concerned with only the post-removal action conditions. Scoping will address downgradient conditions of the removal action. Sampling of sediments indicate elevated levels of lead. Investigative scoping conducted addresses both human health risk. Evaluation of the various media is as follows:

- Subsurface Soil - No previous sampling was conducted to evaluate subsurface soils. Subsurface soil contamination is not expected, and no samples are proposed.

- Sediment - Sediments have the potential to migrate and have several pathways for exposure. Sediment samples will be collected at locations along the stream downgradient of the removal action and in the flood prone area upgradient from the swamp at the head of the pond.

- Surface Water - Surface water samples have been collected, under NPDES sampling, however additional surface water samples will not be required because the source will be eliminated.

- Groundwater - No groundwater samples were collected in the past investigations. Three groundwater samples are proposed.

A summary of the investigative scoping is provided in Table 18-1.

18.6 WORK PLAN

The proposed scope for the field investigation is summarized on Table 18-2. The proposed location of the sample to be collected is provided on Figure 18-3. Table 18-3 summarizes the sampling and analysis program and Table 18-4 provides the sample bottleware, preservation, and holding time requirements. The following provides a breakdown by media on the sampling to be conducted:

- Subsurface Soils - No subsurface samples are proposed.

- Sediment - Five sediment samples will be collected in the area downgradient of the Removal Action for IW87. Samples will be collected in the stream and in the low lying flood plain areas along the stream. The samples will be collected using the techniques identified in Station SOP SA-02 "Surface water and sediment sampling".

- Surface Water - No surface water samples will be collected.

- Groundwater - Three groundwater samples will be collected using the hydropunch method described in station SOPs SA-06 and SA-01.

TABLE 18-1

INVESTIGATION SCOPING
SITE 56 - IW87 - LOAD PIPE OUTFALL
INDIAN HEAD, MARYLAND

Media/ Exposure Pathway	Identified/Suspect Contaminants	Screening Levels	Preliminary Risk Evaluation	Data Gaps/Investigative Objective	Potential Response Actions	Potential Remedial Action
Sediments	Metals	Region III BTAG Screening Levels	Lead concentrations above screening levels, but most concentrations are relatively low.	Further characterize nature and extent of contamination in sediments/use data to conduct risk assessment.	Determine potential risks to human receptors and the need, if any, for additional sediment investigations.	Removal of sediments/No further action.
Surfacewater	Metals	NPDES	A removal action will be conducted to remove source.	Will evaluate the site on a post-removal action basis.	Determine risk and extent of contamination and determine potential risks to human receptors and the need, if any, for additional sediment investigations..	Removal of sediments/No further action.

TABLE 18-2

SITE-SPECIFIC WORK PLAN
SITE 56 - IW87 - LEAD PIPE OUTFALL
INDIAN HEAD, MARYLAND

Data Needs	Investigative Technique	Location	Number of Samples	Analysis
Further characterize nature and extent of contamination in stream sediments.	Collect sediment downgradient of removal action.	Downstream of IW87.	5	TAL metals
Evaluate the nature of any contamination contained in the groundwater.	Collect groundwater samples using the hydropunch method.	Downstream of IW87.	3	TAL metals

TABLE 18-3

SUMMARY OF SAMPLING PROGRAM
SITE 56 - IW87 - LEAD OUTFALL
INDIAN HEAD, MARYLAND

SAMPLE MEDIA	SAMPLE ID NUMBER	SAMPLE DEPTH/ LOCATION	ANALYSIS			
			VOCs	SVOCs	METALS	PESTICIDES /PCBs
Sediment	RI50SD01	Downgradient of IW87			•	
	RI50SD02	Downgradient of IW87			•	
	RI50SD03	Downgradient of IW87			•	
	RI50SD04	Downgradient of IW87			•	
	RI50SD05	Downgradient of IW87			•	
Groundwater	RI56GW01	Upgradient of IW87			•	
	RI56GW02	Immediately downgradient of IW87			•	
	RI56GW03	Further downgradient of IW87			•	

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TABLE 18-4

BOTTLEWARE, PRESERVATION, AND HOLDING TIME REQUIREMENTS
SITE 56 - IW87 - LEAD PIPE OUTFALL
INDIAN HEAD, MARYLAND

Media	Analysis	Total Number of Samples	Number of Containers Per sample	Container Type	Preservation	Holding Times
Groundwater	TAL Metals - CLP ILM04.0	3	1	1L plastic	HNO3 pH <2	6 months; Hg 28 days
Sediment	TAL Metals - CLP ILM04.0	5	1	250 ml CWM glass	Cool to 4°C	6 months; Hg 28 days

CWM - Clear Wide Mouth
* - Includes analysis for nitrate esters (nitroglycerin, nitrocellulose, nitroquanidine) in Modified SW-846-8330.

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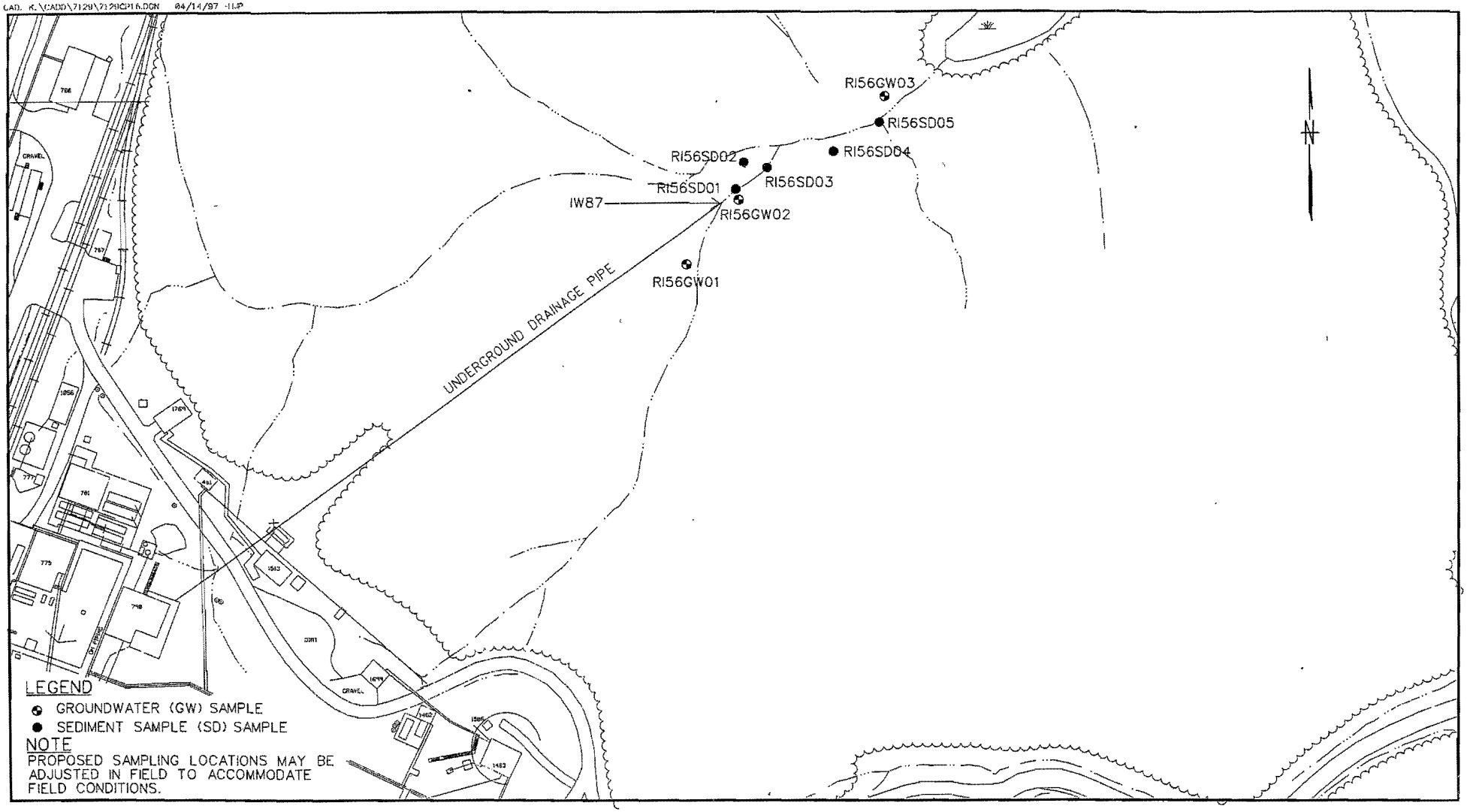

FIGURE 18-3

PROPOSED SAMPLING LOCATION MAP
SITE 56 – IW87 – LEAD PIPE OUTFALL
INDIAN HEAD, MARYLAND

0 100 200
SCALE IN FEET

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APPENDIX A

PROJECT-SPECIFIC HEALTH AND SAFETY PLAN

Project Specific Remedial Investigation (RI) Health and Safety Plan

for

Installation Restoration Program Indian Head Division Naval Surface Warfare Center

Indian Head, Maryland

Engineering Field Activity Chesapeake
Naval Facilities Engineering Command

Northern Division Contract No. N62472-90-D-1298
Contract Task Order 0245

July 1996

039620/P

PROJECT SPECIFIC
REMEDIAL INVESTIGATION (RI)
HEALTH AND SAFETY PLAN
FOR
INSTALLATION RESTORATION PROGRAM
INDIAN HEAD DIVISION, NAVAL SURFACE WARFARE CENTER
INDIAN HEAD, MARYLAND

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Submitted to:
Engineering Field Activity Chesapeake
Environmental Branch Code 181
Naval Facilities Engineering Command
Washington Navy Yard, Building 212
Washington, D.C. 20374-2121

Submitted by:
Brown & Root Environmental
993 Old Eagle School Road, Suite 415
Wayne, Pennsylvania 19087-1710

NORTHERN DIVISION CONTRACT NO. N62472-90-D-1298
CONTRACT TASK ORDER 0245

JULY 1996

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PITTSBURGH, PENNSYLVANIA

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1.0 INTRODUCTION

The objective of this Health and Safety Plan (HASP) is to provide the minimum safety practices and procedures for Brown & Root Environmental (B&R Environmental) and subcontractor personnel engaged in proposed Remedial Investigation (RI) activities that are to be conducted at the Indian Head Division, Naval Surface Warfare Center (NSWC) facility, Indian Head, Maryland.

In order to accomplish the objective this HASP has been constructed using the latest available information regarding known or suspected chemical contaminants and potential and foreseeable physical hazards associated with the proposed work at the various sites identified at the Indian Head NSWC facility. This HASP has been designed to be used in accordance with the Brown & Root Environmental Health and Safety Guidance Manual. The Guidance Manual provides detailed information pertaining to procedures to be performed on site as directed by the HASP, as well as B&R Environmental standard operating procedures.

The Health and Safety Guidance Manual and this HASP have been designed to operate synergistically, however, may be used as stand-alone documents. It is recommended that both documents be present at the site to comply with the requirements stipulated in the Occupational Safety and Health Administration (OSHA) standard 29 CFR 1910.120.

This HASP has been written to support proposed tasks and techniques associated with the scope of work as presented in Section 3.0. Should the proposed work site conditions and/or suspected hazards or if new information becomes available this document will be modified. All changes to the HASP will be made with the approval of the B&R Environmental CLEAN Health and Safety Manager (HSM) and the Project Manager (PM). The PM will notify all affected personnel of all changes. Revision indicators within the plan and Section 15.0 Document Status will record all changes to this plan.

The elements of this HASP are in compliance with the requirements established by OSHA 29 CFR 1910.120, "Hazardous Waste Operations and Emergency Response" (HAZWOPER) and sections of 29 CFR 1926, "Safety and Health Regulations for Construction.". The information contained in this plan, as well as policies on conducting on site operations, have been obtained from the B&R Environmental Health and Safety Program and Indian Head Division NSWC policies and procedures.

1.1 AUTHORITY

This Contract Task Order (CTO) 245 and the requirements setforth represent an integral part of an overall effort conducted under the Comprehensive Long - Term Environmental Action Navy (CLEAN) contract, administered through the U.S. Navy Northern Division Naval Facilities Engineering Command, as defined under Contract No. N62472-90-D-1298.

1.2 KEY PROJECT PERSONNEL AND ORGANIZATION

This section defines responsibility for site safety and health for B&R Environmental and subcontractor employees engaged in on site activities. Personnel assigned to these positions shall exercise the primary responsibility for all on site health and safety. These persons will be the primary point of contact for any questions regarding the safety and health procedures and the selected control measures.

- The B&R Environmental Project Manager (PM) is responsible for the overall direction and implementation of health and safety for this project.

- The B&R Environmental Field Operations Leader (FOL) is responsible for implementation of this HASP with the assistance of an appointed Site Safety Officer (SSO). The FOL manages field activities, executes the work plan, and enforces safety procedures, as applicable to the work plan.

- The SSO supports site activities by advising the FOL on all aspects of health and safety on site. These duties may include the following:

  - Coordinates all health and safety activities with the FOL.
  - Selects, inspects, implements, and maintains personal protective equipment.
  - Establishes work zones and control points.
  - Directs and assists in the development of decontamination areas and procedures.
  - Implements air monitoring program in support of on site activities.
  - Verifies training and medical status of on site personnel status in relation to site activities.
  - Implements hazard communication, respiratory protection, and other associated safety and health programs, as necessary.
  - Coordinates emergency services.
  - Provides site-specific training for all on site personnel.

- Compliance with these requirements is monitored by the Project Health and Safety Officer (PHSO) and is coordinated through the Health and Safety Manager.

1.3 SITE INFORMATION AND PERSONNEL ASSIGNMENTS

Site Name: Indian Head Division Naval Surface Warfare Center **Address:** Indian Head, Maryland

Site Point of Contact: Mr. Shawn Jorgensen **Phone Number:** (302) 743-6745

Purpose of Site Visit: This activity will be divided into a multi-task operation performed sequentially through the execution of the elements as defined in the scope of work (See Section 4.0).

Proposed Dates of Work: TBD

Project Team:

B&R Environmental Personnel:	Discipline/Tasks Assigned:
Anthony P. Klimek, PE	Project Manager (PM)
Rob Simcik, EIT	Project Engineer
TBD	Field Geologist
Matthew M. Soltis, CIH, CSP	Health and Safety Manager (HSM)
TBD	Site Safety Officer (SSO)
Donald J. Westerhoff, ASP	Project Health and Safety Officer (PHSO)

Non-B&R Environmental Personnel	Affiliation/Discipline/Tasks Assigned
TBD	
TBD	

Prepared by: Donald J. Westerhoff, ASP

Reviewed and Approved by:

Anthony P. Klimek, PE
Project Manager

Matthew M. Soltis, CIH, CSP
CLEAN Health & Safety Manager

2.0 EMERGENCY ACTION PLAN

2.1 INTRODUCTION

This section has been developed as part of a preplanning effort to direct and guide field personnel in the event of an emergency. Since a majority of potential emergency situations will require assistance from outside emergency responders, B&R Environmental and subcontractor personnel will not provide emergency response support for significant emergency events beyond the capabilities of on site personnel. In the event of emergencies that cannot be handled by on site personnel, an evacuation will be initiated. In an evacuation, site personnel will move to a safe place of refuge and the appropriate emergency response agencies will be notified. The emergency response agencies listed in this plan are capable of providing the most effective response, and as such, will be designated as the primary responders. These agencies are located within a reasonable distance from the area of operations, which ensures adequate emergency response time. This emergency action plan conforms to the requirements of OSHA Standard 29 CFR 1910.38(a), as allowed in OSHA 29 CFR 1910.120(l)(1)(ii).

B&R Environmental personnel will through the necessary actions provide incidental response measures for incidents such as:

- Incipient spill control and containment measures and prevention
- Removal of personnel from emergency situations
- Provision of initial medical support for injury/illnesses requiring only first-aid level support
- Provision of site control and security measures, as necessary

2.2 PRE-EMERGENCY PLANNING

Through the initial hazard/risk assessment effort, injury or illnesses resulting from exposure to chemical or physical hazards or fire are the most probable emergencies that could be encountered during site activities. To minimize and eliminate these potential emergency situations, pre-emergency planning activities associated with this project shall be implemented. The SSO and/or the FOL are responsible for:

- Coordinating response actions with Indian Head Division NSWC Emergency Services personnel to ensure that B&R Environmental emergency action activities are compatible with existing facility emergency response procedures.

- Site surveying and preparation of investigation areas prior to sending equipment and personnel in to initiate proposed activities. In this manner potential physical hazards can be identified, blocked or barricaded, or removed prior to exposing field personnel.

- Periodic site safety surveys of work activities performed by B&R Environmental FOL and/or the SSO, and subcontractor supervisory representative to identify potential hazards and emergency situations.

- Establishing and maintaining information at the project staging area (support zone) for easy access in the event of an emergency. This information will include the following:

  - Chemical Inventory List (for substances used on site), with Material Safety Data Sheets.
  - On site personnel medical records (medical data sheets).
  - A logbook identifying personnel on site each day.
  - A copy of this HASP.
  - A copy of the B&R Environmental Health and Safety Guidance Manual.

- Identifying a chain of command for emergency action.

- Educating site workers to the hazards and control measures associated with planned activities at the site, and providing early recognition and prevention, where possible.

- Drilling and practicing incidental response measures periodically.

It will be the responsibility of the B&R Environmental FOL to ensure that this information is available and present at the site.

2.3 EMERGENCY RECOGNITION AND PREVENTION

2.3.1 Recognition

Foreseeable emergency situations that may be encountered during site activities will generally be recognizable by visual observation. Visual observation will be the principal method of identifying physical hazards that may be associated with the proposed scope of work. Visual observation may also play a role

in detecting some chemical exposures. A clear knowledge of signs and symptoms of chemical overexposures will provide the information to on site personnel of what to expect and what symptoms may be evident in the event an overexposure takes place. These potential hazards, the activities with which they have been associated, and the recommended control methods are discussed in detail in Sections 5.0 and 6.0 of this document. Additionally, as stated above, early recognition will be supported by periodic site surveys to eliminate any situation predisposed to an emergency. The FOL, SSO, and subcontractor supervisory personnel will constitute the site evaluation team responsible for these periodic surveys. Site surveys will be conducted at least once a week during the initiation of this effort.

The above actions will provide for the early recognition of potential emergency situations. B&R Environmental will only provide incipient stage (i.e., early stage spill response) support. Should an incident take place, B&R Environmental will take defensive and offensive measures to control these situations depending on the nature and extent of the incident. However, if the FOL and the SSO determine that an incident has progressed to a serious emergency situation, B&R Environmental will withdraw, and notify the appropriate response agencies using Table 2-1.

2.3.2 Prevention

B&R Environmental and subcontractor personnel will minimize the potential for emergencies by ensuring compliance with the HASP, the Health and Safety Guidance Manual, applicable OSHA regulations, and by following directions given by those persons responsible for the health, safety, and welfare of the field crews.

2.4 SAFE DISTANCES AND PLACES OF REFUGE

In the event that the site must be evacuated, all personnel will immediately stop activities and report to a safe place of refuge at the support zone area. The safe place of refuge may also serve as the telephone communication point, as communication with emergency response agencies may be necessary. Telephone communication points and safe places of refuge will be determined prior to the commencement of site activities and will be conveyed to personnel as part of issuing the Safe Work Permits to be issued for all exclusion zones activities on a daily basis. Places of refuge and evacuation routes are identified in Section VII, of the Safe Work Permit (See Section 9.4). Upon reporting to the refuge location, personnel will remain there until directed otherwise by the B&R Environmental FOL, SSO, or the On-Scene Incident Commander. The FOL or the SSO will take a head count at this location to confirm the presence of all site

TABLE 2-1
EMERGENCY REFERENCE
NAVAL SURFACE WARFARE CENTER, INDIAN HEAD, MARYLAND

AGENCY	TELEPHONE
EMERGENCY	911
NSWC Fire Department	(301) 743-4281
NSWC Police Department	(301) 743-4333
NSWC Rescue or Ambulance	(301) 743-4449
Site Point of Contact Shawn Jorgensen	(302) 743-6745
Hospital: Physicians Memorial Hospital	(301) 645-0100
Hospital: Southern Maryland Hospital	(301) 868-8000
Chemtrec National Response Center	(800) 424-9300 (800) 424-8802
B&R Environmental, Pittsburgh Office	(412) 921-7090
Health and Safety Manager Matthew M. Soltis, CIH, CSP	(412) 921-8912
Project Health and Safety Officer Donald J. Westerhoff, ASP	(412) 921-7281
Project Manager Anthony P. Klimek, PE	(412) 921-8640

personnel. The site logbook will be used to take the head count. Emergency response agencies will be notified of any unaccounted for personnel.

2.5 EVACUATION ROUTES AND PROCEDURES

Once an evacuation is initiated, personnel will terminate site activities and proceed immediately to the designated place of refuge as identified on the Safe Work Permit for activities conducted within that area, unless doing so would further jeopardize the welfare of workers. In such an event, personnel will proceed to a designated alternate location and remain there until further notification from the FOL. The use of these locations as assembly points provides communication and a direction point for emergency services, should they be needed.

Evacuation procedures will be discussed prior to the initiation of any work at the site. Primary and secondary evacuation routes will be conveyed to site personnel each day as part of issuing the Safe Work Permits for a particular task and area. Evacuation routes from the site are dependent upon the location at which work is being performed and the circumstances under which an evacuation is required. Additionally, site location and meteorological conditions (i.e., wind speed and direction) will influence the designation of evacuation routes. As a result, assembly points will be selected, and will be proceeded to by field personnel in the event of an emergency by the most direct route possible without further endangering themselves.

2.6 DECONTAMINATION PROCEDURES/EMERGENCY MEDICAL TREATMENT

During any site evacuation, decontamination procedures will be performed only if doing so does not further jeopardize the welfare of site workers. Decontamination will not be performed if the incident warrants immediate evacuation. However, it is unlikely that an evacuation would occur which would require workers to evacuate the site without first performing the necessary decontamination procedures.

2.7 EMERGENCY ALERTING AND ACTION/RESPONSE PROCEDURES

Since B&R Environmental personnel will not always be working in close proximity to each other, hand signals, voice commands, air horns, and two-way radios will comprise the mechanisms to alert site personnel of an emergency.

If an incident occurs, site personnel will initiate the following procedures:

- Initiate incident alerting procedures (if needed) verbally, by air horn, or using two-way radios.
- Describe to the FOL (who will serve as the Incident Coordinator) what has occurred and as many details as possible. Once all personnel are evacuated, incipient response procedures will be enacted to control the situation.
- If the FOL and/or the SSO determine that the situation is beyond the capabilities of the site personnel emergency services will be contact using the emergency reference information listed in Table 2-1. Explain the situation and the appropriate emergency services will be dispatched. **Stay on the phone follow the instructions of the emergency dispatcher.**

2.8 PERSONAL PROTECTIVE EQUIPMENT (PPE) AND EMERGENCY EQUIPMENT

A first-aid kit, stretcher, fire extinguishers (strategically placed), and fire blanket will be maintained on site and shall be immediately available for use in the event of an incident. The PPE used in support of everyday activities will serve as the first line of defense in an emergency. This PPE will be required in all work areas of the site and will be accessible to authorized personnel.

2.9 EMERGENCY CONTACTS

Prior to performing work at the site, all personnel will be thoroughly briefed on the emergency procedures to be followed in the event of an accident. A mobile phone shall be available on site, if a telephone communications point near the area of operation is not available. As indicated earlier, Table 2-1 provides a list of emergency contacts and their corresponding telephone numbers. This table must be posted on site where it is readily available to all site personnel.

2.10 EMERGENCY ROUTE TO HOSPITAL

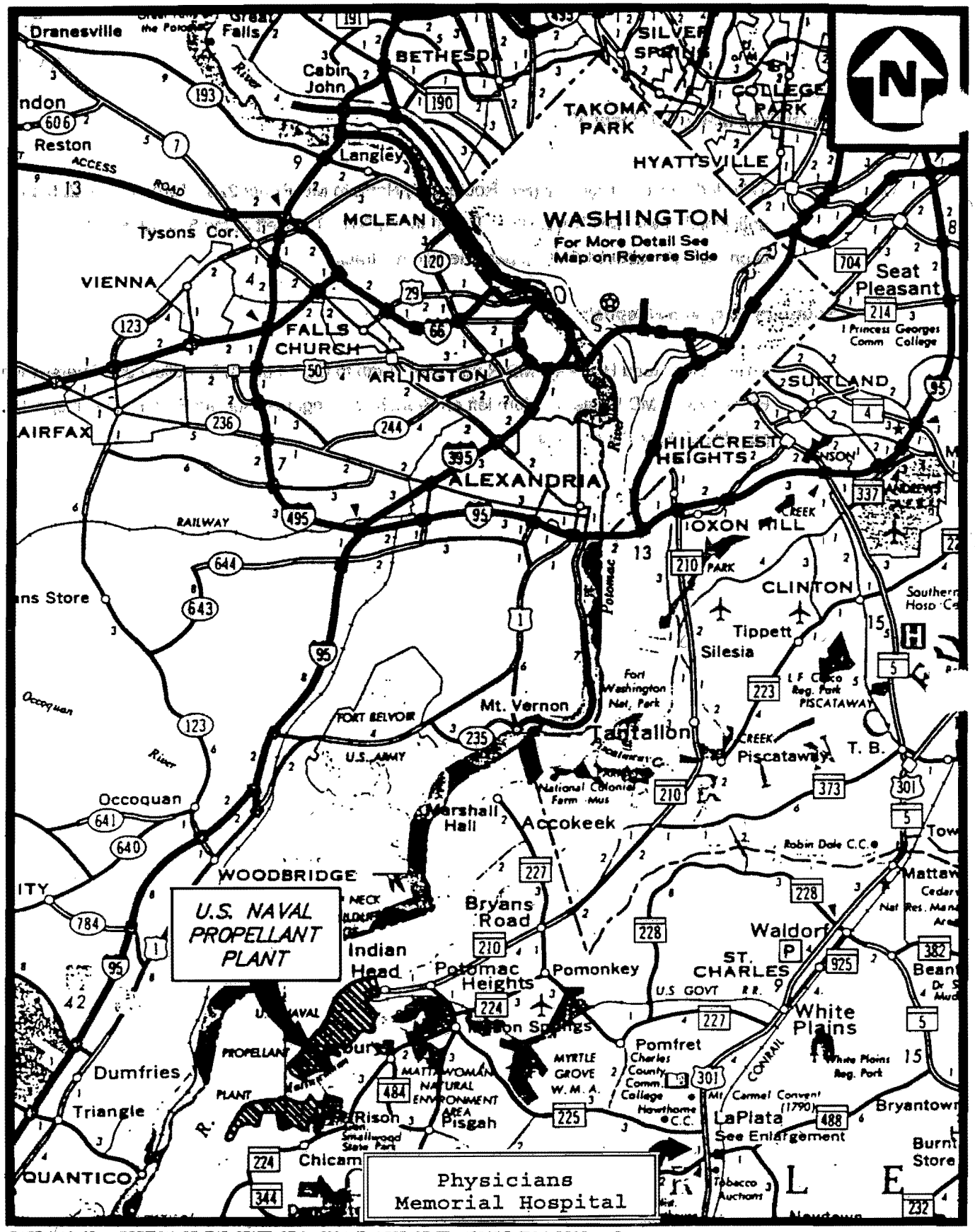
The closest hospital to NSWC is Physicians Memorial Hospital in La Plata, Maryland. The alternate hospital is Southern Maryland Hospital in Clinton, Maryland. A area map showing the proximity of the NSWC to both of the hospitals is presented in Figure 2-1, and 2-2. Directions to the both Physicians Memorial Hospital and Southern Maryland Hospital are provided below:

Physicians Memorial Hospital:

Take Indian Head Highway (MD Route 210) North to MD Route 225. Turn right on 225 and follow until junction with MD Route 301. Turn right on 301. Turn left at the first traffic light. The hospital is on the right, about 1/2 block past the railroad tracks.

Southern Maryland Hospital:

Take Indian Head Highway (MD Route 210) North to MD Route 373. Follow until intersection with Branch Ave. (MD Route 5). Turn left on Branch Ave., right on Surratts Road. The hospital is just past the Colony South Hotel.

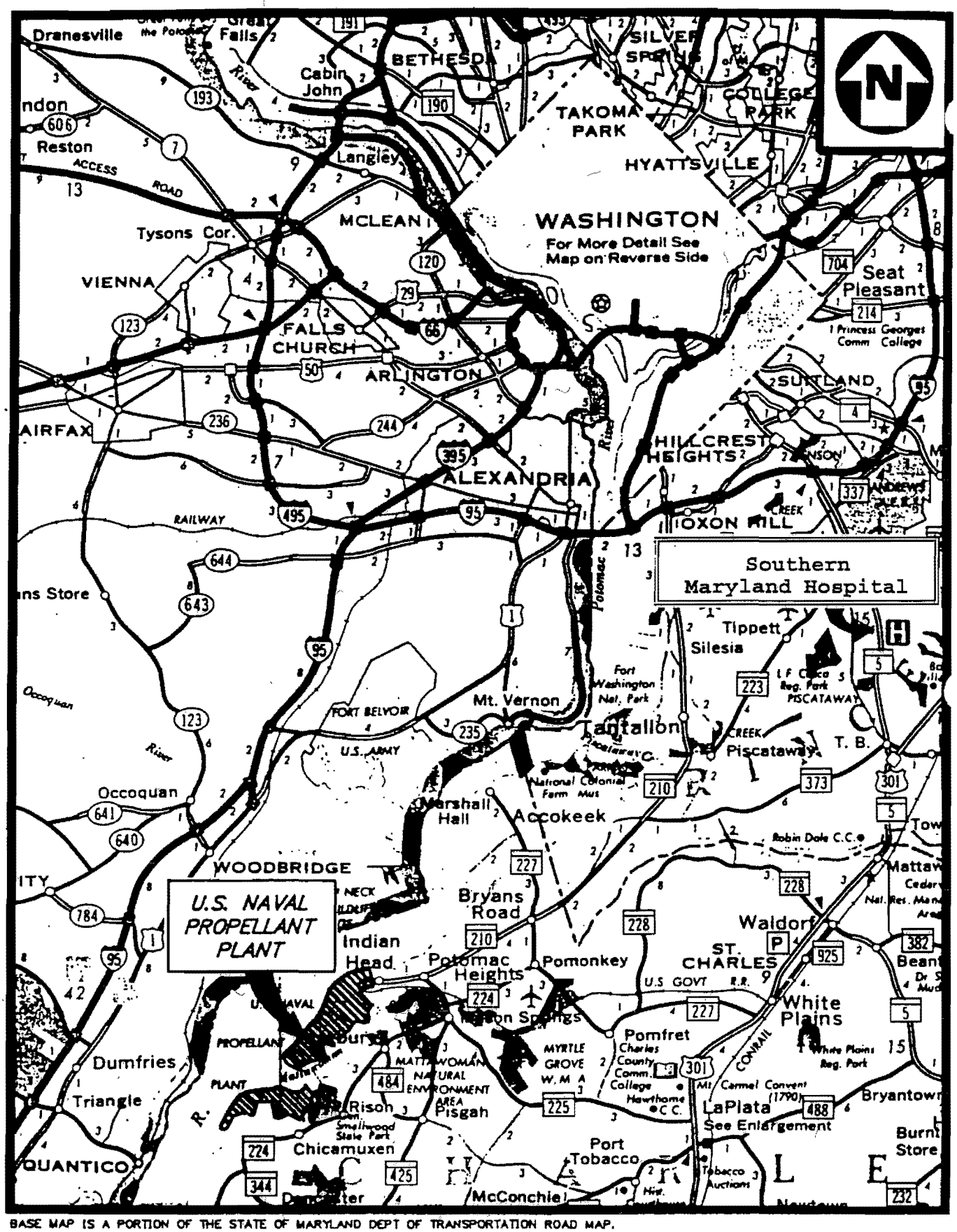


BASE MAP IS A PORTION OF THE STATE OF MARYLAND DEPT OF TRANSPORTATION ROAD MAP.

Geographic Location of Physicians Memorial Hospital

Figure 1

0 4 8
SCALE IN MILES



BASE MAP IS A PORTION OF THE STATE OF MARYLAND DEPT OF TRANSPORTATION ROAD MAP.

Geographic Location of Southern Maryland Hospital

Figure 2-2

U 4 8

SCALE IN MILES

3.0 SITE BACKGROUND

3.1 FACILITY HISTORY

The NSWC is located near Indian Head, Maryland in the west-central portion of Charles County, approximately 30 miles south-southwest of Washington, D.C. The facility occupies two peninsulas of land along the eastern shore of the Potomac River. The Naval Explosive Ordnance Disposal Technology Center (NAVEODTECHCEN) operates as a tenant. NAVEODTECHCEN property is designated as the Stump Neck Annex (Stump Neck) and occupies approximately 1,100 acres situated on the southwest of peninsula. This peninsula known as Stump Neck, is separated from the main NSWC peninsula by Mattawoman Creek.

The principal mission of NAVEODTECHCEN is to: (1) provide Explosive Ordnance Disposal (EOD) technology and logistics management for the joint services and (2) develop war essential elements of intelligence, equipment, and procedures to counter munitions, U.S. and foreign, as required to support Department of Defense components and the peacetime security needs of other agencies. The activities which are performed to support the mission include: research, development, experimentation, and testing of intact and disassembled domestic and foreign explosive ordnance. In addition, active duty military personnel are trained to perform EOD operations at the facility. The term "disposal" used in the context of the Stump Neck principal mission refers to rendering explosives and other ordnance items safe and is not used in the context of RCRA hazardous waste regulations.

The activities performed at Stump Neck, generate reactive hazardous wastes (D003) in the form of explosive waste, propellant waste, and explosive contaminated waste. These wastes are thermally treated by Open Burning (OB) in several treatment units (clay-lined steel pans and other vessels) at the Range 3 facility of Stump Neck. These waste treatment activities are regulated under 40 CFR Part 264, Subpart X. Open detonation is performed at the site only to support testing, experimentation, and training activities and is not performed as a waste treatment process.

Activities related to the Stump Neck principal mission began during the World War II time frame. Activities occurring before World War II are not well documented. Range 3 initiated operations as a testing and training site and OB treatment location in 1976.

Treated waste material includes a wide variety of intact and disassembled ordnance items consisting of explosives, propellants, and explosive contaminated materials. Explosive contaminated materials consist of wooden pallets, cardboard, paper, plastic, packing materials, etc. which came into contact with, and thus, are contaminated by explosives or propellants. Explosive and propellant wastes are treated in clay-lined steel pans. Prior to 1991, these materials were treated on the ground surface. Explosive contaminated materials have always been treated in a large cylindrical "pot".

3.2 SITE DESCRIPTIONS/SITE ACTIVITIES

3.2.1 Site 12 - Town Gut Landfill

Site 12 - Town Gut Landfill is located on the southwest side of the station. Runoff from the site drains into a stream and pond which are located adjacent to the north and west sides of the site respectively. The adjacent stream flows into the pond and the pond outlets through a pipe into Mattawoman Creek. The site is approximately two acres in size. It is bisected by Atkins Road Extension which runs northwest - southeast. Surface runoff from the site drains into the stream north of the site and a pond south of the site. The stream flows south into the pond, which borders the northeastern and southeastern edges of the landfill.

The site was operated by NSWC for disposal of landscaping waste, fill material, and rubble. Operations began in 1968 and terminated in June of 1980. Reportedly, material was deposited at this site from off-station sources until 1972. The site contains solid waste landscaping wastes, tree stumps, and demolition debris. Some of the items reportedly disposed at the Town Gut Landfill include solid waste, paint and varnishes, demolition waste, and chemical wastes. Assorted debris and construction rubble is visible along the edge of the landfill adjacent to the pond. Arsenic was detected in an adjacent creek at a concentration of 30 ppb, therefore, there is a potential for arsenic wastes in the landfill.

Site activities proposed for Site 12 include surface soil sampling, temporary monitoring well installation, groundwater sampling, and sediment sampling.

3.2.2 Site 39 - Organics Plant

Site 39 organic plant is in the southeast portion of the station. Site 39 consists of a discharge pipe, outlet area, and the section of Mattawoman Creek adjacent to the site. Operations in the organics plant occurred from 1961 to 1965 which included formulating bis-2,2-dinitropropanol acetal/formal

(acetal/formal), a propellant binder (E/A&H, 1994). Silver nitrate was used as a catalyst in producing acetal/formal. Reportedly, several accidental releases occurred via the Site 39 outfall as a result of an improperly closed valve (E/A&H, 1994). Compounds suspected of having been released include: acetal/formal, silver, dinitropropanol, ethylene dichloride, methylene chloride, and formaldehyde. Also, site personnel reported that acetal/formal and silver were visible at times on the surface of Mattawoman Creek near this outfall.

Previous investigations found unusually high concentrations of elemental silver existing in the sediments in the area. Silver appeared at a concentration of 1207 ppm, compound with up and downstream levels of 2 to 4 ppm (Hauser and Faith). Proposed activities that are to be conducted at Site 39 include additional sediment sampling.

3.2.3 Site 41 - Scrap Yard

Site 41 - Scrap Yard, is located in the southeastern section of the facility along the shore of Mattawoman Creek, upstream of Sites 39 and 40. The site is approximately 700' long by 100' wide and is surrounded by 10' chain-link fence. The area is generally flat and surface runoff is toward the south in the direction of Mattawoman Creek. The majority of the area is located on concrete, however the extent of the concrete area has not been fully identified.

This active scrap yard, is used to store metal materials and scraps, including empty storage drums, electrical transformers, spent batteries, and old office furniture. The scrap materials eventually are sold to a recycle and/or reused. The northwest end of the scrap yard was once a coal storage area.

From the 1960s to 1988, electrical transformers were stored at the northwest end of the scrap yard before off site disposal. Seventeen transformers were identified as either PCB-contaminated or as PCB-containing after an inspection conducted in 1981 (NEESA, 1983). These transformers were believed to have leaked, potentially contaminating this area. In addition, lead batteries also have been stored in the scrap yard and may have released lead to the surface soils (E/A&H, 1994). No batteries or transformers were identified in the western portion of the scrap yard, however large stains were observed in the area which formerly contained the transformers.

Future site activities at Site 41 are anticipated to include surface soil, sediment, and groundwater sampling.

3.2.4 Site 42 - Olson Road Landfill

Olson Road Landfill is in the southwestern section of the station and covers approximately 2 acres southwest of Olson Road. From approximately 1982 to 1987 the area of Olson Road Landfill was used as an unauthorized solid waste disposal area. Various solid wastes from the station were dumped at the site. Disposal of hazardous wastes at the landfill cannot be confirmed or denied by activity records or personnel. A mixing, assembly, and cure facility was constructed over the northern half of the landfill. The southern half of the site is clear of vegetation and vacant.

Prior to construction of the mixing, assembly, and cure facility and paving of the area surrounding it, the landfill was bisected by a dirt road extension of Olson Road. The southern half of the site slopes to the south with visible debris of construction rubble (asphalt and concrete), wooden pallets, branches, and unlabeled cans and drums along the edges. Drainage swales border the western and southern edges of the site. A drainage pipe outfall with a swale runs along the eastern side of the site.

Future site activities for Site 42 include subsurface, surface, sediment, groundwater, and surface water sampling to determine the nature and extent of contamination.

3.2.5 Site 43 - Toluene Disposal Site

Site 43 - Toluene Disposal Site is in the western portion of the station and consists of the area east of Gallery Road across from Buildings 1040 and 1041 in the area near the utility pole. The site is in the immediate vicinity of the utility pole abutting a large soil bunker to the northwest. A drainage ditch which has a general slope towards the south bisects the site east of the utility pole.

Site 43 was reportedly active between the late 1950s and 1989 when solvents, used in the Cast Plant (Buildings 1040 and 1041) to remove propellants and oily residues from various metal parts, were disposed of directly on the ground by the utility pole.

This cleaning activity took place two or three times per week in Building 1041. After the parts were cleaned, the spent solvents were to be combined or "slummed" with sawdust and placed in 55-gallon drums for disposal at the Cast Plant burn point. On many occasions, however, the spent solvents were carried across Galley Road and poured on the ground at the base of the telephone pole (NEESA, 1992). At Building 1040, acetone was reportedly disposed of in the drainage ditch just outside the door. The total quantity of solvents disposed immediately outside Buildings 1040 and 1041 was estimated to be between

23,000 and 30,000 gallons (NEESA, 1992). No signs of stressed vegetation or solvent dumping stains were observed at the site in 1995 or 1996 during site inspections.

Sampling was conducted to determine if there was contamination in the soils and soil gas surveys were conducted in the vicinity of the utility pole. It is anticipated that additional subsurface soil and groundwater sampling will be performed in the near future at this site.

3.2.6 Site 44 - Soak Out Area

Site 44 - Soak Out Area, is located between Buildings 903 and 907 in the northwest-central portion of the facility. The area is flat grassy open area with a slight grade to the southwest and a drainage ditch which extends along the southeastern edge of the site to a culvert which extends beneath Boyd Road. A concrete walkway which connects Building 903 with Building 1182 bisects the site.

Site 44 was reportedly active during the late 1960s to early 1970s, when a soak out tank was used to remove propellant from rocket motor catapult tubes (NEESA, 1992). According to the 1992 NEESA report, the tank consisted of two 55-gallon drums welded together one on top of the other, located about 75 feet east of Building 1363 and 40 feet south of Building 907. The drums were filled with a nonflammable solvent believed to be Pennchem 9018, a polysulfide solvent containing mercaptan (NEESA, 1992). The propellant contaminated tubes were dipped into the solvent from a large A-frame structure, and soaked for 2 to 3 days. A smaller catch tank was placed at the bottom of the larger tank to collect pieces of propellant that would fall out of the tubes during cleaning. The soak out drums were located directly on the ground, and it is unknown amount of solvent could have been spilled. During the 3 to 4 years that the cleaning was performed, no vegetation was able to grow in an area about 20 feet in diameter around the tank. No signs of stressed vegetation currently exist in this area. It was reported that the solvent drums (approximately ten 55-gallon drums) were placed in the woods near Building 1182 which currently comprise Site 45.

Future site activities planned for Site 44 include additional groundwater sampling.

3.2.7 Site 45 - Abandoned Drums

Site 45 - Abandoned Drums are located in the northwest-central area of the facility in a wooded area overgrown with vegetation approximately 125 feet northeast of Building 674 and 450 feet northwest of Building 1363. The terrain is generally flat with a general slope to the southeast. A drainage ditch is

located northeast of the site and flows towards the southeast. The site consisted of approximately 20 empty rusted drums. The drums contained holes and some appeared to have been cut and welded end-to-end similar to the drums identified being used at the soak out area (Site 44). The actual origin and previous contents of the drums was not known, however according to the January 1992 Preliminary Assessment (NEESA, 1992), the drums have been in this area for 15 to 20 years and may have originated from the soak out process at Site 44.

The site was staked and roped off identifying an area approximately 20' x 10' then the drums were removed and disposed. This area shows no signs of stressed vegetation. Future activities that are proposed for Site 45 include surface soil and groundwater sampling.

3.2.8 Site 46 - Cadmium Sandblast Grit Area

Site 46 - Cadmium Sandblast Grit Area is located in the northwest-central area of the facility in the vicinity of the gravel lot and wooded area immediately southwest of Building 855. The area is generally flat. A drainage ditch which abuts the southeastern edge of the gravel lot flows northeast toward and along Boyd Road. A grassy clearing exists in the woods southeast of the gravel lot immediately behind Buildings 1280 and 1169. Area does not contain any visible signs of stressed vegetation.
Site 46 was reportedly active from the mid-1960's to the mid-1970's when rocket motor catapult tubes were sandblasted in Building 855. Until the mid-1970's, this sandblasting grit, which contained concentrations of cadmium, was sometimes disposed in the gravel area behind Building 855 or in the nearby ditch, east of Building 855. The sandblasting grit was generated by two separate units housed within Building 855. Facility personnel estimated that sandblasting 900 cadmium-plated catapult tubes every 3 months generated approximately 30 gallons of sandblasting grit during the 3-month period (NEESA, 1992). In February 1990, an EPTox grit analysis of the materials generated by the smaller blasting unit housed in Building 855 indicated a 10.6 mg/L concentration of extractable cadmium. A June 1990 analysis of the grit generated by the larger blasting unit produced a value of 69.4 mg/L extractable cadmium (NEESA, 1992).

Additional soil sampling activities are proposed for future site activities at Site 46.

3.2.9 Site 47 - Mercuric Nitrate Disposal Area

Site 47 - Mercuric Nitrate Disposal Area is in the northwest central portion of the facility where mercuric nitrate was disposed in an area approximately 24 square feet on the west bank of the drainage ditch south

of the concrete pad behind Building 856. The area was covered with limestone chips to provide a neutralizing base disposal area where the workers disposed the spent catalyst. The grassy drainage ditch slopes to the south where it joins a larger grassy swale which drains toward the southeast.

Building 856 produced missile propellants which used mercuric nitrate as a catalyst on the production process. During three 8-hour daily shifts, 55-gallon drums containing one ounce of mercuric nitrate dissolved in 98% nitric acid was poured over this limestone area. These three daily shifts were carried out 7 days per week, 6 months per year, for approximately 8 years (NEESA, 1992). This amounts to approximately 274 pounds of mercuric nitrate being poured onto the limestone bed over the 8-year period.

No signs of the former limestone bed or stressed vegetation were visible. A 5-foot by 10-foot concrete pad constructed at the northern corner of Building 856 may cover the former limestone pad (E/A&H, 1994). Future site activities for Site 47 include soil and groundwater sampling.

3.2.10 Site 48 - NG Plant Disposal Area

Site 48 - NG Plant Disposal Area is a site of unknown origin consisting of miscellaneous debris, including solvent containers, bottles, metal scrap, and refuse. It is located in the wooded area southeast of Building 766 in the central part of NSWC. It is unknown whether the containers at the site contained hazardous materials. Some of the glass discarded at the site appears to be common consumer product containers. No signs of stressed vegetation are evident at the site.

The site covers an area approximately 20' x 30' and situated is on the south face of the hill slope across a stream from Building 766. Surface runoff from the site drains into the stream. The flows into the pond adjacent to Site 12 - Town Gut Landfill approximately 1/2 mile east of Site 48..

It is anticipated that additional soil sampling will be conducted in the future at this site.

3.2.11 Site 49 - Chemical Disposal Pit

Site 49 - Chemical Disposal Pit is located in the northeastern part of NSWC in the laboratory area. The site consists of a concrete pit, approximately 2.5 feet in diameter and 3 feet deep, northwest of Building 444. The pit was designed to dispose of laboratory containers without exposing personnel to the contents. To dispose of laboratory waste in laboratory containers, the containers were placed on a steel grate in the pit. A metal plate was dropped on the containers. The fragments of shattered glass were caught in a wire

basket below the steel grate, and the contents of the containers collected in the bottom of the pit and drained from the pit via a drain line to the sanitary sewer system. Reportedly, the pit received limited use until the early 1970's.

According to the Supplemental Preliminary Assessment (NEESA, 1992), a drain line exits the south side of the pit and connects the pit to the sanitary sewer manhole 473. However, during a visual inspection of Site 49 in 1996, another drain line entering the pit from the north was discovered. This line may connect to sanitary sewer manhole 472, as shown on a drawing (Bureau of Yards and Docks, Dwg. No. 15,699, 1964), which was reviewed by NEESA during the Supplemental Preliminary Assessment (1992).

It is unknown if any wastes were released to the soil adjacent to the pit or through the drainage lines. Future proposed site activities include soil, disposal pit sediment, and groundwater sampling.

3.2.12 Site 50 - Building 103 Crawl Space

Site 50 - Building 103 Crawl Space is located in the laboratory area of the northeastern part of the station. Building 103 is a small one story building with a concrete block foundation, built in approximately 1902. Laboratory equipment containing mercury has been reportedly used in Building 103 at different times. The equipment includes nitrometers, pycnometers, talianis, and thermometers.

Spent mercury handling procedures at Building 103 and other buildings in the laboratory area that used mercury consisted of pouring spent mercury into "slop jars" and running tap water into the jar over a sink to remove sulfuric acid from the mercury. Spills often occurred while transferring the spent mercury from nitrometers, and slop jars often broke. In addition, mercury was inadvertently washed out of the jars.

In 1985, while replacing two sinks in Building 103, workers discovered that the two sinks connected to a single drain line discharged directly to the soil beneath the building and did not connect to the storm or sanitary sewer system. After the discovery, a four inch diameter polyvinyl chloride (PVC) pipe was installed from the sink drain line to the manhole west of Building 102 (NEESA, 1992). The quantity of solvents and mercury discharged to the soil from 1902 to 1985 is unknown (EnSafe/Allen & Hoshall, 1994)

The crawl space below Building 103 is divided in half by a central load-bearing wall, running approximately east-west. The ground in the northern part of the crawl space is relatively flat; however, the southern section slopes to the southwest. The entrance to the crawl space is along the southern wall. The drain from the two sinks was located in the southwest corner of the northern section of the crawl space. A small

ditch exists along the west wall of the southern section of the crawl space. It drains to a shallow depression in the southwest corner, forming a collection point for runoff.

The area around Building 103 is similar to the ground surface in the crawl space. The topography at the northern end of the building is relatively flat, while the ground slopes to south at the southern end of the building. Surface soil sampling will be conducted at this site in the future to determine the extent of contamination.

3.2.13 Site 53 - Mercury Contamination in the Sewage System

Site 53 - Mercury Contamination in the Sewage System consists of the sewage system for the general laboratory in the northeastern part of the station. The sewage system consists of the storm sewer lines and the sanitary sewer lines from several buildings in the area. The general laboratory area has the highest local topographic elevation for the area.

Laboratory workers from Building 102 reported that approximately a liter of mercury was lost per month down the sinks (NEESA, 1992). Over the 77-year period that the Building 102 laboratory operated without mercury traps on the sinks (1909-1986), it is estimated that 28,000 pounds of mercury were discharged to the drain lines (NEESA, 1992). Additional large quantities of mercury may have been disposed down the drain lines from similar mercury handling and disposal procedures practiced at the other laboratory buildings.

In 1969, approximately 10 pounds of mercury were recovered from a storm sewer manhole located south of Building 103 (NEESA, 1992). In early 1989, approximately 1 pound of mercury was recovered from the sanitary storm sewer manhole located east of Building 102. Both of these manholes have drain line connections to Building 102.

After mercury was discovered in the manhole east of Building 102 in 1989, other manholes in the vicinity and down-line of the laboratory buildings were inspected for mercury. No visible mercury contamination was discovered. Since then, the manholes in the vicinity and down line of the laboratory facilities have been regularly inspected for signs of visible mercury. In addition, the sewer lines in the area of Building 102 were blocked off with sandbags, and mercury traps were installed on the lines.

In late 1988, a video survey was performed to determine the condition of the gravity sewer lines in the laboratory area. The sewer lines were found to be in poor condition and in need of repair or replacement.

The vitrified clay and terra-cotta pipes were either broken, cracked, sagging, separated, or, in some cases, collapsed. Therefore, the concern exists that mercury has contaminated the soils surrounding the sewer lines.

In late 1988, mercury levels in the sanitary sewage sludge measured at levels up to 150 ppm (NEESA, 1992). The maximum allowable amount of mercury in Class I sanitary sewage sludge is 10 ppm (memorandum, NAVORDSTA Indian Head, Code 0411C, Investigation of Mercury Hazard in Building 102, January 28, 1988).

Future site activities proposed for Site 53 include subsurface soil, sediment, and groundwater sampling.

3.2.14 Site 54 - Building 101 Mercury Contamination

In the mid-1980's, an NSWC employee in Building 101 detected mercury droplets and an organic solvent odor in the basement office when solvents were discharged through the pipe system (NEESA, 1992) suggesting a potential leaky drainage pipe. In January 1990, several droplets of mercury were discovered resting on the insulation of a steam pipe located in the southeast corner room of the basement in Building 101 (NEESA, 1992). When NSWC Safety Office personnel began removing the drop ceiling tiles, mercury vapors were detected in the breathing zone, but no visible signs of mercury on the ceiling tile tracks were observed (NEESA, 1992).

Future site activities planned for Site 54, Building 101 include building materials sampling (wipe sampling, bulk material) and subsurface soil sampling beneath the concrete floor.

3.2.15 Site 55 - Building 102

Building 102, constructed in 1909, was used as a laboratory for testing nitrocellulose by the nitrometer method. Other mercury-containing equipment including pycnometers, talianis, vacuum stability testing equipment, and thermometers, were used to determine the densities and sensitivity of propellants throughout the 80 years of laboratory operations in Building 102.

On October 6, 1987, metallic mercury was discovered dripping from the ceiling onto the sink table on top of the coffee mess, located in the northern end of the basement of Building 102. The source of the mercury was believed to be the equipment located on the first floor (NEESA, 1992). Ceiling tiles were removed, revealing the original tongue and groove wood flooring. A layer of asbestos sheeting was found

beneath this wood flooring. Plastic sheeting was placed under the ceiling to capture the mercury leaking from the wooden floor above. An estimated 2 ounces of mercury leaked onto the plastic sheeting from the wooden floor, necessitating the closure of the northern end of the building to protect the health of employees (NEESA 1992). Building 102 was abandoned in February 1989 and the water supply to Building 102 was terminated to help alleviate high mercury levels in the sanitary sewage sludge (NEESA, 1992).

Interviews with past facility employees as to the historical operations of Building 102 revealed that the wooden floor was not sealed with an impervious surface until the early 1960s (NEESA, 1992). According to employee interviews, a major spill occurred upstairs in Building 102 in the early 1960s before the impervious concrete floor was installed.

In the mid-1970s the nitrometer was moved to the southern room in the basement of Building 102 (NEESA, 1992). The floor drains in the basement were plugged in the early 1980s to prevent the release of mercury in case of a spill (NEESA, 1992).

In 1986 mercury traps were installed in the sinks where mercury was handled. When the U-joints were removed to install the traps, the plumber reported "about a teaspoon" of mercury in each U-joint (NEESA, 1992). After the building was closed, the sinks were salvaged for use in other buildings. Additional mercury was found in the piping and U-joints when the sinks were removed (NEESA, 1992).

Visual inspection and the record search for Building 102 revealed that friable and nonfriable asbestos containing materials (ACM) are present throughout the structure (NEESA, 1992). Possible sources include thermal system insulation (TSI) on the steam and hot water lines, asbestos mud on the steam and hot water pipe elbows, transite wall board, ceiling tiles, asphalt-asbestos floor tiles, floor glue, batt insulation in the ceiling and walls, flooring felts, and heating, ventilation, and air conditioning (HVAC) system insulation. The ACMs observed during the 1992 site visit were deteriorated and friable, creating a possible fiber release hazards (NEESA, 1992).

Future activities planned for Site 55 include building material sampling (wipe sampling, bulk material) and soil sampling from beneath the concrete floor.

3.2.16 Site 56 - IW87 Lead Contamination

Site 56 is composed of three distinct areas: the Biazzi Nitration Plant, Building 279, and IW87. The Biazzi Nitration Plant was constructed in 1953 to provide a continuous process for the manufacture of nitroglycerin (NG) (NSWC, 1994). In 1963, the facility was expanded to include the production of Otto fuel, which contains propylene glycol dinitrate, a nitrate ester similar to NG. Additional nitrate esters can be and are produced at the Biazzi Nitration Plant.

Building 790 is located in the Biazzi Nitration Plant and is used for the storage of spent nitric and sulfuric acid from the production of nitrate esters (NSWC, 1994). The building is part of the original nitration facility and was constructed in 1953.

All explosive operating buildings, including Building 790, are constructed following the Navy Explosive Safety Instruction, OP-5 (NSWC, 1994). OP-5 requires these buildings be equipped with conductive floors to eliminate the possibility of static electricity discharges which may cause an explosion. In the past, the floors in these buildings were lined with lead to provide a conductive surface. Sulfuric and nitric acids, which are used in the building, are very strong acids and have a tendency to generate fumes. The acidic fumes, in combination with periodic wash down of the walls and floor, caused lead to go into solution in the wash down water and be transported through the floor drain to IW87 (NSWC, 1994). It is also possible that particulate lead was washed to IW87 via the floor drain (NSWC, 1994). Lead is no longer used for this purpose.

Industrial wastewater (IW) outfall monitoring limits were established at IHDIV-NSWC in 1985, as a result of the National Pollutant Discharge Elimination System (NPDES) regulation, 40 CFR 122 (NSWC, 1994). IW87 drainage has been monitored for lead concentrations since 1988 (NSWC, 1994). The majority of the water entering IW87 is from storm water runoff. However, some sources are from plant operations, such as equipment cooling water and maintenance wash water (NSWC, 1994). A majority of these sources enter a pit outside Building 790, which discharges through an underground pipe to IW87. In addition, a large volume of water flows overland to IW87 from a sump pump at Building 1463 (NSWC, 1994). The sump pump runs almost continuously in wet months and pumps groundwater away from the buildings, which is located partially underground, similar to Building 790. In drier months, the pump runs less frequently, but is still required to keep water out of the building.

The level of 82 micrograms of lead per liter (µg/L) has been exceeded in 16 monthly monitoring rounds since May 1990 (NSWC, 1994). More recently, the limit, 82 µg/L of lead, has been exceeded in 8 monthly

monitoring rounds since the limit was made effective on June 4, 1992 (NSWC, 1994). The drain leading to the pit from inside the building was sealed in October 1992, because of these exceedances.

Beginning June 1993, the lead limit of 82 µg/L at IW87 was exceeded almost every month (NSWC, 1994). These increased NPDES exceptions revealed a problem with the drainage area from the pit outside the building, since all sources of lead to the outfall from current operations and buildings had been eliminated (NSWC, 1994).

Additional sediment sampling indicated that the lead had settled in the sediment in the pit outside of Building 790. The lead-contaminated sediment had also settled in the 700-foot-long, 24-inch terra-cotta pipe which flows to IW87 (NSWC, 1994).

Based on these analytical results, the proposed removal action boundary for Site 56 include the pit located at the corner of Building 790, and the entire open channel for IW87 (NSWC, 1994). The 1994 EE/CA established 35 mg/kg to be the action level for removal of sediment containing lead. Also, 82 µg/L was the lead concentration established as the action level for surface water (NSWC, 1994). It is established that a total of 51 cubic yards of sediment and 25,000 gallons of lead-contaminated surface water must be remediated through this proposed activity (NSWC, 1994).

4.0 SCOPE OF WORK

This section of the HASP addresses all proposed site activities that are to be conducted at the Indian Head Division, NSWC facility at this time. This site-specific HASP, particularly Table 5-1, provides information related to each of those tasks to be performed as part of the scope of work. If other tasks, other than those identified, are to be performed at this site this HASP will have to be modified.

The activities to be conducted as part of the scope of work include soil boring activities, monitoring well installations, and multi-media sampling including subsurface soils, surface soils, groundwater, sediments, and Investigative Derived Wastes (IDW).

The above listings represent a summary of the identified tasks as they apply to the scope and application of this HASP. For a more detailed description of associated tasks see the Work Plan (WP) or the Sampling and Analysis Plan (SAP).

5.0 TASKS/HAZARDS/ASSOCIATED CONTROL MEASURES SUMMARIZATION

Table 5-1 of this section serves as the primary portion of this site-specific HASP, addressing the tasks that are to be performed. The anticipated hazards, recommended control measures, air monitoring recommendations, required PPE, and decontamination measures for each site task are discussed in detail in this table. This table and the associated control measures shall be changed if the scope of work, contaminants of concern, or site conditions change. Through using the table, the FOL and field personnel can determine which hazards are associated with each task, what hazards are present at each site area, and what associated control measures are necessary to minimize potentials for personnel exposure or injuries.

TABLE 5-1

TASKS/HAZARDS/CONTROL MEASURES COMPENDIUM
FOR INDIAN HEAD DIVISION, NAVAL SURFACE WARFARE CENTER, INDIAN HEAD, MARYLAND REMEDIAL INVESTIGATION

Tasks/Operation/ Locations	Anticipated Hazards	Recommended Control Measures	Air Monitoring Type/Action Levels	Personal Protective Equipment	Decontamination Procedures
Mobilization/ Demobilization	***Chemical hazards:*** Exposure to potential site contaminants are not anticipated during this activity. However, chemicals brought on site in support of field activities are to be identified, logged, accompanied by an appropriate MSDS, properly stored, and evaluated for purposes of hazard communication. ***Physical hazards:*** Potential physical hazards associated with this task may include: 1) Lifting (muscle strains and pulls) 2) Pinches and compressions 3) Slip, trips, and falls 4) Moving machinery 5) Biological hazards (Insect/animal bites and stings) 6) Vehicular and foot traffic	***Chemical Hazards:*** To eliminate potential chemical hazards associated with this task ensure the following: - A chemical inventory list is generated for all chemical brought on site (Complete Section 5.0 of the B&R Health and Safety Guidance Manual). - Material Safety Data Sheets must be available for all chemicals brought on site (Complete Section 5.0 of the B&R Health and Safety Guidance Manual). - Materials are stored in accordance with recommended practices and according to compatibility (See MSDS for storage and compatibility recommendations). ***Physical hazards:*** 1) Employ machinery or multiple personnel for heavy lifts. - Use proper lifting techniques. 2) Use pinch bars or other equipment to keep hands from the point of operation. 3) Preview and prepare work locations where unstable/uneven terrain exists. Barricade all excavations deeper than 2 feet from access closer than two feet from the edge from foot and vehicular traffic. 4) All equipment to be employed will be - Inspected in accordance with OSHA, and manufacturers design. The inspection will include the completion of the Equipment Record Sheet documenting the review and acceptance/failure of safety devices, guards, emergency stops. The Equipment Record Sheet may be found in Section 10.0 of the B&R Environmental Health and Safety Guidance Manual. - Operated by knowledgeable operators, and knowledgeable ground crew, as applicable. - Operated in establish safe zones of approach (i.e., Boom or mast + 3 feet). - Secure all loose articles to avoid possible entanglement. 5) Avoid insect nesting areas, employ repellents (Do NOT use repellents during sampling activities). Report potential hazards to the SSO. Frequently inspect clothing and persons during and after activities in wooded areas for ticks and other vectors. 6) Identify all access/egress routes and locations to within established areas of operation. - All equipment capable of self propelled movement will be equipped with movement alarms as applicable. - Traffic regulations for NSWC are to be followed as posted. - Traffic regulations for B&R Environmental, operational areas will be posted by the SSO as required.	Not required during mobilization/demobilization.	Mobilization/demobilization activities is intended to initiate and proceed in Level D protection Level D - (Minimum Requirements) - Standard field attire (Long sleeve shirt; long pants; or coveralls) - Safety shoes (Boots with steel toe/shank) - Safety glasses - Hardhat (when overhead hazards exists, or identified as an operation requirement) - Reflective vest for high traffic areas - Hearing protection for high noise areas, or as directed on an operation by operation scenario. As a general rule of thumb, if you need to raise your voice to be heard while engaged in conversation with someone who is within 2 feet of your position you may be exposed to excessive noise levels and should employ hearing protection until the SSO can quantify the potential hazard through sound level measurements or noise dosimetry. **Note:** The Safe Work Permits (See Section 9.4) will be issued at the beginning of each day to address the tasks planned for that day. Additional PPE may be specified on these permits to reflect site-specific conditions or special considerations or conditions associated with any identified task.	As potential site contaminants are not anticipated as part of this task, personal decontamination is not required. All equipment arriving/leaving the site will be inspected prior to permitting this equipment to enter or exit the site. The SSO will inspect the equipment and give the clearance to allow the equipment to pass. Failure to pass inspection will prohibit entering or exiting the site as applicable. All equipment which fails the inspection will have to be decontaminated again to a level acceptable to the SSO prior to passage on or off site. All equipment permitted to pass on/off site will be documented using an Equipment Record Sheet indicating the equipment serial number, description, brief history of the other sites the equipment has been on, and the results of the inspection. This form may be found within Section 10.0 of the B&R Environmental Health and Safety Guidance Manual.

TABLE 5-1
TASKS/HAZARDS/CONTROL MEASURES COMPENDIUM
FOR INDIAN HEAD DIVISION, NAVAL SURFACE WARFARE CENTER, INDIAN HEAD, MARYLAND REMEDIAL INVESTIGATION

Tasks/Operation/ Location	Anticipated Hazards	Recommended Control Measures	Air Monitoring	Personal Protective Equipment	Decontamination Procedures
Soil Borings/ Monitoring Well(s) Installation at Site 12 - Town Gut Landfill	***Chemical hazards:*** 1) Air/particulate/water borne contaminants will be separated according to their respective sites. **Site 12:** Primary contaminant for this site and scheduled activities is arsenic. As this landfill has not been previously investigated and no tangible information exists at this time it is possible that other components may exist. Other contaminants which have been listed to exist at the other sites including but not limited to, Chlorinated hydrocarbons: trichloroethylene, tetrachloroethylene; Poly Aromatic Hydrocarbons (PAHs): benzo (a) anthracene, benzo (a) pyrene, phenanthrene, fluoranthene, chrysene, acenaphthalene, anthracene; Metals: Aluminum, arsenic, beryllium, cadmium, copper, lead, manganese, mercury, nickel, silver; Energetics: Nitroguanidine, nitrocellulose, trinitrotoluene, nitrotoluene, RDX, and HMX 2) Transfer of contamination into clean areas or onto persons ***Physical hazards*** 3) Rotating machinery (entanglement) 4) Noise 5) Energized systems 6) Lifting 7) Slips, trips, and falls 8) Traffic hazards	***Chemical hazards*** 1) Employ real-time monitoring instrumentation, action levels, and identified PPE to identify, quantify, and control exposures to potentially contaminated medias (e.g., air, water, soils). These instrument will be employed as a general screening tool for detect other potential contaminants that may be encountered. - Identify and physically barricade operational zones where potential contamination may exist to prevent incidental contact and transfer outside of the operational area. 2) Decontaminate all equipment and supplies between drilling events and prior to leaving the site. ***Physical hazards*** 3) All equipment to be used will be - Inspected in accordance with Federal safety and transportation guidelines, OSHA (1926.600,.601,.602), and manufacturers design and documented as such using Equipment Record Sheet (See Section 10.0 of the B&R Environmental Health and Safety Guidance Manual. - Operated by Certified operators, and knowledgeable ground crew. - Only manufacturer approved equipment may be used in conjunction with equipment repair procedures (i.e., pins for auger flights etc.). In addition to the equipment considerations, the following standard operating procedures will be employed: - All personnel not directly supporting the drilling operation will remain at least 25 feet from the point of operation. - All loose clothing/protective equipment will be secured to avoid possible entanglement. - Hand signals will be established prior to the commencement of drilling. - The driller and helper can simultaneously handle moving augers or flights only when there is a standby person to activate the emergency stop device. - The driller must never leave the controls while tools are rotating unless all personnel are clear of the rotating equipment. - A long handled shovel or equivalent shall be used to clear away drill cuttings from the hole and rotating equipment. Hands or feet shall not be used for this purpose. - A remote sampling device must be used to sample drill cuttings near rotating tools. The driller shall shutdown operations if the sampler is near the tools. - Never climb a drill mast while equipment is rotating. - Use ANSI approved fall protection (i.e., belts, lanyards and a fall protection slide rail) or portable ladders which meet OSHA's requirements when climbing drill masts. - Work areas will be kept clear of clutter. - All personnel will be instructed in the location and operations of the emergency shut off device(s). This device will be tested initially (and then periodically) to insure its operational status. - Areas will be inspected prior to the movement of drill rigs and support vehicle to eliminate any physical hazards. This will be the responsibility of the FOL and/or SSO. - Drill rigs and support vehicles will be moved no closer to banks, ditches, and other excavations than 3 feet unless the wall is supported. 4) Excessive noise levels will be mitigated through the use of hearing protection. Any piece of equipment or operation that has the potential to generate excessive noise levels (You must raise your voice to speak to someone within two feet of where you are standing) will require hearing protection until sound level measurements and/or noise dosimetry may be conducted to quantify the associated noise levels. 5) All utility clearances shall be obtained in writing prior to subsurface activities. The locations of all underground utilities will be identified and marked prior to all subsurface investigations. Where the clearance cannot be obtained in a reasonable period, or not located, drilling shall proceed with extreme caution using a magnetometer for periodic downhole surveys to at least 6 feet. - Drilling, drill masts or other projecting devices shall be at least 20 feet from overhead power lines and a minimum of 3 feet from identified underground locations. 6) Employ machinery or multiple personnel for heavy lifts. - Use proper lifting techniques. 7) Traffic and equipment considerations are to include the following: - Establish safe zones of approach (i.e. Boom + 3 feet). - All equipment shall be equipped with movement warning systems. - All personnel working in high equipment traffic areas are required to wear reflective vests for high visibility. - Employ safety belts and follow the site traffic rules. Traffic patterns will be dictated supporting on site activities. However, regulated patterns in and about the work zones and support thereof will be established to safely control the flow patterns of mechanized vehicles and pedestrians.	The primary contaminant of concern based on sampling information from down strean receptors appears to be arsenic. This compound as with many others are solid at ambient temperatures. Therefore, control of potential exposure will be facilitated through such controls as using water to suppress airborne contaminant laden dust and particulates. Direct readings instruments will not be used to estimate potential airborne concentrations, they will just be controlled. Direct reading instrument such as photoionization detectors w/10.6 eV and flame ionization detectors will be employed as general screening instruments as a precautionary measure as limited information exists about other potential contaminants of concern. **Elevated airborne concentrations impacting the field crews or downwind receptors are not anticipated. The following information is provided as a contingency action only.** These instruments will only be employed as a screening devices to be employed in the following manner: 1) Source monitoring of the borehole will be conducted at regular intervals to be determined by the SSO. Positive sustained results at a source or downwind location(s) which may impact operations crew will require the following actions: - Monitor the breathing zone of at-risk and downwind employees. Any sustained reading above background in the breathing zone of the at-risk employees requires the person (SSO/sampler, etc.) monitoring to: - Elevate the level of protection until the source of the readings can be identified and quantified. - Sustained readings greater than established background to 5 ppm, Level C protection. - 5 ppm to 500 ppm, Level B protection. These action levels have been excerpted from EPA Standard Operating Safety Guides. 4) The SSO will perform noise dosimetry to ensure the drilling, and any contributional levels associated with the operation do not surpass the noise attenuation factors associated with the hearing protection selected. 5) When utilities cannot be identified a procedure permitting downhole magnetometer surveys every 2 feet to a total of 6 feet.	All drilling operations are to be initiated in Level D protection. Level D protection constitutes the following minimum protection - Standard field dress (Long pants Long Sleeve Shirts - Steel toe/shank safety shoes These following items will be incorporated during drilling operations: - Nitrile gloves with a cotton liner, - Hardhat, safety glasses, and earplugs or muffs. - *Tyvek coveralls will be worn if there is a possibility of soiling work attire* - *Impermeable boot covers* - *PVC or PE coated tyvek will be incorporated if there is a potential for saturation of work attire.* *(These items are optional as conditions dictate or as specified on the Safe Work Permit)* Level C protection upgrade will be done based on monitoring instrument results to the following: - Air-Purifying Respirator (APR) with organic vapor/HEPA cartridges for positive results greater than background to 5 ppm within the workers breathing zone. Chemical protective clothing will consist of impermeable boot covers, nitrile gloves with a cotton liner, Tyvek coveralls (unless free phase product is encountered). Free phase product or splash potential PVC or PE splash suit. Level B protection Self-Contained Breathing Apparatus (SCBA), or airline respiratory protection will be used for - positive breathing zone results greater than 5 ppm. Chemical protective clothing will consist of impermeable boot covers, nitrile gloves with a cotton liner, Tyvek coveralls (unless free phase product is encountered). Free phase product or splash potential PVC or PE splash suit. Ascention to Level C or B protection requires immediate notification of the PM, and HSM. As site conditions may change the following equipment will be maintained during all on site activities - Fire Extinguishers (Strategically placed) - Basket stretcher, blankets, and first-aid kit	**Personnel Decontamination** - Will consist of a soap/water wash and rinse for outer protective equipment (e.g., boots, gloves, PVC splash suits, etc.). This function will take place at an area adjacent to the drilling operations bordering the support zone. This decontamination procedure for **Level D** protection will consist of - Equipment drop - Soap/water wash and rinse of outer gloves and outer boots, as applicable - Soap/water wash and rinse of the outer splash suit, as applicable - Wash hands and face, leave contamination reduction zone For **Levels C & B** in addition to that described above: **Note:** SCBA air tank or APR cartridge change out would take place at this point. - Outer suit, boot covers, outer glove removal - Respiratory (face mask) protection removal - Wash hands and face, leave contamination reduction zone **Equipment Decontamination** - All equipment decontamination will take place at a centralized decontamination pad utilizing steam or pressure washers. Heavy equipment such as drill rigs, will have the wheels and tires cleaned along with any loose debris removed, prior to transporting to the central decontamination area. All site vehicles will be restricted access to exclusion zones, or also have their wheels/tires sprayed off as not to track mud onto the roadways servicing this installation. Roadways shall be cleared of any debris resulting from the on site activity. All equipment used in the exclusion zone will require a complete decontamination between locations and prior to removal from the site. The FOL or the SSO will be responsible for evaluating equipment arriving on site and that which is to leave the site. No equipment will be authorized access or exit without this authorization. Evaluation will consist of - Visual inspection - Scanning equipment with monitoring instruments

TABLE 5-1
TASKS/HAZARDS/CONTROL MEASURES COMPENDIUM
FOR INDIAN HEAD DIVISION, NAVAL SURFACE WARFARE CENTER, INDIAN HEAD, MARYLAND REMEDIAL INVESTIGATION

Task/Operation/ Location	Anticipated Hazards	Recommended Control Measures	Air Monitoring Type/Action Levels	Personal Protective Equipment	Decontamination Procedures
Multi-media sampling including soils (surface and subsurface); sediments; seeps (surface waters) and groundwater; air (personal and area) and Investigative Derived Waste (IDW)	***Chemical hazards:*** 1) Air/particulate/water borne contaminants will be separated according to their respective sites. **Site 12:** Primary contaminant for this site and scheduled activities is arsenic. As this landfill has not been previously investigated and no tangible information exists at this time it is possible that other components may exist. Other contaminants which have been listed to exist at the other sites including but not limited to, Chlorinated hydrocarbons: trichloroethylene, tetrachloroethylene; Poly Aromatic Hydrocarbons (PAHs): benzo(a) anthracene, benzo(a) pyrene, phenanthrene, fluoranthene, chrysene, acenaphthalene, anthracene; Metals: Aluminum, arsenic, beryllium, cadmium, copper, lead, manganese, mercury, nickel, silver; Energetics: Nitroguanidine, nitrocellulose, trinitrotoluene, nitrotoluene, RDX, HMX. See Table 6-1 for more information regarding these possible secondary contaminants of concern. 2) Transfer of contaminants into clean areas or onto persons ***Physical hazards:*** 3) Noise 4) Lifting (muscle strains and pulls) 5) Pinches and compressions 6) Slip, trips, and falls 7) Biological hazards (Insect/animal bites and stings)	***Chemical hazards:*** 1) Employ real-time monitoring instrumentation, action levels, and identified PPE to identify, quantify, and control exposures to potentially contaminated medias (e.g., air, water, soils). These instrument will be employed as a general screening tool for detect other potential contaminants that may be encountered. - Visual observation will be employed as a means to determine if dusty conditions are prevalent. Control measures such as wetting areas down will be employed to control airborne contaminant laden particulates to control dispersion and possibly exposures to potentially contaminated medias (e.g., air, water, soils, etc.). 2) Restrict the cross use of equipment and supplies between sampling locations without first going through a suitable decontamination. ***Physical hazards:*** 3) Due to operational and contributory activities in and about work areas, generated noise levels may be excessive. Noise control will be facilitated through the use of hearing protection. As a general rule of thumb, anytime you must raise your voice to speak to someone to be heard within 2 feet of where you are standing the potential exists that sound pressure levels may be excessive. Therefore, personnel will be required to employ hearing protection in these situations until sound level measurements and/or noise dosimetry may be conducted to quantify the associated noise levels. 4) Employ machinery or multiple personnel for heavy lifts. Use proper lifting techniques. 5) Use pinch bars or other equipment to keep hands out of the point of operation, when acquiring samples. 6) Preview work locations for unstable/uneven terrain. Barricade all excavations deeper than 2 feet from access closer than 2 feet from the edge. 7) Avoid insect nesting areas (Do NOT use insect repellents during sampling activities). Report potential hazards to the SSO.	Monitoring instrumentation will be employed as specified in the QA/QC plan to bias environmental samples. Ground and surface waters will not require monitoring as part of sample acquisition. Wells to be sampled will require opening to allow venting and equilibration prior to sampling. Subsurface soils monitoring direction and action levels will proceed in the following manner. - The primary contaminant of concern for Site 12 is arsenic which is a solid at ambient temperatures. No DRIs will be employed to identify and quantify this compound. Therefore, control of potential exposure will be facilitated through such controls as using water to suppress airborne contaminant laden dust and particulates. **Screening source locations and samples for secondary contaminants** Using photoionization detectors w/10.6 eV and/or flame ionization detectors **Elevated airborne concentrations impacting the field crews or downwind receptors are not anticipated. The following information is provided as a contingency action only.** 1) Source monitoring will be conducted at regular intervals to be determined by the SSO. Positive sustained results at a source location which may impact operations crew will require the following actions: - Monitor the breathing zone of high risk employees. Any sustained reading above background in the breathing zone of the at-risk employees requires the person (SSO/sampler, etc.) monitoring to: - Elevate the level of protection to Level C until the source of the readings may be identified and quantified. - Background to 5 ppm, Level C protection - 5 ppm to 500 ppm, Level B protection These action levels have been excerpted from the EPA Standard Operating Safety Guides. It is anticipated that these action levels will be employed in this instance until the substances are identified through a specific monitoring approach.	All sampling activities are anticipated to proceed in a modified Level D protection, or as specified on the Safe Work Permit. Level D - (Minimum Requirements) For sampling activities: - Standard field attire (Long sleeve shirt; long pants) - Safety shoes (Steel toe/shank) - Safety glasses - Hard hat (when overhead hazards exists, or identified as a operation requirement) - Reflective vest for high traffic areas - Hearing protection for high noise areas, or as directed on an operation by operation scenario. - Inner nitrile gloves (Clean pair for each sample location) If an upgrade to Level C is required: - Air purifying respirator with organic vapor/HEPA filters up to 5 ppm. Level C chemical protective clothing will consist of impermeable boot covers, layered (inner nitrile gloves) if necessary, Tyvek coveralls. Free phase product or splash potential will require the use of PVC or Saranex splash suit.	Decontaminate sample containers in accordance with the QA/QC Plan. **Personnel decontamination:** - Wash and rinse outer protective garments, as applicable. - Remove outer protection garments and containerize for disposal. - Wash hands and face, leave contamination reduction zone. **Equipment decontamination:** All sampling equipment will undergo a soap/water wash and rinse utilizing a suitable potable water source until visibly clean. Sampling equipment may also be high pressure soap/water wash and rinse or steam cleaned. All chemical decontamination will proceed in accordance with the other site documents such as QA/QC and the Sampling Analysis Plan.

TABLE 5-1
TASKS/HAZARDS/CONTROL MEASURES COMPENDIUM
FOR INDIAN HEAD DIVISION, NAVAL SURFACE WARFARE CENTER, INDIAN HEAD, MARYLAND REMEDIAL INVESTIGATION

Task/Operation/ Location	Anticipated Hazards	Recommended Control Measures	Air Monitoring	Personal Protective Equipment	Decontamination Procedures
Decontamination of sampling, and heavy equipment	***Chemical hazards:*** 1) Air/particulate/water borne contaminants will be separated according to their respective sites. **Site 12:** Primary contaminant for this site and scheduled activities is arsenic. As this landfill has not been previously investigated and no tangible information exists at this time it is possible that other components may exist. Other contaminants which have been listed to exist at the other sites include but not limited to, Chlorinated hydrocarbons: trichloroethylene, tetrachloroethylene; Poly Aromatic Hydrocarbons (PAHs): benzo (a) anthracene, benzo (a) pyrene, phenanthrene, fluoranthene, chrysene, acenaphthalene, anthracene; Metals: Aluminum, arsenic, beryllium, cadmium, copper, lead, manganese, mercury, nickel, silver; Energetics: Nitroguanidine, nitrocellulose, trinitrotoluene, nitrotoluene, RDX, and HMX. See Table 6-1 for more information regarding the contaminants of concern. - Decontamination fluids - Liquinox (detergent), acetone or methanol, and hexane ***Physical hazards:*** 2) Lifting (muscle strains and pulls) 3) Pinches and compressions	1) Employ protective equipment to minimize contact with site contaminants and hazardous decontamination fluids. - Have a means by which the eyes and/or skin may be flushed (i.e., portable camp shower, emergency eyewash, etc.) readily accessible 2) Use multiple persons where necessary for lifting and handling heavy pieces of equipment for decontamination purposes. 3) Provide stacking racks for air drying of decontaminated equipment to prevent unstable drying stacks of equipment from collapsing.	1) Use visual observation, and real-time monitoring instrumentation to ensure all equipment and/or areas which has been cleaned and dried is properly cleaned of potentially contaminated medias (e.g., air, water, soils). **Elevated airborne concentrations impacting field crew or downwind receptors are not anticipated for this task.**	***For Drill rigs:*** This applies to high pressure soap/water, steam cleaning wash and rinse procedures. Level D Minimum requirements - - Standard field attire (Long sleeve shirt; long pants) - Safety shoes (Steel toe/shank) - Chemical resistant boot covers - Nitrile outer gloves, cotton liners - PVC Rain suits or PE or PVC coated Tyvek - Safety glasses underneath a splash shield ***For sampling equipment including trowels, split spoons, bailers, etc.:*** Level D Minimum requirements - - Standard field attire (Long sleeve shirt; long pants) - Safety shoes (Steel toe/shank) - Nitrile outer gloves, cotton liners - Safety glasses underneath a splash shield In the event of overspray of chemical decontamination fluids employ PVC Rain suits or PE or PVC coated Tyvek as necessary. Respiratory protection is not anticipated for these activities.	This decontamination procedure for **Level D** protection will consist of - Soap/water wash and rinse of outer gloves - Soap/water wash and rinse of the outer splash suit, as applicable - Wash hands and face, leave contamination reduction zone

6.0 HAZARD ASSESSMENT

This section provides information regarding the chemical and physical hazards associated with the NSWC and the activities that are to be conducted as part of the scope of work. Table 6-1 provides various information related to the chemical hazards that may be present at the site. Specifically, toxicological information, exposure limits, symptoms of exposure, physical properties, and air monitoring and sampling data are also discussed in that table.

6.1 CHEMICAL HAZARDS

Previous investigations conducted at the NSWC site have indicated the presence of various volatile organic compounds. Potential contaminants of concern consist of Total Petroleum Hydrocarbons (TPHs) including organic solvents (1,1,1 - trichloroethane, acetone, trichlororethene, tetrachloroethene, naphthalene, carbon tetrachloride), Polynuclear Aromatic Hydrocarbons (PAHs such as acenaphthene, benzo(a)pyrene, chrysene, naphthalene, and phenanthrene), various metals, and Poly Chlorinated Biphenyls (PCBs). Information on the toxicological, chemical, and physical properties of these substances addressed in Table 6-1 of this HASP. It is anticipated that the greatest potential for exposure to site contaminants is during intrusive activities (i.e., drilling, monitoring well installations, sampling, etc.).

Data from the Environmental Baseline Survey (EBS), suggests that pesticides and herbicides were used in one small area of the site. The potential exists for personnel performing sampling activities to come into contact with these contaminants. Additionally, the main building of the facility is reported to contain asbestos and lead-based paint. Activities conducted as part of the scope of work are not anticipated to result in any potential for exposure to these contaminants. Personnel will not be directly handling either asbestos or lead-based paints, however these contaminants are included in Table 6-1 for general information.

6.2 PHYSICAL HAZARDS

In addition to the chemical hazards discussed above, the following physical hazards may be present during the performance of site activities.

- Contact / entanglement with rotating equipment or machinery.
- Slips, trips, and falls.

- Contact with underground or overhead utilities (electric lines, gas lines, water lines, etc.).
- Strain from heavy lifting.
- Pinch / compression points.
- Noise in excess of 85 decibels (dBA).
- Heat stress and inclement weather.
- Contact with poisonous plants and disease carrying animals and insects.
- Other physical hazards associated with ongoing facility operations (proximity to heavy equipment and machinery, vehicular traffic, etc.).

These physical hazards and their applicability to each site task are discussed in detail in Table 5-1.

TABLE 6-1

CHEMICAL, PHYSICAL, AND TOXICOLOGICAL DATA

Substance	CAS No.	Air Monitoring/Sampling Information		Exposure Limits	Warning Property Rating	Physical Properties	Health Hazard Information
Acenaphthalene This contaminant has been identified at measurable concentrations at Sites 41 and 47 within soils and sediments.	83-32-9 208-96-8	No information found concerning ionization potentials or relative response ratios for PID or FID detection.	Air sample using charcoal tube; carbon disulfide desorption; GC/FID detection; Sampling and analytical protocol in accordance with OSHA 07 or NIOSH Method #1501.	None established for this compound. However, it is recommended that 0.2 mg/m^3 for coal tar pitch volatiles be employed where excessive concentrations may exist. This is more relevant for those PAHs considered carcinogenic.	Information regarding this substance was limited. This material is a natural constituent of coal tar. Adequate - Odor threshold 0.08-0.22 ppm. OSHA accepts the use of air-purifying respirators with organic vapor cartridge up to 10 mg/m^3, providing cartridges are changed at the beginning of each shift. Recommended gloves: Butyl - >8.00 hrs; are recommended for other coal tar pitch associated substances; Neoprene >4.00 hrs; Nitrile >1.00 hrs	Boiling Pt: 534°F; 279°C Melting Pt: 203°F; 95°C Solubility: Insoluble Flash Pt: Not available LEL/LFL: Not available UEL/UFL: Not available Density: 1.189 Vapor density: 5.32 Vapor Pressure: 10 mmHg Specific Gravity: 1.189 Incompatibilities: Strong oxidizers, caustics, and acids Appearance and Odor: Colorless needles with an aromatic odor at concentrations of 0.08-0.22 ppm	Overexposure may result in irritation to the eyes, nose, throat, and respiratory system.
Chrysene This substance has been identified at measurable concentrations at Sites 41 and 47 within soils and sediments.	218-01-9	PID: Ionization potential 7.59 eV, relative response ratio unknown. FID: Relative response ratio for FID detection is unknown.	Air sample using 37 mm cassette, glass fiber, binder free, 1.0 micron pore size; HPLC-UV detection. Sampling and analytical protocol in accordance with OSHA 58 or NIOSH Method #1(184).	It is recommended that 0.2 mg/m^3 for coal tar pitch volatiles be employed where airborne concentrations may exist. This is relevant as this PAH is considered to be a suspected human carcinogenic.	Information regarding this substance was limited. This material is a natural constituent of coal tar. Adequate - Odor threshold 0.08-0.22 ppm. OSHA accepts the use of air-purifying respirators with organic vapor cartridge up to 10 ppm, providing cartridges are changed at the beginning of each shift. Recommended gloves: Butyl - >8.00 hrs; are recommended for other coal tar pitch associated substances; Neoprene >4.00 hrs; Nitrile >1.00 hrs	Boiling Pt: 910°F; 488°C Melting Pt: 489°F; 254°C Solubility: Insoluble in water Flash Pt: 143°F; 62°C LEL/LFL: 1.1% @ 200°F; 93°C UEL/UFL: 12.7% @ 275°F; 135°C Vapor Density: 4.07 Vapor Pressure: 0.8 mmHg @ 72°F; 22°C Density: 1.274 Specific Gravity: 1.274 Incompatibilities: Strong oxidizers, strong caustics, and strong acids Appearance and Odor: Crystals	This substance is considered a suspected human carcinogen.
RDX Synonym: Cyclo-1,3,5-trimethylene-2,4,6-trinitramine; Cyclonite; Trimethylenetrini-tramine; T$_4$; RDX This substance has been identified at measurable concentrations at Sites 48, 53, and 55 within soils.	121-82-4	No information found.	Air sampling use particulate filter; gravimetric detection. Sampling and analytical procedures shall be in accordance with NIOSH Method #0500, (Nuisance Dust, Total).	OSHA/NIOSH/ACGIH: 1.5 mg/m^3 (skin); STEL 3 mg/m^3 (skin)	Sensitive to friction, as stable as TNT, explosive when heated to 260°C; 126.8°F Respiratory Protection: Can use air purifying respirator with an organic vapor cartridge for concentrations up to 75 mg/m^3. Airborne concentrations above this level use an airline respirator or SCBA. Recommended Gloves: Impermeable gloves suitable to prevent skin contact. Nitrile gloves have been selected for most other applications.	Boiling Pt: Not available Melting Pt: Pure 399°F; 204.1°C Military grade ~10% HMX ~374°F; ~190°C Freezing Pt: Not available Solubility: Insoluble in water; soluble hot aniline, phenol, and nitric acid Specific Gravity: 1.2 Vapor Pressure: Not available Flash Pt: Heat (explosion in 5 seconds) 500°F; 260°C LEL: Not available UEL: Not available Incompatibles: Strong oxidizers, combustible materials, mercury fulminate, and heat Appearance and odor: Colorless to white crystalline powder, odorless	Routes of exposure: Inhalation, ingestion, skin and eye contact. Sign and symptoms of overexposure may include: headaches, dizziness, nausea, hyperactivity, convulsions, seizures, fatigue, irritability. These effects may be experienced quickly or several hours later. Topically irritating to skin and eyes.

TABLE 6-1

CHEMICAL, PHYSICAL, AND TOXICOLOGICAL DATA

Substance	CAS No.	Air Monitoring/Sampling Information		Exposure Limits	Warning Property Rating	Physical Properties	Health Hazard Information
Cyclotetramethylene tetranitramine Octogen, (HMX) This substance has been identified at measurable concentrations at Sites 49, 53, and 55 within soils.	2691 41-0	No information found.	Air sampling use particulate filter; gravimetric detection. Sampling and analytical procedures shall be in accordance with NIOSH Method #0500 (Nuisance Dust, Total).	OSHA/NIOSH: 15 mg/m^3 total dust; 5 mg/m^3 respirable fraction. ACGIH: 10 mg/m^3 for total dust.	Respiratory Protection: Can use air purifying respirator with an organic vapor cartridge for concentrations up to 75 mg/m^3. Airborne concentrations above this level use an airline respirator or SCBA. Recommended Gloves: Impermeable gloves suitable to prevent skin contact. Nitrile gloves have been selected for most other applications.	Boiling Pt: Not available Melting Pt: 530°F; 276.7°C Freezing Pt: Not available Solubility: Not available Specific Gravity: Not available Vapor Pressure: Not available Flash Pt: Not available LEL: Not available UEL: Not available Incompatibles: Not available Appearance: White powder	Routes of exposure: Inhalation, ingestion, and skin and eye contact. Signs and symptoms of overexposure will be similar to those specified for RDX.
Dinitrotoluene This substance has been identified at Site 53 in measurable concentrations within the soils.	25321-14-6	Particulate form unable to be detected by PID/FID.	Particulate Filter/Tenax tube; GC-TCA with explosives packages. Sampling and analytical protocol in accordance with OSHA Method #44.	OSHA/NIOSH: 1.5 mg/m^3 (skin) ACGIH: 0.15 mg/m^3 (skin) IDLH: 200 mg/m^3	In the particulate form - Can use air purifying respirator with organic vapor cartridge/HEPA up to 50 mg/m^3 Recommended glove: nitrile	Boiling Pt: 572°F; 300°C Melting Pt: 158°F; 70°C Solubility: Insoluble Flash Pt: 404°F;207°C LEL/LFL: Not available UEL/UFL: Not available, however, airborne in the form of a dust this substance will support combustion Vapor Density: 6.27 Vapor Pressure: 1 mmHg Specific Gravity: 1.32 Incompatibilities: Strong oxidizers, caustics, metals such as tin and zinc Appearance and Odor: Orange to yellow crystalline solid with characteristic odor.	Overexposure to this substance may result in anemia, methemoglobinemia, cyanosis, kidney and liver damage. This substance may result in an irritant and possible allergic reaction.
Nitrocellulose (NC) Synonyms: Pyroxylin Plastics Cellulose Nitrate Cellulose Tetranitrate This substance has been identified at Site 39 in measurable concentrations within soils and sediments.	9004-70-0	Particulate form - unable to be detected by the PID or FID.	None found.	None established	Extremely flammable Burns rapidly with extreme heat Deteriorates rapidly in the presence of moisture. Recommended gloves: Impermeable work gloves (Note: Nitrile has been selected as the predominant glove of choice for the other tasks.)	Boiling Pt: Not available Melting Pt: Not available Detonation Pt: 446°F; 230°C Solubility: Insoluble Specific Gravity: Not available TDP: Toxic fumes of Nox Vapor Density: Negligible Vapor Pressure: Negligible Flash Pt: 55°F; 13°C LEL: Not available UEL: Not available Incompatibles: Not available Appearance and odor: White fibers	Excessive airborne concentrations may react similar to that of nuisance dust. This would include difficulty in breathing, coughing, sneezing, tightness in the chest, increased sputum production. No chronic effects known.

TABLE 6-1

CHEMICAL, PHYSICAL, AND TOXICOLOGICAL DATA

Substance	CAS No.	Air Monitoring/Sampling Information		Exposure Limits	Warning Property Rating	Physical Properties	Health Hazard Information
Nitroglycerine (NG) Synonyms: Blasting gelatin; Glyceryl Trinitrate, solution up to 10% in alcohol Nitroglycerin liquid; Desensitized; Nitroglycerin, Liquid Not desensitized This substance has been identified at Site 53 in measurable concentrations within soils and sediments.	55-63-0	No information found	Tenax GC tubes; ethanol desorption; GC/ECD detection. Sampling and analytical protocol in accordance with NIOSH Method #2507.	OSHA: 0.1 mg/m^3 (skin) ACGIH: 0.48 mg/m^3 (skin) NIOSH: 0.1 mg/m^3 (ceiling); (skin) IDLH: 75 mg/m^3	Air purifying respirators are recommended for escape purposes only. Recommended Gloves: Gloves suitable to prevent skin contact. Natural rubber or Nitrile rubber recommended for incidental contact.	Boiling Pt: 498.8°F; 258°C (decomposes 122°F-140°F; 50-80°C) Melting Pt: 44.8°F; 7°C Freezing Pt: 56°F; 13°C Detonation Pt: 424.4°F; 218°C Solubility: 0.1% Specific Gravity: 1.60 Vapor Density: 7.84 Vapor Pressure: 0.0003 mm Flash Pt: Explodes at 500°F; 258°C LEL: Unknown UEL: Unknown Incompatibles: Heat, ozone, shock, UV radiation, and acids Appearance: Colorless to pale yellow viscous liquid or solid with a sweet taste	Routes of exposure: Inhalation, ingestion, absorption, and contact. The following symptoms may be experienced resulting from exposure to nitroglycerine or its intermediates. The severity of the effect will depend on the concentrations, duration, and frequency of exposure. Severe headaches, nausea, vomiting, abdominal cramps, confusion, delirium, altered heart rhythm, dyspnea (potentially respiratory paralysis), methemoglobinemia, and cyanosis may result from overexposure to this material. This material will also cause skin irritation and possibly a rash. Chronic Toxicity: Severe headaches, hallucinations, and skin rashes. NOTE: Alcohol may aggravate and intensify the symptoms.
Nitroguanidine (NQ) Synonyms: Nitroguanidine, containing less than 20% water; Nitroguanidine dry; Picrite This substance has been identified in measurable concentrations at Site 39 within soils and sediments.	556-88-7	No information found	None established	None established	This material will be in the form of a particulate under ambient temperatures. As there is no suitable way to determine its presence through warning properties or monitoring instruments, a general approach will be to control all particulate emissions and hence control potential exposures to this compound. Not very sensitive to shock or impact. Recommended Gloves: Gloves suitable to prevent skin contact. Natural rubber or Nitrile rubber recommended for incidental contact.	Boiling Pt: Decomposes at 437°F; 225°C Melting Pt: 450°F; 232°C Solubility: Yes, in hot water Specific Gravity: Not available Vapor Density: 3.6 Vapor Pressure: Negligible Flash Pt: Not available LEL: Not available UEL: Not available Incompatibles: oxidizers Appearance and Odor: White, fiber-like crystals	Routes of exposure: inhalation, absorption, and ingestion. The following symptoms may be experienced resulting from exposure to Nitroguanidine or its intermediates. The severity of the effect will depend on the concentrations, duration, and frequency of exposure. Acute Toxicity: CNS depression Chronic Toxicity: Chronic exposure may cause poison by intraperitoneal route, mutagenic effects, anemia, moderate cyanosis, dizziness, headache, and insomnia. *based on general amine exposure

TABLE 6-1

CHEMICAL, PHYSICAL, AND TOXICOLOGICAL DATA

Substance	CAS No.	Air Monitoring/Sampling Information		Exposure Limits	Warning Property Rating	Physical Properties	Health Hazard Information
Nitrotoluene This substance has been identified in measurable concentrations at Site 53 within soils and sediments.	o-88-72-2 m-99-08-1 p-99-99-0	PID: Ionization potential - 9.43 - 9.50 eV, relative response ratio unknown FID: Relative response ratio is unknown it is estimated that the response will be slightly less than benzene (150%) or toluene (110%).	Air sample using silica gel capture media; methanol desorption; GC/FID detection; Sampling and analytical protocol in accordance with NIOSH Method #2005.	NIOSH; ACGIH: 2 ppm OSHA: 5 ppm (skin) IDLH: 200 ppm	Adequate - Odor threshold 0.03 - 0.05 ppm. The use of air-purifying respirators with organic vapor cartridge/HEPA filter up to 20 ppm (Half-face); <200 ppm (full-face), providing cartridges are changed at the beginning of each shift. Recommended gloves: Butyl - >8.00 - >23.00 hrs; PV Alcohol >8.00 - >18.00 hrs; Silver shield >8.00 hrs; Nitrile 0.48 hrs	Boiling Pt: o-432°F, 222°C; m-450°F, 232°C; p-460°F, 237°C Melting Pt: o-25°F, -4°C; m-59°F, 15°C; p-126°F,52°C Solubility: 0.04% - 0.07% in water Flash Pt: 223°F; 108°C LEL/LFL: o-2.2%; m-,p-1.8% UEL/UFL: Not available Density: o-,m-1.18; p-1.12 Vapor Density: 4.72 Vapor Pressure: 0.1 mmHg Specific Gravity: o-,m-1.18; p-1.12 Incompatibilities: Strong oxidizers, sulphuric acid Appearance and Odor: Yellow liquid with a weak aromatic odor.	Topically this material is a skin and eye irritant. Systemically, overexposure can result in anoxia, cyanosis, headache, weakness, difficulty in breathing, loss of muscular coordination, accelerated heart rate, and possible nausea and vomiting. Repeated or prolonged exposure to the skin may result in dermatitis.
Phenanthrene This substance has been identified within measurable concentrations at Site 41 and 47 within soils and sediments.	85-01-8	Ionization potential for this compound is unknown. This material is combustible however the relative response ratio concerning FID detection is unknown.	Air sample using glass fiber filter, 37 mm cassette with pore size ranging from 0.8 to 1.0 microns in size; Gravimetric or HPLC-UV detection; Sampling and analytical protocol in accordance with OSHA Method #58.	It is recommended that 0.2 mg/m^3 for coal tar pitch volatiles be employed where excessive airborne concentrations may exist. This is more relevant for those PAHs considered carcinogenic. This substance is considered questionable regarding carcinogenic potential.	Information regarding this substance was limited. This material is a natural constituent of coal tar. Adequate - Odor threshold 0.055-0.060 ppm. OSHA accepts the use of air-purifying respirators with organic vapor cartridge up to 10 ppm, providing cartridges are changed at the beginning of each shift. Recommended gloves: Butyl - >8.00 hrs; are recommended for other coal tar pitch associated substances; Neoprene >4.00 hrs; Nitrile >1.00 hrs	Boiling Pt: 644°F; 340°C Melting Pt: 212°F; 100°C Solubility: Insoluble in water Flash Pt: Not available LEL/LFL: Not available UEL/UFL: Not available Density: 1.179 @ 77°F; 25°C Vapor Density: 6.14 Vapor Pressure: 1 mmHg @ 245°F; 118.3°C Specific Gravity: 1.025 Incompatibilities: Strong oxidizers, alkalis, and acids. Appearance and Odor: Colorless leaflets with a burnt acrid odor.	Overexposure to this substance has shown to be a skin, eye, and mucous membrane irritant. This substance is considered a photosensitizer and mild allergen. This substance is considered mildly to moderately toxic by ingestion.
2,4,6-Trinitrotoluene (TNT) Synonyms: Trinitrotoluene (dry) This substance has been identified within measurable concentrations at Site 53 within soils and sediments.	118-96-7	PID: Ionization Potential - 10.59 eV, relative response ratio is unknown. FID: Relative response ratio is unknown it is estimated that the response will be slightly less than benzene (150%) or toluene (110%).	Air sample using a Tenax GC tube; Acetone desorption; GC/TEA detection. Sample and analytical protocol in accordance with OSHA Method #44.	OSHA: 1.5 mg/m^3 (skin) ACGIH: 0.5 mg/m^3 (skin) NIOSH: 0.5 mg/m^3 (skin)	Rapid heating to 486°F; 240°C will cause detonation. Pale yellow crystals, subject to detonation by exposure to shock or temperatures exceeding 486°F; 240°C. Air purifying respirators recommended for escape purposes only. Recommended Gloves: Any glove which is impermeable to contact.	Boiling Pt: 486°F; 240°C Melting Pt: 176°F; 800C Detonation Pt: 464°F; 240°C Solubility: 0.01% at 75°F; 25°C Specific Gravity: 1.65 Vapor Density: 7.8 Vapor Pressure: 0.057 mmHg @ 178°F; 81°C Flash Pt: Explodes 842°F; 450°C LEL: Not available UEL: Not available Incompatibles: Strong oxidizers, ammonia, combustible materials, and heat. Appearance and odor: Colorless to light yellow solid or crushed flakes.	Routes of Exposure: Inhalation, absorption, ingestion, and skin & eye contact. The following symptoms may be experienced: Sneezing, coughing, sore throat, muscle pain, peripheral nerve sensitization, and irritation of the skin and mucous membranes. Chronic exposure may cause liver damage, jaundice, cyanosis, kidney damage, anemia, cataract, leukocytosis.

TABLE 6-1

CHEMICAL, PHYSICAL, AND TOXICOLOGICAL DATA

Substance	CAS No.	Air Monitoring/Sampling Information		Exposure Limits	Warning Property Rating	Physical Properties	Health Hazard Information
Aluminum This substance has been identified within measurable concentrations at Sites 41, 42, and 58 within the groundwater.	7429-90-5	Particulate form - unable to be detected by PID/FID.	Air sample using a cellulose ester membrane filter (particulate filter); atomic absorption (Method #7013) or ICP (Method #7300). Sampling and analytical protocol shall proceed in accordance with NIOSH Methods #7013 and #7300 as applicable.	OSHA: 15 mg/m^3 Total dust, 5 mg/m^3 Respirable fraction NIOSH: 10 mg/m^3 Total dust, 5 mg/m^3 Respirable fraction ACGIH: 10 mg/m^3	Particulate form - No identifiable warning properties to indicate presence and thereby detection. Employ air purifying respiratory protection suitable for dust and fume. Organic vapor acid gases with HEPA filter. Recommended gloves: This is in the particulate form. Therefore any glove suitable to prevent skin contact (Nitrile has been the one most widely used for the other substances).	Boiling Pt: 4452°F; 2450°C Melting Pt: 1220°F; 660°C Solubility: Insoluble Flash Pt: Nonflammable LEL/LFL: Nonflammable UEL/UFL: Nonflammable It should be noted that finely divided powders or dust when airborne becomes moderately flammable/explosive when exposed to heat, flame, or powerful oxidizers. Vapor Density: Not available Vapor Pressure: 1 mmHg @ 2343°F; 1284°C Specific Gravity: 2.702 @ 77°F; 25°C Incompatibles: Acids, alkalis, oxidizers, halogens and halocarbons, alcohols Appearance and odor: silvery grey ductile, lustrous metal.	Inhalation of finely divided powders or dusts may result in difficulty in breathing, coughing, and has been reported to cause pulmonary fibrosis. This malady known as "Shavers disease" is a form of benign pneumoconiosis.
Arsenic This substance has been identified within measurable concentrations at Sites 12, 41, 46, 49, and 50 within the groundwater.	7440-38-2	Particulate form - This substance is unable to be detected by PID/FID.	Air sample using a particulate filter, acid desorption; AAS detection. Sampling and analytical protocol shall proceed in accordance with NIOSH Method #7900.	OSHA: Organic compounds 0.5 mg/m^3 Inorganic compounds 0.01 mg/m^3 NIOSH: (Ceiling) 0.002 mg/m^3 ACGIH: 0.2 mg/m^3 IDLH: 5 mg/m^3 as arsenic	No identifiable warning properties to indicate presence and thereby detection. Recommended APR Cartridge: Suitable for dust and fume. Organic vapor acid gases with HEPA filter. This substance may be presented as a pesticide, therefore a cartridge suitable for pesticides (MSA-GMP). Recommended Gloves: This is in the particulate form. Therefore any glove suitable to prevent skin contact (Nitrile has been the one most widely used for the other substances).	Boiling Pt: sublimation @ 1134°F; 612°C Melting Pt: 1497°F; 814°C @ 36 atm Solubility: Insoluble in water; soluble in nitric acid Flash Pt: Nonflammable, however, airborne in the form of a dust this substance will support combustion LEL/LFL: Nonflammable UEL/UFL: Nonflammable Vapor Density: Not available Vapor Pressure: 1 mmHg @ 372°C (sublimes) Specific Gravity: 5.73 Incompatibilities: Oxidizers, halogens, zinc, lithium, azides, and acetylides Appearance and odor: Gray to black, brittle, crystalline, amorphous, odorless.	Overexposure to this substance through inhalation or ingestion may result in ulceration of the nasal septum, GI disturbances resulting in violent purging and vomiting, hoarse voice, sore throat, excessive salivation, peripheral neuropathy (numbness and burning sensations beginning at the extremities followed by motor weakness), respiratory irritation leading to possible pulmonary edema. Skin or eye contact may result in irritation, conjunctiva, dermatitis, and hyperpigmentation (darkening of the areas exposed) of the skin. This substance has been judged to be a Human carcinogen by NTP, and IARC.

TABLE 6-1

CHEMICAL, PHYSICAL, AND TOXICOLOGICAL DATA

Substance	CAS No.	Air Monitoring/Sampling Information		Exposure Limits	Warning Property Rating	Physical Properties	Health Hazard Information
Beryllium This substance has been identified within measurable concentrations at Sites 41 and 42 within the groundwater.	7440-41-7 as Be	Particulate form - This substance is unable to be detected by PID/FID.	Air sample using a particulate filter; acid desorption; AAS/GF detection. Sampling and analytical protocol shall proceed in accordance with NIOSH Method #7102.	OSHA: 0.002 mg/m^3, (Ceiling) 0.005 mg/m^3 NIOSH: 0.0005 mg/m^3 ACGIH: 0.002 mg/m^3	No identifiable warning properties to indicate presence and thereby detection. Recommended APR Cartridge: Suitable for dust and fume. Organic vapor acid gases with HEPA filter. Recommended gloves: This is in the particulate form. Therefore any glove suitable to prevent skin contact (Nitrile has been the one most widely used for the other substances).	Boiling Pt: 5378°F; 2970°C Melting Pt: 2332°F; 1278°C Solubility: Insoluble Flash Pt: Not available (Airborne dust may burn or explode when exposed to heat, flame, or incompatible chemicals) LEL/LFL: Not available UEL/UFL: Not available Vapor Density: Not available Vapor Pressure: 0 mmHg Specific Gravity: 1.85 Incompatibilities: Halocarbons, strong oxidizers, acids and caustics Appearance and odor: gray to white hard light metal, brittle.	Overexposure to this substance may result in respiratory symptoms including difficulty in breathing, coughing, rales, chest pain, possibly pulmonary edema, weakness, fatigue, headache, weight loss. Direct contact may result in irritant action on the skin (dermatitis), eyes (conjunctivae), and mucous membranes. This substance has been identified as a potential human carcinogen.
Cadmium This substance has been identified within measurable concentraitons at Sites 41, 45, 46, 47, 49 and 50 within sediments and soils.	7440-43-9	Particulate Form - Unable to be easily detected by PID or FID.	Air sample using a mixed cellulose ester filter / acid desorption and analysis by atomic absorption-flame. Sampling and analytical protocol shall proceed in accordance with NIOSH Method #7300 or #7048.	OSHA: 2 $\mu g/m^3$ (0.002 mg/m^3) ACGIH: 0.01 mg/m^3 (total particulate); 0.002 mg/m^3 (respirable particulate) IDLH: 9 mg/m3 (as cd)	The use of an air purifying, full face-piece respirator with a high efficiency particulate air filter for concentrations up to 0.25 mg/m^3. Recommended Gloves: This is in particulate form. Therefore any glove suitable to prevent skin contact.	Boiling Pt: 1412°F; 767°C Melting Pt: 610°F; 321°C Solubility: Insoluble Flash Pt: Not applicable (Airborne dust may burn or explode when exposed to heat, flame, or incompatible chemicals) LEL/LFL: Not applicable UEL/UFL: Not applicable Vapor Density: Not available Vapor Pressure: 1 mmHg @ 741°F; 394°C Specific Gravity: 8.65 @ 90°F; 32°C Incompatibilities: Strong oxidizers, elemental sulfur, selenium, tellurium, zinc, nitric acid, and hydrazoic acid Appearance and Odor: Metal: Silver-white, blue-tinged lustrous, odorless solid. Fume: yellow-brown, finely divided particulate dispersed in air.	Overexposure to this substance may result in irritation to the respiratory tract, dyspnea, tightness in the chest, coughing, possibly pulmonary edema. Overexposure to fumes causes symptoms characteristic of the flu (headaches, chills, muscle aches, nausea, vomiting, diarrhea). Chronic exposure may result in damage to the lungs, kidneys and liver. This substance has been identified as a confirmed animal; potential human carcinogen by IARC and NTP.

TABLE 6-1

CHEMICAL, PHYSICAL, AND TOXICOLOGICAL DATA

Substance	CAS No.	Air Monitoring/Sampling Information		Exposure Limits	Warning Property Rating	Physical Properties	Health Hazard Information
Copper This substance has been identified in measurable concentrations at Sites 39, 41, 46, 49, and 50 within the soils, sediments, and at Sites 41, 42 and 58 within groundwater.	7440-50-8 (Cu) 1317-38-0 (CuO)	Substance is not volatile. Unable to be detected by PID or FID.	Air sample using a mixed cellulose ester filter; inductively coupled plasma/atomic emission spectroscopy. Sampling and analytical protocol shall proceed in accordance with NIOSH Method #7300.	NIOSH; OSHA: 0.10 mg/m^3 ACGIH: 0.2 mg/m^3	The use of an air-purifying full-face respirator with a high efficiency particulate air filter. Recommended gloves: This is in the particulate form. Therefore any glove suitable to prevent skin contact (Nitrile has been the one most widely used for the other substances).	Boiling Pt: 4215°F; 2324°C Melting Pt: 1981°F; 1083°C Solubility: Insoluble Flash Pt: Not applicable (Airborne dust may burn or explode when exposed to heat, flame, or incompatible chemicals) LEL/LFL: Not applicable UEL/UFL: Not applicable Vapor Density: Not available Vapor Pressure: 1 mmHg @ 2962°F; 1628°C Specific Gravity: 8.94 Incompatibilities: Oxidizers, alkalis, sodium azide, acetylene, bromates, chlorates, iodates, and acids. Appearance and Odor: Metal: Reddish, lustrous malleable, odorless solid. Fume: Finely divided black particulate dispersed in air.	Irritation to the nose, throat, and respiratory tract. Metallic taste. Discoloration of skin (potential dermatitis) and hair. Chronic exposure may result in dermatitis and damage to the liver and kidneys. Overexposure to fumes causes symptoms characteristic of the flu (headaches, chills, muscle aches, nausea, vomiting, diarrhea). Ingestion may cause burning in the mouth, throat, and stomach. Metallic taste with colicky abdominal pain. Individuals with Wilson's disease are at greater risk of chronic exposure as a result of the bodies tendency to absorb and retain copper.
Lead This substance has been identified within measurable concentrations at Sites 39, 41, 46, 47, 49 and 50 within soils, sediments and at Sites 41 and 42 within the groundwater.	7439-92-1	Particulate form. Unable to be detected by either PID or FID.	Air sample using a mixed cellulose ester filter; or HNO_3 or H_2O_2 desorption; or Atomic absorption detection. Sampling and analytical protocol shall proceed in accordance with NIOSH Method #7082 or #7300.	OSHA: 0.05 mg/m^3 ACGIH: 0.15 mg/m^3 NIOSH: 0.10 mg/m^3 IDLH: 100 mg/m^3 as lead	The use of a air purifying, full-face respirator with high efficiency particulate air filter for up to 2.5 mg/m^3. Recommended gloves: This is in the particulate form. Therefore any glove suitable to prevent skin contact (Nitrile has been the one most widely used for the other substances).	Boiling Pt: 3164°F; 1740°C Melting Pt: 621°F; 327°C Solubility: Insoluble Flash Pt: Not applicable (Airborne dust may burn or explode when exposed to heat, flame, or incompatible chemicals) LEL/LFL: Not applicable UEL/UFL: Not applicable Vapor Density: Not available Vapor Pressure: 0 mmHg Specific Gravity: 11.34 Incompatibilities: Strong oxidizers, peroxides, sodium acetylide, zirconium, and acids Appearance and Odor: Metal: A heavy ductile, soft gray solid.	Overexposure to this substance via ingestion or inhalation may result in metallic taste in the mouth, dry throat, thirst, Gastrointestinal disorders (burning stomach pain, nausea, vomiting, possible diarrhea sometimes bloody or black, accompanied by severe bouts of colic), CNS effects (muscular weakness, pain, cramps; headaches, insomnia, depression, partial paralysis possibly coma and death. Extended exposure may result in damage to the kidneys, gingival lead line, brain, and anemia.

TABLE 6-1

CHEMICAL, PHYSICAL, AND TOXICOLOGICAL DATA

Substance	CAS No.	Air Monitoring/Sampling Information		Exposure Limits	Warning Property Rating	Physical Properties	Health Hazard Information
Manganese This substance has been identified within measurable concentrations at Sites 39, 41, 46, 47, 49 and 50 within soils, sediments, and at Sites 41, 42, and 56 within the groundwater.	7439-96-5 as Mn	Particulate form - This substance is unable to be detected by PID/FID.	Air sample using particulate filter; acid desorption, ICP detection. Sampling and analytical protocol shall proceed in accordance with NIOSH Method #7300.	OSHA: Ceiling 5 mg/m^3 as a fume 1 mg/m^3 NIOSH: 1 mg/m^3 for dust and fume; 3 mg/m^3 as a STEL ACGIH: 5 mg/m^3 for dust; 1 mg/m^3 for fume IDLH: 500 mg/m^3	No identifiable warning properties to indicate presence and thereby detection. Recommended APR Cartridge: Suitable for dust and fume. Organic vapor acid gases with HEPA filter. Recommended gloves: This is in the particulate form. Therefore any glove suitable to prevent skin contact (Nitrile has been the one most widely used for the other substances).	Boiling Pt: 3452°F; 1900°C Melting Pt: 2300°F; 1260°C Solubility: Insoluble Flash Pt: Not available (Airborne dust may burn or explode when exposed to heat, flame, or incompatible chemicals. This substance is considered a combustible solid.) LEL/LFL: Not available UEL/UFL: Not available Vapor Density: Not available Vapor Pressure: 1 mmHg @ 2358°F; 1292°C Specific Gravity: 7.20 Incompatibilities: Strong oxidizers, halogens, and nitrates. Will react with water to produce hydrogen gas. Appearance and odor: Silvery solid or reddish-grey, odorless	Overexposure to this product may result in Central Nervous System and pulmonary effects by inhalation. Symptoms may include disturbances in gait and speech, sleepiness, mental confusion, stolid, masklike face, muscular twitching varying from tremors to coarse rhythmical movements of the extremities accompanied by cramps. Symptoms are described as postencephalitic Parkinsonism. Additionally dry throat, tightness in the chest, dyspnea, rales, flu-like symptoms low back pain, and vomiting.
Mercury This substance has been identified within measurable concentrations at Sites 39, 41, 46, 47, 49, 50, 53, 54, and 55 within soils, sediments, and at Sites 41 and 42 within the groundwater.	7439-97-6	Jerome Mercury Vapor Analyzer This substance is unable to be detected by PID/FID.	Air sample using Hydrar® sorbent tube; acid desorption; AA cold detection. Sampling and analytical protocol shall proceed in accordance with NIOSH Method #6009.	OSHA, NIOSH, ACGIH: as alkyl compounds 0.01 mg/m^3; STEL 0.03 mg/m^3 IDLH: 10 mg/m^3	No identifiable warning properties to indicate presence and thereby detection. Recommended APR Cartridge: Suitable for Metallic mercury with HEPA filter. Preferably, with an end-of-service life indicator. Recommended gloves: Rubber gloves	Boiling Pt: 674°F; 356.9°C Melting Pt: -38°F; -38.89°C Solubility: Insoluble Flash Pt: Not available. LEL/LFL: Not available UEL/UFL: Not available Vapor Density: Not available Vapor Pressure: 0.0012 mmHg @ 77°F; 25°C Specific Gravity: 13.6 Incompatibilities: Acetylene, ammonia, chlorine dioxide, azides, calcium, sodium carbide, lithium, rubidium, and copper. Appearance and odor: Silvery-white heavy mobile liquid, odorless	This substance is corrosive to all points of contact. Systemic symptoms include irritability, wakefulness, muscle weakness and tremors, increased reflexes, gingivitis, anorexia, headache, tinnitus, hypermobility, GI disturbances (nausea, vomiting), diarrhea (sometimes bloody), liver changes, dermatitis, and fever. Symptoms experienced via inhalation include to those above coughing, chest pain, dyspnea, bronchial pneumonitis, and excessive salivation.

TABLE 6-1

CHEMICAL, PHYSICAL, AND TOXICOLOGICAL DATA

Substance	CAS No.	Air Monitoring/Sampling Information		Exposure Limits	Warning Property Rating	Physical Properties	Health Hazard Information
Nickel This substance has been identified within measurable concentrations at Sites 39, 41, 46, and 49 for soils and sediment. No groundwater	7440-02-0	Particulate form This substance is unable to be detected by PID/FID.	Air sample using particulate filter; acid desorption; ICP detection. Sampling and analytical protocol shall proceed in accordance with NIOSH Method #7300.	OSHA: as Ni metal and insoluble compounds 1 mg/m^3 NIOSH: 0.015 mg/m^3 ACGIH: 0.05 mg/m^3 IDLH: 10 mg/m^3	No identifiable warning properties to indicate presence and thereby detection. Recommended APR Cartridge: Suitable for dust and fume. Organic vapor acid gases with HEPA filter. Recommended gloves: This material is in the particulate form. Therefore any glove suitable to prevent skin contact (Nitrile has been the one most widely used for the other substances).	Boiling Pt: 4946°F; 2730°C Melting Pt: 2651°F; 1455°C Solubility: Insoluble acid Flash Pt: Not available(Airborne dust may burn or explode when exposed to heat, flame, or incompatible chemicals) LEL/LFL: Not available UEL/UFL: Not available Vapor Density: Not available Vapor Pressure: 1 mmHg @ 3290°F; 1810°C Specific Gravity: 8.90 Incompatibilities: Strong acids, halogens, sulfur, wood and other combustibles, nickel nitrate, and oxidizers Appearance and odor: Silvery white, hard, malleable ductile metal, odorless	Symptoms of overexposure to this product may include headaches, vertigo, delirium, extreme weakness, GI disturbance and pain including nausea vomiting and diarrhea, coughing, hyperpnea, cyanosis, weakness, allergic dermatitis, nickel itch, pulmonary asthma, chest pains tightness, dyspnea, dry cough, and conjunctivitis. This substance has been identified as a Human carcinogen by NTP and IARC.
Silver This substance has been identified within measurable concentrations at Sites 39, 41, 45, 46, 47, 49, and 53 within soils, sediments, and at Site 41 within the groundwater.	7440-22-4	Particulate form - Unable to be detected by PID or FID.	Air sample using a mixed cellulose ester filter; acid desorption; Atomic absorption or plasma emission spectroscopy detection. Sampling and analytical protocol shall proceed in accordance with NIOSH Method #5(a182), or OSHA Method #ID121.	NIOSH; OSHA; ACGIH: 0.01 mg/m^3	No identifiable warning properties to indicate presence and thereby detection. The use of a air purifying, full-face respirator with a high efficiency particulate air filter. Recommended gloves: This is in the particulate form. Therefore any glove suitable to prevent skin contact (Nitrile has been the one most widely used for the other substances).	Boiling Pt: 4014°F; 2212°C Melting Pt: 1764°F; 962°C Solubility: Insoluble Flash Pt: Not applicable (Airborne dust may burn or explode when exposed to heat, flame, or incompatible chemicals) LEL/LFL: Not applicable UEL/UFL: Not applicable Vapor Density: Not available Vapor Pressure: 0 mmHg Specific Gravity: 10.49 Incompatibilities: Acetylene, acetylene compounds, ammonia, peroxides, bromoazide, chlorine, trifluoride, ethylene imine, oxalic acid, nitric acid, and tartaric acid Appearance and Odor: Metal: white lustrous solid.	Overexposure to this substance may result in gastrointestinal, upper respiratory, and skin irritation. Discoloration of the eyes, skin and hair.

TABLE 6-1

CHEMICAL, PHYSICAL, AND TOXICOLOGICAL DATA

Substance	CAS No.	Air Monitoring/Sampling Information		Exposure Limits	Warning Property Rating	Physical Properties	Health Hazard Information
Zinc This substance has been identified within measurable concentrations at Sites 39, 41, 46, 49, and 50 within soils, sediments, and at Site 41 within the groundwater.	7440-66-6	Particulate form - This substance is not detectable using a PID or FID.	Air sample using a particulate filter, acid desorption; AAS detection. Sampling and analytical protocol will proceed in accordance with NIOSH Method #7300.	OSHA: 10 mg/m^3 Total dust, 5 mg/m^3 Respirable fraction NIOSH: 5 mg/m^3, 15 mg/m^3 (Ceiling) ACGIH: 10 mg/m^3	No identifiable warning properties to indicate presence and thereby detection. Recommended APR Cartridge: Suitable for dust and fume. Organic vapor acid gases with HEPA filter. Recommended gloves: This is in the particulate form. Therefore any glove suitable to prevent skin contact (Nitrile has been the one most widely used for the other substances).	Boiling Pt: 1666°F; 908°C Melting Pt: 788°F; 419.8°C Solubility: Insoluble Flash Pt: Not available (Airborne dust may burn or explode when exposed to heat, flame, or incompatible chemicals) LEL/LFL: Not available UEL/UFL: Not available Vapor Density: Not available Vapor Pressure: 0 mmHg Specific Gravity: 7.14 Incompatibilities: Strong acids, halogens, catalytic metals, combustibles, oxidizers, nitryl fluoride Appearance and odor: Bluish-white, lustrous metal, odorless	Inhalation of fumes may result in metal fume fever. This condition is characterized by metallic taste, dryness of the throat, coughing with generalized aching and flu-like symptoms. Effects through ingestion may include coughing, difficulty in breathing, and sweating. A human skin irritant. Irritation to the eyes may result from mechanical action.
DDT and the major metabolites; DDD and DDE. These substances have been identified within measurable concentrations at Site 41 within soils, sediments, and groundwater.	50-29-3 72-54-8 72-55-9	Substance is not volatile, I.P. is unknown, detection by PID is unknown. Substance non-combustible, therefore a FID is anticipated to have reduced response to DDT.	Air sample using a binder free, glass fiber filter; isoctane desorption; gas chromatography-electron capture detector. Sampling and analytical protocol will proceed in accordance with NIOSH Method #3(S274).	OSHA; ACGIH: 1 mg/m^3 NIOSH: 0.5 mg/m^3	Adequate - Can use air purifying respirator with high efficiency particulate air filter (HEPA). Recommended glove: Nitrile acceptable for incidental contact.	Boiling Pt: 230°F; 110°C Melting Pt: 226°F; 108°C Solubility: Insoluble Flash Pt: 162-171°F; 72-77°C LEL/LFL: Not available UEL/UFL: Not available Vapor Density: Not available Vapor Pressure: Low Specific Gravity: 0.99 Incompatibilities: Strong oxidizers and alkalis Appearance and Odor: Colorless crystals or off-white powder with a slight aromatic odor	Large doses are followed by vomiting due to gastric irritation, diarrhea may follow. Numbness and paresthesias of the lips tongue and face associated with malaise, headache, sorethroat, fatigue and weakness. Coarse tremors (usually first of the neck, head, and eyelids). This may be accompanied by confusion, apprehension, and depression. Convulsions may result and death may occur from respiratory failure. DDT is absorbed and retained in the fat of humans. Chronic exposure may result in damage to the liver, kidneys and Peripheral Nervous System. DDT is recognized as possessing carcinogenic properties by IARC and NTP.
Benzo(a)pyrene This substance has been identified within measurable concentrations at Sites 41 and 47 within soils and sediments.	50-32-8	Particulate form - This substance is not detectable using a PID or FID.	Air sample using a glass fiber or silver membrane filter; analysis by gas chromatography/infrared or other spectrophotometric method or colorimeter. Sampling and analytical protocol shall proceed in accordance with NIOSH Method #1(186).	OSHA: 0.2 mg/m^3 NIOSH: 0.1 mg/m^3	Adequate - use a full-face air-purifying respirator with dust/mist cartridge up to 10 mg/m^3. Recommended glove: Nitrile	Boiling Pt: 594°F; 312°C Melting Pt: 354°F; 179°C Solubility: Insoluble Flash Pt: Not available LEL/LFL: Not available UEL/UFL: Not available Vapor Density: Not available Vapor Pressure: 10 mmHg @ 594°F; 312°C Specific Gravity: Not available Incompatibilities: Not available Appearance and Odor: Yellow odorless crystals.	Regulated primarily as a result of potential carcinogenic properties. Listed by NTP, IARC, and ACGIH as carcinogenic.

TABLE 6-1

CHEMICAL, PHYSICAL, AND TOXICOLOGICAL DATA

Substance	CAS No.	Air Monitoring/Sampling Information		Exposure Limits	Warning Property Rating	Physical Properties	Health Hazard Information
Bis(2-ethylhexyl) phthalate This substance has been identified within measurable concentrations at Sites 42 and 58 in the groundwater.	117-81-7	No information found This is a combustible liquid therefore the FID should detect it however the relative response ratio is unknown.	Particulate filter; carbon disulfide desorption; GC/FID detection. Sampling and analytical protocol shall proceed in accordance with NIOSH Method #5020.	NIOSH; ACGIH: 5 mg/m^3, STEL 10 mg/m^3 OSHA: 5 mg/m^3 IDLH: 5000 mg/m^3	Irritating, tingling sensation. Recommended APR Cartridge: Organic vapor acid gases with HEPA filter. Recommended gloves: Nitrile >8.00 hrs has been the one most widely used for the other substances and is acceptable for this substance. Other options include butyl rubber >8.00 hrs or neoprene >8.00 hrs	Boiling Pt: 680°F; 386°C Melting Pt: freezes 6.8°F; -14°C Solubility: insoluble Flash Pt: 419°F; 215°C LEL/LFL: 0.3% @ 473°F; 245°C UEL/UFL: Not available Vapor Density: Not available Vapor Pressure: <0.01 mm Specific Gravity: 0.99 Incompatibilities: Nitrates, strong oxidizers, acids, and caustics. Appearance and odor: Colorless, oily liquid, odorless	This substance is a mild skin, eye, mucous membrane irritant, and mild gastric disturbance. In test animals liver damage and teratogenic effects have been noted.
Creosote / cresol (Fluoranthene, pyrene) These substances have been identified in measurable concentrations at Sites 41 and 47 within the soils and sediments.	8001-58-9 1319-77-3 (206-44-0)	PID: I.P. of 8.97 eV, relative response ratio unknown. FID: Response factor unknown but given the substances flammability, detection by FID can be anticipated.	Air sampling for cresol (a major constituent of creosote) by silica gel or xad-7 sorbent tube; Acetone desorption and analysis by gas chromatography flame ionization detector or high pressure liquid chromatography. Sampling and analytical protocol shall be in accordance with NIOSH Method #2001, or OSHA Method #32	OSHA; ACGIH: 5 ppm NIOSH: 2.3 ppm IDLH: 80 mg/m^3	Adequate - use a full-face air-purifying respirator with organic vapor / dust/mist cartridge up to 250 ppm. Odor Threshold of cresol is 0.00005-0.0079 ppm. Recommended gloves: Viton >98.00 hrs; butyl rubber >90.00 hrs; neoprene >4.50 hrs	Boiling Pt: 376-397°F; 191-203°C Melting Pt: 52-98°F; 10.9-35.5°C Solubility: insoluble Flash Pt: 178°F; 81°C LEL/LFL: Not available UEL/UFL: Not available Vapor Density: 3.72 Vapor Pressure: 1 mmHg @ 100-127°F; 38-53°C Specific Gravity: 1.030-1.038 Incompatibilities: Nitric acid, oleum, chlorosulfonic acid, oxidizers Appearance and Odor: Yellowish or colorless, flammable, oily liquid (often brownish because of impurities or oxidation)	Regulated based on effects on central nervous system, and respiratory system. Acute exposures may result in difficulty breathing, respiratory failure and skin and eye burns. Chronic exposure may damage the liver, kidneys, lungs and skin.
Asbestos This substance has been identified at Sites 54 and 55 within building materials, however it is not anticipated that it will impact planned operations.	1332-21-4	Particulate / fibrous form - unable to be detected by PID/FID.	Air sample using particulate filter; analyze using Phase Contrast Microscopy (PCM). Sampling and analytical protocol in accordance with NIOSH Method #7400.	OSHA; NIOSH: 0.1 fiber per cubic centimeter ACGIH: Exposure limits are dependent upon the type of asbestos; range from 0.2 to 2.0 fiber/cc	Unable to be perceived by senses. Requires use of full face air purifying respirator with dual High Efficiency Air Particulate (HEPA) filter in accordance with OSHA standards 29 CFR 1910.1001 and 1926.58.	Boiling Pt: Decomposes Melting Pt: 1112°F; 600°C Solubility: insoluble Flash Pt: Not applicable LEL/LFL: Not applicable UEL/UFL: Not applicable Vapor Density: Not available Vapor Pressure: Not available Specific Gravity: Not available Incompatibilities: None Reported Appearance and odor: White or greenish (chrysotile), blue (crocidolite), or gray-green (amosite) fibrous, odorless, solids	Exposure may result in difficulty breathing, scaring of the lungs, restricted pulmonary function, and finger clubbing. Asbestos is listed as a carcinogen. Target organ is listed as the lungs.

TABLE 6-1

CHEMICAL, PHYSICAL, AND TOXICOLOGICAL DATA

Substance	CAS No.	Air Monitoring/Sampling Information		Exposure Limits	Warning Property Rating	Physical Properties	Health Hazard Information
Tetrachloroethylene See also Perchloroethylene PERK PCE This substance has been identified within measurable concentrations at Sites 47 and 49 within soils and sediments.	127-18-4	PID: I.P. 9.32 eV, relative response ratio 200% with 10.6 eV lamp. FID: 70% relative response ratio with a FID.	Air sample using charcoal tube, carbon disulfide desorption; GC/FID detection. Sampling and analytical protocol shall proceed in accordance with OSHA Method #07, or NIOSH Method #1003	ACGIH: 25 ppm 100 ppm STEL OSHA: 100 ppm 200 ppm Ceiling; 300 ppm 5-minute max peak in any 3-hr period. IDLH: 150 ppm	Odor threshold for this substance has been determined to be at airborne concentrations of approximately 47 ppm, which is considered adequate. APR with organic vapor/acid gas cartridges should be used for escape purposes only. Exceedances over the recommended exposure limits requires the use of airline or airline/APR combination units. Recommended gloves: Viton, PV alcohol 5-16 hrs; silver shield >8.00 hrs; teflon 10-24 hrs; and Nitrile in that order. The breakthrough time for the nitrile gloves ranges between 1.5 - 5.5 hrs. during complete immersion.	Boiling Pt: 250°F; 121°C Melting Pt: -2°F; 19°C Solubility: 0.02% Flash Pt: Not available LEL/LFL: Not available UEL/UFL: Not available Vapor Density: 5.83 Vapor Pressure: 14 mmHg @ 77°F; 25°C Specific Gravity: 1.62 @ 77°F; 25°C Incompatibilities: Strong oxidizers, alkalis, fuming sulfuric acid, and chemically active metals. When heated to decomposition temperatures will emit toxic fumes of chlorine. Appearance and Odor: Colorless liquid with a mild chloroform like odor.	Overexposure may result in irritation to eyes, nose, throat, and skin. Potential CNS effects including sleepiness, incoordination, headaches, hallucinations, distorted perceptions; and stupor (narcosis). Systemically, symptoms may result in nausea, vomiting, weakness, tremors, and cramps. Chronic exposures may result in dermatitis, enlarged tender liver, kidney, and lung damage. This material is considered a animal carcinogen (liver tumors), however, inadequate evidence exists concerning carcinogenic potential in humans.
Arsenic This is reposted. See previous listing.	7440-38-2	Particulate form This substance is not detectable using a PID or FID.	Sample with a Mixed-cellulose ester (MCE) filter and analyze using inductively coupled plasma / atomic emission spectroscopy in accordance with NIOSH Method 7300.	OSHA: 0.010 mg/m^3 (1910.1018) NIOSH: 0.002 mg/m^3 (Ceiling) ACGIH: 0.010 mg/m^3	The substance will generally be present in a particulate form or bound to particulates. As a result, air purifying respirators equipped with High Efficiency Particulate Air (HEPA) filters are suitable for use. Recommended gloves: Given this chemicals particulate form, any glove material is suitable for protection. Nitrile is the most common glove material.	Boiling Pt: Sublimes Melting Pt: 1135°F; 613°C Solubility: Insoluble Flash Pt: Not available LEL/LFL: Not available UEL/UFL: Not available Vapor Density: Not available Vapor Pressure: 0 mmHg (approx.) Specific Gravity: 5.73 (metal) Incompatibilities: Strong oxidizers, bromine azide. Hydrogen gas can react with inorganic arsenic to form the highly toxic gas arsine. Appearance and Odor: Metal - Silver-grey or tin-white, brittle, odorless solid.	Exposure to arsenic may cause ulceration of the nasal septum, dermatitis, gastrointestinal disturbances, respiratory irritation, hyperpigmentation of the skin, and peripheral neuropathy. Arsenic is recognized as a carcinogen by IARC, NTP, OSHA, and ACGIH. Target organs include the liver, kidneys, skin, lungs, and lymphatic system (lung and lymphatic cancer).

TABLE 6-1

CHEMICAL, PHYSICAL, AND TOXICOLOGICAL DATA

Substance	CAS No.	Air Monitoring/Sampling Information		Exposure Limits	Warning Property Rating	Physical Properties	Health Hazard Information
Butylbenzylphthalate	85-68-7	PID: Ionization potential unknown. FID: This material is combustible, however, the relative response ratio and detection using the FID is unknown.	Particulate filter collection; carbon disulfide desorption; GC/FID detection. Sampling and analytical protocol shall proceed in accordance with NIOSH Method #5020 modified for this substance.	Exposure limits for this compound have not been established by OSHA, NIOSH, or ACGIH.	An air purifying respirator equipped with a organic vapors filter is acceptable. Odor threshold - unknown Recommended gloves: Butyl, nitrile, or neoprene which have demonstrated properties in protecting against phthalates.	Boiling Pt: 698°F; 370°C Melting Pt: <-35°F; <-31°C Solubility: Slight Flash Pt: 390°F; 199°C LEL/LFL: Not available UEL/UFL: Not available Vapor Density: 10.8 Vapor Pressure: 8.6×10^{-8} mmHg @ 68°F; 20°C Specific Gravity: 1.116 @ 77°F; 25°C Incompatibilities: Strong oxidizers, acids, and alkalis Appearance and Odor: Colorless oily liquid with a slight odor.	Overexposure may result in irritation to the eyes, nose, throat, and respiratory system. Dermal contact with concentrated solutions may cause slight irritation, redness and inflammation. Due to the bitter taste this material is sometimes used as a denaturant.

7.0 AIR MONITORING

Monitoring devices such as Direct Reading Instruments (DRIs), may be employed at the site to detect and evaluate the presence of site contaminants and other potentially harmful agents as indicated in Table 6-1. The specific type of monitoring and the associated instruments, frequency of use, and applicable action levels are dependent upon the specific scope of work and the contaminants of concern. As a result, specific air monitoring measures and requirements have been established in Table 5-1 of this site-specific HASP. Additionally, Section 1.0 of the B&R Environmental Health and Safety Guidance Manual contains detailed information regarding direct reading instrumentation and personal and area air sampling procedures, as well as general calibration procedures of various instruments.

It several cases, many of the contaminants of concern are unable to be detected or are difficult to detect with the use of direct reading instruments employed for site operations. In particular, metals, PCBs, and some of the PAHs exhibit poor detection characteristics (i.e., the non photoionizable or non combustible nature of the contaminant). The greatest potential for exposure to these contaminants generally would be as a result of inhalation or ingestion of contaminant laden particulates (dusts). As a result, any observations of airborne particulates will indicate a potential for exposure and shall require control measures such as area wetting. Given the proposed activities, previous sampling data, it is not anticipated that contaminants identified in this HASP will be encountered in any appreciable concentrations. However, as a precaution, contaminants of particular concern have been identified and measures to quantify any positive indications of their presence will be instituted through the use of direct reading instrumentation as stipulated in Table 5-1. Additionally, these potential hazards will be minimized through adherence to the requirements of this HASP (site control measures, decontamination efforts, safe work practices, etc.).

8.0 TRAINING/MEDICAL SURVEILLANCE REQUIREMENTS

8.1 INTRODUCTORY/REFRESHER/SUPERVISORY TRAINING

This section is included to specify health and safety training and medical surveillance requirements for both B&R Environmental and subcontractor personnel participating in on site activities.

8.1.1 Requirements for B&R Environmental Personnel

All B&R Environmental personnel must complete 40 hours of introductory hazardous waste site training prior to performing work at the Indian Head Division, NSWC facility. B&R Environmental personnel who have had introductory training more than 12 months prior to site work must have completed 8 hours of refresher training within the past 12 months before being cleared for site work. In addition, 8-hour supervisory training in accordance with 29 CFR 1910.120(e)(4) will be required for site supervisory personnel.

Documentation of B&R Environmental introductory, supervisory, and refresher training as well as site-specific training will be maintained at the site. Copies of certificates or other official documentation will be used to fulfill this requirement.

B&R Environmental will conduct a brief meeting daily to discuss operations planned for that day and to issue Safe Work Permits (See Section 9.4) for those operations.

8.1.2 Requirements for Subcontractors

Identified B&R Environmental subcontractor personnel must have completed introductory hazardous waste site training or equivalent work experience as defined in OSHA Standard 29 CFR 1910.120(e) and 8 hours of refresher training meeting the requirements of 29 CFR 1910.120(e)(8) prior to performing field work at the NSWC facility. B&R Environmental subcontractors must certify that each employee has had such training by sending B&R Environmental a letter, on company letterhead, containing the information in the example letter provided in Figure 8-1. This letter will be accompanied by training certificates or some other for of official documentation for all subcontractor personnel participating in site activities.

FIGURE 8-1

TRAINING LETTER

The following statements must be typed on company letterhead and signed by an officer of the company and accompanied by copies of personnel training certificates:

LOGO
XYZ CORPORATION
555 E. 5th Street
Nowheresville, Kansas 55555

Month, day, year

Mr. Anthony Klimek, P.E.
Project Manager
B&R Environmental
Foster Plaza 7, 661 Andersen Drive
Pittsburgh, Pennsylvania 15220

Subject: HAZWOPER Training for Indian Head Division, Naval Surface Warfare Center, Indian Head, Maryland

Dear Mr. Klimek:

As an officer of XYZ Corporation, I hereby state that I am aware of the potential hazardous nature of the subject project. I also understand that it is our responsibility to comply with all applicable occupational safety and health regulations, including those stipulated in Title 29 of the Code of Federal Regulations (CFR), Parts 1900 through 1910 and Part 1926.

I also understand that Title 29 CFR 1910.120, entitled "Hazardous Waste Operations and Emergency Response," requires an appropriate level of training for certain employees engaged in hazardous waste operations. In this regard, I hereby state that the following employees have had 40 hours of introductory hazardous waste site training or equivalent work experience as requested by 29 CFR 1910.120(e) and have had 8 hours of refresher training as required by 29 CFR 1910.120(e)(8) and site supervisory personnel have had training in accordance with 29 CFR 1910.120(e)(4).

LIST FULL NAMES OF EMPLOYEES AND THEIR SOCIAL SECURITY NUMBERS HERE.

Should you have any questions, please contact me at (555) 555-5555.

Sincerely,

(Name and Title of Company Officer)

8.2 SITE-SPECIFIC TRAINING

B&R Environmental will provide site-specific training to all B&R Environmental and subcontractor personnel who will perform work on this project. Site-specific training will also be provided to all personnel (DOD, OSHA, EPA, Navy personnel, and other authorized visitors) who may enter the site to perform functions that may or may not be directly related to site operations. Site-specific training will include:

- Names of designated personnel and alternates responsible for site safety and health
- Safety, health, and other hazards present on site
- Use of personal protective equipment
- Work practices to minimize risks from hazards
- Safe use of engineering controls and equipment
- Medical surveillance requirements
- Signs and symptoms of overexposure to site contaminants
- Contents of the Health and Safety Plan
- Emergency response procedures (evacuation and assembly points)
- Spill response procedures
- Review of the contents of relevant Material Safety Data Sheets
- Associated hazards and restricted areas within the NSWC.

Site-specific documentation will be established through the use of Figure 8-2. All site personnel and visitors must sign this document upon receiving site-specific training.

8.3 MEDICAL SURVEILLANCE

8.3.1 Medical Surveillance Requirements for B&R Environmental Personnel

All B&R Environmental personnel participating in project field activities will have had a physical examination meeting the requirements of B&R Environmental's medical surveillance program and will be medically qualified to perform hazardous waste site work using respiratory protection.

Documentation for medical clearances will be maintained in the B&R Environmental Pittsburgh office and made available, as necessary.

FIGURE 8-2

SITE-SPECIFIC TRAINING DOCUMENTATION

My signature below indicates that I am aware of the potential hazardous nature of performing remedial activities at Indian Head Division Naval Surface Warfare Center, Indian Head, Maryland, and that I have received site-specific training which included the elements presented below:

- Names of designated personnel and alternates responsible for site safety and health
- Safety, health, and other hazards present on site
- Use of personal protective equipment
- Work practices to minimize risks from hazards
- Safe use of engineering controls and equipment
- Medical surveillance requirements
- Signs and symptoms of overexposure to site contaminants
- Contents of the Health and Safety Plan
- Emergency response procedures (evacuation and assembly points)
- Spill response procedures
- Review of contents of relevant Material Safety Data Sheets
- Associated hazards and restricted areas within the NSWC.

I further state that I have been given the opportunity to ask questions and that all of my questions have been answered to my satisfaction.

I further state, by the presence of my signature below that, the date of my training (introductory, refresher, and supervisory, as applicable) and my medical surveillance requirements are accurate and correct to the best of my knowledge.

Name	40-Hour General Site Worker Training (Date)	8-Hour Refresher Training (Date)	8-Hour Supervisory Training (Date)	Date of Medical Surveillance	SIGNATURE

8.3.2 Medical Surveillance Requirements for Subcontractors

Identified subcontractors are required to obtain a certificate of their ability to perform hazardous waste site work and to wear respiratory protection. The "Subcontractor Medical Approval Form" provided in Figure 8-3 shall be used to satisfy this requirement, providing it is properly completed and signed by a licensed physician.

Subcontractors who have a company medical surveillance program meeting the requirements of paragraph (f) of OSHA 29 CFR 1910.120 can substitute "Subcontractor Medical Approval Form" with a letter, on company letterhead, containing all of the information in the example letter presented in Figure 8-4 of this HASP.

8.3.3 Requirements for All Field Personnel

Each field team member, including subcontractors and visitors, entering the exclusion zone(s) shall be required to complete and submit a copy of the Medical Data Sheet found in the B&R Environmental Health and Safety Guidance Manual. This shall be provided to the SSO, prior to participating in site activities. The purpose of this document is to provide site personnel and emergency responders with additional information that may be necessary in order to administer medical attention.

8.4 SUBCONTRACTOR EXCEPTIONS

In situations in which the exclusion zone is not entered or when there is no potential for exposure to site contaminants, subcontractor personnel may be exempt from some of the training and medical surveillance requirements. All subcontractors and visiting personnel are required to receive site-specific training (as discussed in Section 8.2) regarding information provided in this HASP. Examples of subcontractors who may be exempt from training and medical surveillance requirements may include surveyors who perform surveying activities in areas were there is no potential for exposure to site contaminants. Typically, surveying activities are performed after intrusive activities are completed. Additionally, surveying activities generally do not require contact with any media that is potentially contaminated.

FIGURE 8-3

SUBCONTRACTOR MEDICAL APPROVAL FORM

For employees of _____
Company Name

Participant Name: _____ Date of Exam: _____

Part A

The above-named individual has:

1. Undergone a physical examination in accordance with OSHA Standard 29 CFR 1910.120, paragraph (f), and was found to be medically -

   ( ) qualified to perform work at the Indian Head Division, Naval Surface Warfare Center work site
   ( ) not qualified to perform work at the Indian Head Division, Naval Surface Warfare Center work site

   and,

2. Undergone a physical examination in accordance with OSHA 29 CFR 1910.134(b)(10) and was found to be medically -

   ( ) qualified to wear respiratory protection
   ( ) not qualified to wear respiratory protection

My evaluation has been based on the following information, as provided to me by the employer.

( ) A copy of OSHA Standard 29 CFR 1910.120 and appendices.
( ) A description of the employee's duties as they relate to the employee's exposures.
( ) A list of known/suspected contaminants and their concentrations (if known).
( ) A description of any personal protective equipment used or to be used.
( ) Information from previous medical examinations of the employee that is not readily available to the examining physician.

Part B

I, _____, have examined _____
Physician's Name (print) Participant's Name (print)

and have determined the following information:

FIGURE 8-3
SUBCONTRACTOR MEDICAL APPROVAL FORM
PAGE TWO

1. Results of the medical examination and tests (excluding finding or diagnoses unrelated to occupational exposure):

   _____
   _____
   _____

2. Any detected medical conditions which would place the employee at increased risk of material impairment of the employee's health:

   _____
   _____
   _____

3. Recommended limitations upon the employee's assigned work:

   _____
   _____
   _____

I have informed this participant of the results of this medical examination and any medical conditions which require further examination of treatment.

Based on the information provided to me, and in view of the activities and hazard potentials involved at the Indian Head Division, Naval Surface Warfare Center work site, this participant

( ) may
( ) may not

perform his/her assigned task.

Physician's Signature _____

Address _____

Phone Number _____

NOTE: Copies of test results are maintained and available at:

_____
Address

FIGURE 8-4

MEDICAL SURVEILLANCE LETTER

The following statements must be typed on company letterhead and signed by an officer of the company:

LOGO
XYZ CORPORATION
555 E. 5th Street
Nowheresville, Kansas 55555

Month, day, year

Mr. Anthony Klimek, P.E.
Task Order Manager
B&R Environmental Corp.
Foster Plaza 7, 661 Andersen Drive
Pittsburgh, Pennsylvania 15220

Subject: Medical Surveillance for Indian Head Division, Naval Surface Warfare Center Indian Head, Maryland

Dear Mr. Klimek

As an officer of XYZ Corporation, I hereby state that the persons listed below participate in a medical surveillance program meeting the requirements contained in paragraph (f) of Title 29 of the Code of Federal Regulations (CFR), Part 1910.120, entitled "Hazardous Waste Operations and Emergency Response: Final Rule." I further state that the persons listed below have had physical examinations under this program within the past 12 months and that they have been cleared, by a licensed physician, to perform hazardous waste site work and to wear positive- and negative- pressure respiratory protection. I also state that, to my knowledge, no person listed below has any medical restriction that would preclude him/her from working at the Indian Head Division, Naval Surface Warfare Center, Indian Head Maryland work site.

LIST FULL NAMES OF EMPLOYEES AND THEIR SOCIAL SECURITY NUMBERS HERE.

Should you have any questions, please contact me at (555) 555-5555.

Sincerely,

(Name and Title of Company Officer)

9.0 SITE CONTROL

This section outlines the means by which B&R Environmental will delineate work zones and use these work zones in conjunction with decontamination procedures to prevent the spread of contaminants into previously unaffected areas of the site. It is anticipated that a fractured three-zone approach will be used during work at this site. This three zone approach will utilize an exclusion zone, a contamination reduction zone, and a support zone. It is also anticipated that this control measure will be used to control access to site work areas. Use of such controls will restrict the general public, minimize the potential for the spread of contaminants, and protect individuals who are not cleared to enter work areas.

9.1 EXCLUSION ZONE

The exclusion zone will be considered those areas of the site of known or suspected contamination. It is not anticipated that significant amounts of surface contamination are present in the proposed work areas of this site. It is anticipated that this will remain so until/unless contaminants are brought to the surface by intrusive activities, such as drilling or sampling. Furthermore, once intrusive activities have been completed and surface contamination has been removed, the potential for exposure is again diminished and the area can then be reclassified as part of the contamination reduction zone. Therefore, the exclusion zones for this project will be limited to those areas of the site where active work is being performed plus a designated area surrounding the point of operation (see Table 5-1 for specific operation). The exclusion zone for most site activities will be fragmented to represent the areas where the soils are disturbed through drilling or sampling activities. All exclusion zones will be delineated using barrier tape, cones and/or drive poles, and postings to inform and direct facility personnel.

9.1.1 Exclusion Zone Clearance

A pre-startup site visit will be conducted by members of the identified field team in an effort to identify proposed subsurface investigation locations, obtain utility clearances, and provide upfront notices concerning scheduled activities within the facility.

In all cases, no subsurface activities will proceed without utility clearance. In the event that a utility is struck during a subsurface investigative activity, the emergency numbers provided in Section 2.9, Table 2-1 will be notified.

When base personnel are working within the proximity of this investigation, they will be moved or their operation temporarily discontinued to remove them from potential hazards associated with this operation.

9.2 CONTAMINATION REDUCTION ZONE

The contamination reduction zone (CRZ) will be a buffer area between the exclusion zone and any area of the site where contamination is not suspected. A limited personnel and equipment decontamination may take place in this area, to the extent required to move equipment or personnel as necessary to a central decontamination location. This area will also serve as a focal point in supporting exclusion zone activities. This area will be delineated using barrier tape, cones and/or drive poles, and postings to inform and direct facility personnel.

9.3 SUPPORT ZONE

The support zone for this project will include a staging area where site vehicles will be parked, equipment will be unloaded, and where food and drink containers will be maintained. In all cases, the support zones will be established at areas of the site where exposure to site contaminants would not be expected during normal working conditions or foreseeable emergencies.

9.4 SAFE WORK PERMITS

All exclusion zone activities conducted in support of this project will be done so using this HASP as a reference guide and Safe Work Permits to incorporate site-specific information to guide and direct field crews on a task by task basis. An example of the Safe Work Permit to be used is illustrated in Figure 9-1.

All permits will be issued by the SSO or his/her on site representative in the morning prior to the commencement of on site activities.

All personnel identified on the permit as participating in the task will be made aware of its contents by the supervisor accepting the permit. Any problems which occurred throughout the task will be documented by the supervisor on the permit.

All permits will be returned to the FOL or the SSO at the end of the day.

FIGURE 9-1
BROWN & ROOT ENVIRONMENTAL
SAFE WORK PERMIT

Permit No. _____ Date: _____ Time: From _____ to _____

SECTION I: General Job Scope (To be filled in by person performing work)

I. Work limited to the following (description, area, equipment used): _____

II. Names: _____

III. Onsite Inspection conducted ☐ Yes ☐ No Initials of Inspector _____ B&RE _____ NSWC

SECTION II: General Safety Requirements (To be filled in by permit issuer)

IV. Protective equipment required

Level D ☐ Level B ☐
Level C ☐ Level A ☐
Detailed on Reverse

Respiratory equipment required

Full face APR ☐ Escape Pack ☐
Half face APR ☐ SCBA ☐
SKA-PAC SAR ☐ Bottle Trailer ☐
Skid Rig ☐ None ☐

Modifications/Exceptions: _____

V. Chemicals of Concern _____ Action Level(s) _____ Response Measure _____

VI. Additional Safety Equipment/Procedures

Hardhat	☐ Yes	☐ No	Hearing Protection (Plugs/Muffs)	☐ Yes	☐ No
Safety Glasses	☐ Yes	☐ No	Safety belt/harness	☐ Yes	☐ No
Chemical/splash goggles	☐ Yes	☐ No	Radio	☐ Yes	☐ No
Splash Shield	☐ Yes	☐ No	Barricades	☐ Yes	☐ No
Splash suit/coveralls	☐ Yes	☐ No	Gloves (Type)	☐ Yes	☐ No
Steel Toe/shank Workboots	☐ Yes	☐ No	Work/rest regimen	☐ Yes	☐ No

Modifications/Exceptions: _____

VII. Procedure review with permit acceptors

	Yes	NA		Yes	NA
Safety shower/eyewash (Location & Use)	☐	☐	Emergency alarms	☐	☐
Procedure for safe job completion per HASP	☐	☐	Evacuation routes	☐	☐
Contractor tools/equipment inspected	☐	☐	Assembly points	☐	☐

VIII. Equipment Preparation

	Yes	NA
Equipment drained/depressured	☐	☐
Equipment purged/cleaned	☐	☐
Isolation checklist completed	☐	☐
Electrical lockout required/field switch tested	☐	☐
Blinds/misalignments/blocks & bleeds in place	☐	☐
Hazardous materials on walls/behind liners considered	☐	☐

IX. Additional Permits required (Hot work, enclosed entry, excavation etc.) ☐ Yes ☐ No
If yes, contact the Health Sciences Department.

X. Special instructions, precautions: _____

Permit Issued by: _____ Permit Accepted by: _____
Job Completed by: _____ Date: _____

9.5 SITE VISITORS

Site visitors for the purpose of this document are identified as representing the following groups of individuals:

- Personnel invited to observe or participate in operations by B&R Environmental
- Regulatory personnel (i.e., DOD, EPA, OSHA)
- Northern Division Navy Personnel
- Other authorized visitors

All non-DOD personnel working on this project are required to gain initial access to the base by coordinating with the B&R Environmental FOL or designee and following established base access procedures.

Once access to the base is obtained, all personnel who require site access into areas of ongoing operations will be required to obtain permission from the FOL and the Base Contact. Upon gaining access to the site, all site visitors wishing to observe operations in progress will be escorted by a B&R Environmental representative and shall be required to meet the minimum requirements discussed below:

- All site visitors will be routed to the FOL, who will sign them into the field logbook. Information to be recorded in the logbook will include the individual's name (proper identification required), the entity which they represent, and the purpose of the visit.

- All site visitors will be required to produce the necessary information supporting clearance to the site. This shall include information attesting to applicable training and medical surveillance as stipulated in Section 8.0 of this document. In addition, to enter the site operational zones during planned activities, all visitors will be required to first go through site-specific training covering the topics stipulated in Section 8.2 of this HASP.

Once the site visitors have completed the above items, they will be permitted to enter the operational zone. All visitors are required to observe the protective equipment and site restrictions in effect at the site at the time of their visit. Any and all visitors not meeting the requirements, as stipulated in this plan, for site clearance will not be permitted to enter the site operational zones during planned activities. Any incidence of unauthorized site visitation will cause the termination of all on site activities until the unauthorized visitor is removed from the premises. Removal of unauthorized visitors will be accomplished

with support from the Base Contact. If necessary, the Base Contact will be notified of any unauthorized visitors.

9.6 SITE SECURITY

Site security will be accomplished using B&R Environmental field personnel. B&R Environmental will retain complete control over active operational areas. As this activity takes place at a Navy facility, the first line of security will take place at the base gate restricting the general public. The second line of security will take place at the work site referring interested parties to the Base Contact. The Base Contact will serve as a focal point for base personnel, interested parties, and serve and the final line of security and the primary enforcement contact.

9.7 SITE MAP

Once the areas of contamination, access routes, topography, and dispersion routes are determined, a site map will be generated and adjusted as site conditions change. These maps will be posted to illustrate up-to-date collection of contaminants and adjustment of zones and access points.

9.8 BUDDY SYSTEM

Personnel engaged in on site activities will practice the "buddy system" to ensure the safety of all personnel involved in this operation.

9.9 MATERIAL SAFETY DATA SHEET (MSDS) REQUIREMENTS

B&R Environmental and subcontractor personnel will provide MSDSs for all chemicals brought on site. The contents of these documents will be reviewed by the SSO with the user(s) of the chemical substances prior to any actual use or application of the substances on site. A chemical inventory of all chemicals used on site will be developed using the Health and Safety Guidance Manual. The MSDSs will then be maintained in a central location (i.e., temporary office) and will be available for anyone to review upon request.

9.10 COMMUNICATION

As personnel may not always be working in proximity to one another during field activities, a supported means of communication between field crews will be used as necessary. Two-way radio communication devices will be submitted for approval by NSWC for use while at the facility.

External communication will be accomplished by using the telephones at predetermined and approved locations or through cellular phones. External communication will primarily be used for the purpose of resource and emergency resource communications. Prior to the commencement of activities at the NSWC, the FOL will determine and arrange for telephone communications, if it is determined a cellular means will not be used.

10.0 SPILL CONTAINMENT PROGRAM

10.1 SCOPE AND APPLICATION

It is not anticipated that bulk hazardous materials (over 55-gallons) will be handled at any given time as part of this scope of work. It is also not anticipated that any spillage would constitute a danger to human health or the environment. However, as the job progresses, the potential for accumulating Investigative Derived Wastes (IDW), such as decontamination fluids, soil cuttings, purge waters from well development, etc. in a central staging area does exist. Once these materials are characterized, they can be removed from this area and be properly disposed of. Because these IDW remain uncharacterized while in the staging area, a spill containment program will be developed and instituted as part of this HASP.

10.2 POTENTIAL SPILL AREAS

Potential spill areas will be periodically monitored in an ongoing attempt to prevent and control further potential contamination of the environment. Currently, limited areas are vulnerable to this hazard including:

- Resource deployment
- Waste transfer
- Central staging

At this junction, it is anticipated all IDW generated as a result of this scope of work will be containerized, labeled, and staged to await further analyses. The results of this analysis will determine the method of disposal.

10.3 LEAK AND SPILL DETECTION

To establish an early detection of potential spills or leaks, a periodic walk-around by the personnel staging or disposing of drums will be conducted during working hours to visually determine that storage vessels are not leaking. If a liquid leak is detected, the contents will be transferred into a new vessel using a hand pump. The leak will then be collected and contained using absorbents such as Oil-dry, vermiculite, or sand. The absorbents will be stored at the vulnerable areas in a conspicuously marked drum. This used

absorbent material will also be containerized for disposal pending analysis. All inspections will be documented in the project logbook.

10.4 PERSONNEL TRAINING AND SPILL PREVENTION

All personnel will be instructed in the procedures for spill prevention, containment, and collection of hazardous materials in the site-specific training. The FOL and the SSO will serve as the Spill Response Coordinators for this operation, should the need arise.

10.5 SPILL PREVENTION AND CONTAINMENT EQUIPMENT

The following represents the minimum equipment that will be maintained at the staging area at all times for the purpose of supporting this Spill Prevention/Containment Program.

- Sand, clean fill, vermiculite, or other non combustible absorbent (Oil-dry);
- Drums (55-gallon U.S. DOT 17-E or 17-H)
- Shovels, rakes, and brooms
- Hand-operated drum pump with hose
- Container labels

10.6 SPILL CONTROL PLAN

This section describes the procedures the B&R Environmental field crew members will employ upon the detection of a spill or leak.

1. Notify the SSO or FOL immediately upon the detection of a leak or spill.

2. Employ the personal protective equipment stored at the staging area. Take immediate actions to stop the leak or spill by plugging or patching the container or raising the leak to the highest point in the vessel. Spread the absorbent material in the area of the spill, covering it completely.

3. Transfer the material to a new vessel; collect and containerize the absorbent material. Label the new container appropriately. Await analyses for treatment or disposal options.

4. Re-containerize spills, including 2-inches of top cover affected by the spill. Await test results for treatment or disposal options.

It is not anticipated that a spill will occur that the field crews cannot handle. Should this occur, notification of the appropriate emergency response agencies will be carried out by the FOL or SSO in accordance with the procedures discussed in Section 2.0 of this HASP.

11.0 CONFINED-SPACE ENTRY

Personnel under the provisions of this HASP are not allowed, under any circumstances, to enter confined spaces. A confined space is defined as an area that has one or more of the following characteristics:

- Is large enough and so configured that an employee can bodily enter and perform assigned work.
- Has limited or restricted means for entry or exit (for example, tanks, manholes, sewers, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry).
- Is not designed for continuous employee occupancy.
- Contains or has a potential to contain a hazardous atmosphere.
- Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly caving walls or by a floor that slopes downward and tapers to a smaller cross-section.
- Contains any other recognized, serious, safety or health hazard.

For further information on confined space operations, consult the Health and Safety Guidance Manual or call the HSM. Any activity that may be considered a confined-space entry shall require modifications of this HASP and shall result in the immediate notification of the Project Health and Safety Officer. This determination shall be made by the FOL and SSO.

12.0 MATERIALS AND DOCUMENTATION

The B&R Environmental Field Operations Leader (FOL) shall ensure the following materials/documents are taken to the project site and used when required.

- A complete copy of this HASP
- Health and Safety Guidance Manual
- Incident Reports
- Medical Data Sheets
- Material Safety Data Sheets for all chemicals brought on site, including decontamination solutions, fuels, sample preservatives, calibration gases, etc.
- Follow-up Reports (to be completed by the FOL)
- A full-size OSHA Job Safety and Health Poster (posted in the site trailer)
- Training/Medical Surveillance Documentation Form (Blank)
- First-Aid Supply Usage Form
- Emergency Reference Form (Section 2.0, extra copy for posting)
- Drilling Log Forms

12.1 MATERIALS TO BE POSTED AT THE SITE

The following documentation is to be posted at the site for quick reference purposes. In situations where posting of these documents is not feasible (such as no office trailer), these documents should be separated and be immediately accessible to site personnel.

Chemical Inventory Listing - This list represents all chemicals brought on site, including decontamination solutions, sample preservatives, fuel, calibration gases, etc.. This list should be posted in a central area.

Material Safety Data Sheets (MSDSs) - The MSDSs should also be in a central area accessible to all site personnel. These documents should match all the listings on the chemical inventory list for all substances employed on site. It is acceptable to have these documents within a central folder and the chemical inventory as the table of contents.

The OSHA Job Safety & Health Protection Poster - This poster, as directed by 29 CFR 1903.2 (a)(1), should be conspicuously posted in places where notices to employees are normally posted. Each FOL shall ensure that this poster is not defaced, altered, or covered by other material.

Site Clearance Posting - This listed is found within the training section of the HASP (See Figure 8-1). This list identifies all site personnel, dates of training (including site-specific training), and medical surveillance. This lists indicates not only clearance but also status. If personnel do not meet these requirements, they do not enter the site while site personnel are engaged in activities.

Emergency Phone Numbers and Directions to the Hospital(s) - This list of numbers and the directions will be maintained at all phone communications points and in each site vehicle.

Medical Data Sheets/Cards - Medical Data Sheets will be filled out by all on site personnel and filed in a central location. The Medical Data Sheet will accompany any injury or illness requiring medical attention to the medical facility. A copy of this sheet or a wallet card will be given to all personnel to be carried on their person.

Hearing Conservation Standard (29 CFR 1910.95) - This standard will be posted anytime hearing protection or other noise abatement procedures are employed.

Personnel Monitoring - All results generated through personnel sampling (levels of airborne toxins, noise levels, etc.) will be posted to inform individuals of the results of that effort.

Placards and Labels - Where chemical inventories have been separated, because of quantities and incompatibilities, these areas will be conspicuously marked using Department of Transportation (DOT) placards and acceptable [Hazard Communication 29 CFR 1910.1200.(f)] labels.

13.0 ACRONYMS / ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Hygienists
ACM	Asbestos Containing Material
APR	Air-Purifying Respirator
ASP	Associate Safety Professional
ASVE	Air Sparging Vapor Extraction
CFR	Code of Federal Regulations
CIH	Certified Industrial Hygienist
CNS	Central Nervous System
CRZ	Contamination Reduction Zone
CSP	Certified Safety Professional
CQP	Construction Quality Plan
dBA	Decibels measured on the A-scale
DRI	Direct Reading Instrument
eV	electron Volts
FID	Flame Ionization Detector
FOL	Field Operations Leader
FTL	Field Team Leader
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HEPA	High Efficiency Particulate Air
HSM	Health and Safety Manager
IDLH	Immediately Dangerous to Life and Health
IDW	Investigative Derived Wastes
MSDS	Material Safety Data Sheet
NSWC	Naval Surface Warfare Center
N/A	Not Available
NIOSH	National Institute for Occupational Safety and Health
NPDES	National Pollution Discharge Elimination System
OSHA	Occupational Safety and Health Administration (U.S. Department of Labor)
PCB	Polychlorinated Byphenyls
PEL	Permissible Exposure Limit

PHSO	Project Health and Safety Officer
PID	Photoionization Detector
PM	Project Manager
PPE	Personal Protective Equipment
PPM	parts per million
PVC	poly vinyl chloride
SAP	Sampling and Analyses Plan
SCBA	Self-Contained Breathing Apparatus
SOPs	Standard Operating Procedures
SSO	Site Safety Officer
STEL	Short Term Exposure Limit
TBD	To be determined
TSD	Treatment Storage and Disposal Facility
TWA	Time-Weighted Average
UV	Ultra violet
WP	Work Plan

14.0 DOCUMENT STATUS REPORT

Revision Requested:	By Whom:	Date:
Revisions Made:	Approval: PM: HSM	

APPENDIX B

PROJECT-SPECIFIC
QUALITY ASSURANCE PROJECT PLAN

**(To be used in conjunction with
Master Quality Asurance Project Plan)**

1.0 PROJECT DESCRIPTION

1.1 INTRODUCTION

This Project-Specific Quality Assurance Project Plan has been prepared by Brown & Root Environmental on behalf of the United States Navy Engineering Field Activity Chesapeake Naval Facilities Engineering Command and the Indian Head Division Naval Surface Warfare Center (the Station) under the Comprehensive Long-Term Environmental Action Navy Contract N62472-90-D-1298, Contract Task Order 0245.

This document is intended to be used in conjunction with the Master Quality Assurance Project Plan and only includes the sections and information specific to the sixteen sites to be investigated. This document is not intended to be used by itself.

1.1.1 Overall Project Objectives

The Master QAPP provides general Quality Assurance (QA) guidelines that will be common to multiple site investigations to be conducted at the Station. It outlines QA issues for what are expected to be the most common types of field efforts and analyses during the Remedial Investigation efforts. Specific project objectives are identified in the Project-Specific Work Plans of which this document is an appendix. Additional Quality Assurance issues will be addressed in Addenda to the Master QAPP as necessary and are to be provided as appendices to the Project-Specific Work Plans.

Important companion documents to the Master QAPP and the Project-Specific Work Plan include the Indian Head Master Standard Operating Procedures and a Master Work Plan.

1.1.2 QAPP Preparation Guidelines

The Project-Specific QAPP has been prepared to be used in conjunction with the Master QAPP to fulfill the general requirements outlined in Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans dated December 29, 1980 (QAMS-005/80).

1.2 FACILITY DESCRIPTION

A facility description, including the location and general description, station history, land use, water sources and usage, population, physiography and topography, geology, soils, hydrogeology, hydrology, ecology, and meteorology is provided in the Master Work Plan.

1.3 PROJECT TARGET PARAMETERS AND INTENDED DATA USES

This section discusses typical field and laboratory analytical information to be generated during the course of the Remedial Investigation efforts at the Station. Field parameters and intended data uses are discussed in Section 1.3.1. Laboratory parameters and intended data uses are discussed in Section 1.3.2.

1.3.1 Field Parameters

Field parameters will typically include those associated with the completion of soil borings, installation and development of monitoring wells, and groundwater sampling and analysis. Field measurements will include only those completed using simple field instrumentation.

Field measurements of total volatile organics will be completed using a Photoionization Detector. These measurements will be used to determine appropriate subsurface sample horizons to be submitted for laboratory analysis.

Field parameters including pH, specific conductance, turbidity, dissolved oxygen, and temperature will be completed for all aqueous phase samples. These measurements will typically be used to support monitoring well development and purging of stagnant water from well casings. Specific conductance and pH will also be used as general indicators of water quality.

1.3.2 Laboratory Parameters

Laboratory parameters will generally include Target Compound List (TCL) volatile and semivolatile organics and pesticides/polychlorinated biphenyls as well as Target Analyte List (TAL) metals. Tables 1-1 and 1-2 provide a summary of all target laboratory analytes and associated Contract Required Quantitation Limits (organics) and Contract Required Detection Limits (inorganics). If additional analyses become necessary on a project-specific basis then an Addenda to the Master QAPP and the Project-Specific QAPP will be added to the Project-Specific Work Plan appendix.

TABLE 1-1

ANALYTICAL DETECTION LIMITS - ORGANICS
NSWC INDIAN HEAD, MARYLAND
PAGE 1 OF 4

Parameter	CRQL(1)	
	Aqueous(2)	Solid(3)
Volatile Organic Compounds	µg/L	µg/kg
Acetone	10	10
Benzene	10	10
Bromodichloromethane	10	10
Bromoform	10	10
Bromomethane	10	10
2-Butanone	10	10
Carbon disulfide	10	10
Carbon tetrachloride	10	10
Chlorobenzene	10	10
Chloroethane	10	10
Chloroform	10	10
Chloromethane	10	10
Dibromochloromethane	10	10
1,1-Dichloroethane	10	10
1,2-Dichloroethane	10	10
1,1-Dichloroethene	10	10
1,2-Dichloroethene (total)	10	10
1,2-Dichloropropane	10	10
cis-1,3-Dichloropropene	10	10
trans-1,3-Dichloropropene	10	10
Ethylbenzene	10	10
2-Hexanone	10	10
4-Methyl-2-pentanone	10	10
Methylene chloride	10	10
Styrene	10	10
1,1,2,2-Tetrachloroethane	10	10
1,1,1-Trichloroethane	10	10
1,1,2-Trichloroethane	10	10
Trichloroethene	10	10
Tetrachloroethene	10	10
Toluene	10	10
Vinyl chloride	10	10
Xylenes (total)	10	10

TABLE 1-1

ANALYTICAL DETECTION LIMITS - ORGANICS
NSWC INDIAN HEAD, MARYLAND
PAGE 2 OF 4

Parameter	CRQL(1)	
	Aqueous(2)	Solid(3)
Semivolatile Organic Compounds	µg/L	µg/kg
Acenaphthene	10	330
Acenaphthylene	10	330
Anthracene	10	330
Benzo(a)anthracene	10	330
Benzo(a)pyrene	10	330
Benzo(b)fluoranthene	10	330
Benzo(g,h,i)perylene	10	330
Benzo(k)fluoranthene	10	330
Bis(2-chloroethoxy)methane	10	330
Bis(2-chloroethyl)ether	10	330
Bis(2-ethylhexyl)phthalate	10	330
4-Bromophenyl-phenylether	10	330
Butylbenzylphthalate	10	330
Carbazole	10	330
4-Chloro-3-methylphenol	10	330
4-Chloroaniline	10	330
2-Chloronaphthalene	10	330
2-Chlorophenol	10	330
4-Chlorophenyl-phenylether	10	330
Chrysene	10	330
Dibenz(a,h)anthracene	10	330
Dibenzofuran	10	330
3,3'-Dichlorobenzidine	10	330
Diethylphthalate	10	330
Di-n-butylphthalate	10	330
Di-n-octylphthalate	10	330
4,6-Dinitro-2-methylphenol	25	830
2,4-Dinitrophenol	25	830
2,4-Dinitrotoluene	10	330
1,2-Dichlorobenzene	10	330
1,3-Dichlorobenzene	10	330
1,4-Dichlorobenzene	10	330
2,4-Dichlorophenol	10	330

TABLE 1-1

ANALYTICAL DETECTION LIMITS - ORGANICS
NSWC INDIAN HEAD, MARYLAND
PAGE 3 OF 4

Parameter	CRQL(1)	
	Aqueous(2)	Solid(3)
Semivolatile Organic Compounds	µg/L	µg/kg
Dimethylphthalate	10	330
2,4-Dimethylphenol	10	330
2,6-Dinitrotoluene	10	330
Fluoranthene	10	330
Fluorene	10	330
Hexachlorobenzene	10	330
Hexachlorobutadiene	10	330
Hexachlorocyclopentadiene	10	330
Hexachloroethane	10	330
Indeno(1,2,3-cd)pyrene	10	330
Isophorone	10	330
2-Methylnaphthalene	10	330
2-Methylphenol	10	330
4-Methylphenol	10	330
Naphthalene	10	330
2-Nitroaniline	25	830
3-Nitroaniline	25	830
4-Nitroaniline	25	830
Nitrobenzene	10	330
2-Nitrophenol	10	330
4-Nitrophenol	25	830
N-nitroso-di-n-propylamine	10	330
N-nitrosodiphenylamine	10	330
2,2'-Oxybis(1-chloropropane)	10	330
Pentachlorophenol	25	830
Phenanthrene	10	330
Phenol	10	330
Pyrene	10	330
1,2,4-Trichlorobenzene	10	330
2,4,5-Trichlorophenol	25	830
2,4,6-Trichlorophenol	10	330

TABLE 1-1

ANALYTICAL DETECTION LIMITS - ORGANICS
NSWC INDIAN HEAD, MARYLAND
PAGE 4 OF 4

Parameter	CRQL(1)	
	Aqueous(2)	Solid(3)
Pesticides	µg/L	µg/kg
alpha-BHC	0.050	1.7
beta-BHC	0.050	1.7
delta-BHC	0.050	1.7
gamma-BHC (lindane)	0.050	1.7
Heptachlor	0.050	1.7
Aldrin	0.050	1.7
Heptachlor epoxide	0.050	1.7
Endosulfan I	0.050	1.7
Dieldrin	0.10	3.3
4,4'-DDE	0.10	3.3
Endrin	0.10	3.3
Endosulfan II	0.10	3.3
4,4'-DDD	0.10	3.3
Endosulfan sulfate	0.10	3.3
4,4'-DDT	0.10	3.3
Methoxychlor	0.50	17
Endrin ketone	0.10	3.3
Endrin aldehyde	0.10	3.3
alpha-Chlordane	0.050	1.7
gamma-Chlordane	0.050	1.7
Toxaphene	5.0	170
Polychlorinated biphenyls	µg/L	µg/kg
Aroclor-1016	1.0	33
Aroclor-1221	2.0	67
Aroclor-1232	1.0	33
Aroclor-1242	1.0	33
Aroclor-1248	1.0	33
Aroclor-1254	1.0	33
Aroclor-1260	1.0	33

1 CRQL Contract Required Quantitation Limit, as specified in OLM03.1.
2 Groundwater and surface water.
3 Soil and sediment.

TABLE 1-2

ANALYTICAL DETECTION LIMITS - INORGANICS
NSWC INDIAN HEAD, MARYLAND

Parameter	CRDL(1)	
	Aqueous(2)	Solid(3)
Target Analyte List Metals	µg/L	mg/kg
Aluminum	200	40
Antimony	60	12
Arsenic	10	2
Barium	200	40
Beryllium	5	1
Cadmium	5	1
Calcium	5000	1000
Chromium	10	2
Cobalt	50	10
Copper	25	5
Cyanide	10	10
Iron	100	20
Lead	3	0.6
Magnesium	5000	1000
Manganese	15	3
Mercury	0.2	0.1
Nickel	40	8
Potassium	5000	1000
Selenium	5	1
Silver	10	2
Sodium	5000	1000
Thallium	10	2
Vanadium	50	10
Zinc	20	4

1 CRDL Contract Required Detection Limit; as specified in ILM04.0.
2 Groundwater and surface water
3 Soil and sediment.

1.4 DATA QUALITY OBJECTIVES

Data quality objectives are discussed in Project-Specific Work Plan.

1.5 SAMPLE NETWORK DESIGN AND RATIONALE

Sample network design and rationale is provided in Project-Specific Work Plan.

1.6 PROJECT SCHEDULE

Project schedule has not been determined to date and will be provided as an addendum to the Project-Specific Work Plan.

2.0 PROJECT ORGANIZATION

The project organization for the Remedial Investigation/Feasibility Study activities is project-specific. The project organization is provided in project-specific Work Plans in Section 1.6. Personnel expected to be involved with the RI/FS activities at a programmatic level for the foreseeable future include the Navy Remedial Project Manager, the facility point of contact, and the current contractor's Program Manager and Quality Manager, as follows:

Mr. Shawn Phillips, Code 1812
Department of the Navy
Engineering Field Activity Chesapeake
Naval Facilities Engineering Command
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(202) 433-7018 (FAX)

Mr. Shawn Jorgensen, Code 0952C
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(302) 743-4180 (FAX)

Mr. John Trepanowski
Program Manager
Brown & Root Environmental
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Mr. J. David Yesso
Quality Manager
Brown & Root Environmental
661 Andersen Drive
Pittsburgh, PA 15275
(412) 921-8984
(412) 921-4040 (FAX)

4.0 SAMPLING PROCEDURES

Field sampling procedures for NSWC Indian Head Remedial Investigation activities are discussed in detail in the Master Standard Operating Procedures (SOPs) deliverable. Specific sampling information contained in the Master SOP Deliverable and are provided in Project-Specific Work Plans is as follows:

- Field sampling by matrix
- Field quality control sample collection/preparation procedures
- Sample containers, preservatives, and volume requirements
- Decontamination procedures
- Sample packaging and shipping procedures
- Mobilization/demobilization
- Monitoring well installation
- Monitoring well development
- Groundwater sampling
- Water level measurements
- Soil sampling procedures
- Surveying
- Aquifer testing
- Waste handling
- Quality control sample procedures
- Field measurements/screening
- Preventive maintenance procedures/schedule
- Sample disposal

Attachment 2
Kick-off Meeting Checklist for Database

Project Name _____ Project Number _____

1) ☐ Has the method of determining field duplicate samples been identified?

2) ☐ How will field duplicates be handled for each media?

3) ☐ Are there any unvalidated data? If yes, how will they be handled?

4) ☐ Are there any field screening data? If yes, how will they be handled (e.g. should a correlation be performed with lab data to determine usability)?

5) ☐ Are there wells that have been screened in various aquifers? If yes, will these data need to be separated?

6) ☐ Have there been any removal actions performed at the site? If yes, a list of excavated locations and depths will be required in order for data to reflect current conditions.

7) ☐ Were any composites collected for either waste disposal purposes or to act as confirmatory samples subsequent to a removal action?

8) ☐ Will the site be subdivided into areas of concern (e.g. SWMUs)? If yes, will these areas be the same for risk assessment and nature and extent purposes?

9) ☐ Were any locations, namely wells or surface water locations, sampled temporally? If yes, how will these data be evaluated for the risk assessment?

10) ☐ What state and federal criteria will be used for data presentation and/or COC selection?

11) ☐ Are filtered groundwater and surface water samples differentiated from unfiltered samples? If yes, how?

12) ☐ What is the scope of the project (i.e. RI/FS)? Will a GIS be required?

13) ☐ Are there any background data? If yes, how are these samples identified?

_____

_____

_____

_____

Project Manager's Initials _____ Date _____