N00174.AR.001129
NSWC INDIAN HEAD
5090.3a

SITE SCREENING INVESTIGATION WORK PLAN FOR SITE 32, SITE 33, SITE 34, SITE 36, SITE 37, SITE 51, SITE 52 NSWC INDIAN HEAD MD

9/1/2001

TETRA TECH

Received 10/1/01

Site Screening Investigation Work Plan

for

Site 32 – Tool Burial
Site 33 – Scrap Metal Pit
Site 34 – Tool Burial
Site 36 – Closed Landfill
Site 37 – Causeway
Site 51 – Building 101 Dry Well
Site 52 – Building 102 Dry Well

Indian Head Division
Naval Surface Warfare Center

Indian Head, Maryland

Engineering Field Activity Chesapeake
Naval Facilities Engineering Command

Contract Number N62472-90-D-1298

Contract Task Order 0325

September 2001

TETRA TECH NUS, INC.

TETRA TECH NUS, INC.
661 Andersen Drive ▪ Pittsburgh, Pennsylvania 15220-2745
(412) 921-7090 ▪ FAX (412) 921-4040 ▪ www.tetratech.com

PITT-09-01-009

September 6, 2001

Project Number 0525

Mr. Jeffrey W. Morris
Engineering Field Activity, Chesapeake
Building 212
1314 Harwood Street, S.E.
Washington Navy Yard, DC 20374

Reference: CLEAN Contract No. N62472-90-D-1298
Contract Task Order No. 325

Subject: Indian Head Division, Naval Surface Warfare Center
Site 32, Tool Burial; Site 33, Scrap Metal Pit; Site 34, Tool Burial;
Site 36, Closed Landfill; Site 37, Causeway; Site 51, Building 101 Dry Well; and
Site 52, Building 102 Dry Well.
Draft Site Screening Investigation Work Plan

Dear Mr. Morris:

Forwarded herewith are two (2) copies of a draft Site Screening Investigation Work Plan for the sites listed above, at the Indian Head Division, Naval Surface Warfare Center, Indian Head, Maryland.

By a copy of this letter, additional copies are being forwarded to others as follows.

Shawn Jorgensen	IHDIV-NSWC	4 copies
Dennis Orenshaw	US EPA Region III	2 copies
Curtis DeTore	MDE	1 copy

If you have any questions regarding the document, please contact me at 412-921-8684.

Sincerely,

George J. Latulippe, P.E.
Project Manager

GJL/gp
Enclosure

c: Mr. Roger Boucher, NORTHDIV (w/o enclosures)
Mr. John Trepanowski, P.E., Tetra Tech NUS, King of Prussia
Project File 0525

SITE SCREENING INVESTIGATION WORK PLAN
FOR
Site 32 – Tool Burial
Site 33 – Scrap Metal Pit
Site 34 – Tool Burial
Site 36 – Closed Landfill
Site 37 – Causeway
Site 51 – Building 101 Dry Well
Site 52 – Building 102 Dry Well

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 18
Naval Facilities Engineering Command
Building 212
1314 Harwood Street S.E.
Washington Navy Yard, D.C. 20374-2121

Submitted by:
Tetra Tech NUS, Inc.
600 Clark Avenue, Suite 3
King of Prussia, Pennsylvania 19406-1433

CONTRACT NUMBER N62472-90-D-1298
CONTRACT TASK ORDER 0325

SEPTEMBER 2001

PREPARED BY:

GEORGE J. LATULIPPE, P.E.
PROJECT MANAGER
TETRA TECH NUS, INC.
PITTSBURGH, PENNSYLVANIA

APPROVED BY:

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

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NUMBER

LIST OF ACRONYMS/ABBREVIATIONS

µg/kg	Micrograms per kilogram
µg/L	Micrograms per liter
AR	Administrative Record
ARAR	Applicable or Relevant and Appropriate Requirements
AWQC	Ambient Water Quality Criteria
B&R Environmental	Brown and Root Environmental
bgs	Below ground surface
CAA	Clean Air Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLEAN	Comprehensive Long-Term Environmental Action Navy
COCs	Chains-of-Custody
CTO	Contract Task Order
DOT	Department of Transportation
DQO	Data quality objectives
EOD	Explosive Ordnance Disposal
EPA	United States Environmental Protection Agency
FSP	Field Sampling Plan
ID	Inside Diameter
IDW	Investigation derived waste
IHDIV-NSWC	Indian Head Division, Naval Surface Warfare Center
IR	Installation Restoration
MDE	Maryland Department of the Environment
mg/L	Milligrams per liter
NCP	National Oil and Hazardous Substances Contingency Plan
OSHA	Occupational Safety and Health Administration/Act
OSWER	Office of Solid Waste and Emergency Response
PA	Preliminary assessment
PCB	Polychlorinated biphenyl
PID	Photoionization detector
ppb	Parts per billion
PPE	Personal protective equipment
QA	Quality assurance
QAP	Quality Assurance Plan
QAPP	Quality Assurance Project Plan
QC	Quality control

RBC	Risk-based criteria
RCRA	Resource Conservation and Recovery Act
RPM	Remedial project manager
SARA	Superfund Amendments and Reauthorization Act
SOPs	Standard operating procedures
SS	Site screening
SSL	Soil screening level
SVOC	Semivolatile organic compound
TAL	Target Analyte List
TCL	Target Compound List
TtNUS	Tetra Tech NUS, Inc.
USGS	United States Geological Survey
VOC	Volatile organic compound
WP	Work plan

1.0 INTRODUCTION

This Site Screening (SS) Work Plan (WP) for seven sites at Indian Head Division Naval Surface Warfare Center (IHDIV-NSWC) Indian Head, Maryland was prepared by Tetra Tech NUS, Inc. (TtNUS) [formerly Brown & Root Environmental (B&R Environmental)] in response to Contract Task Order (CTO) 325, under the Comprehensive Long-Term Environmental Action Navy (CLEAN), Contract Number N62472-90-D-1298. This WP outlines the requirements and describes the procedures for performing the SS field investigation at the following seven sites:

- Site 32 – Suspected Tool Burial
- Site 33 – Scrap Metal Pit
- Site 34 – Tool Burial
- Site 36 – Closed Landfill
- Site 37 – Causeway
- Site 51 – Building 101 Dry Well
- Site 52 – Building 102 Dry Well

This WP is intended to be used in conjunction with the Master Plan for NSWC Indian Head, which includes the following:

- 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 above sites.

1.1 STATION DESCRIPTION

The IHDIV-NSWC is located in northwestern Charles County, Maryland, approximately 25 miles southwest of Washington D.C. The IHDIV-NSWC is a military facility consisting of the main area on the Cornwallis Neck Peninsula and the Annex on Stump Neck. 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). Stump Neck Annex is located across Mattawoman Creek. The Stump Neck Annex is not contiguous with the main area, has a separate United States Environmental

Protection Agency (EPA) identification number, and is operated by a tenant. Sites 32, 33, 34, 36, and 37 are located on the Stump Neck Annex and Sites 51 and 52 are located on the main area (Figure 1-2)

1.2 SCOPE AND OBJECTIVE

TtNUS has been tasked to develop a SS WP to be conducted at the seven above-mentioned sites at IHDIV-NSWC, Indian Head Maryland. The overall objective of the work described in this WP is to assemble sufficient data to determine whether a release has occurred at the sites and to identify sites posing immediate health or environmental threats that require emergency response.

To meet the overall goals of this document, it was necessary to develop a more narrowly focused set of objectives for each site to guide the scoping of specific investigation field activities. The more detailed set of objectives described in Section 3, Investigation Scope Development, was developed by a process that closely parallels the EPA data quality objectives (DQO) process discussed in Section 1.3. The detailed objectives lead directly to the specific field investigation activities necessary to address the objectives.

1.3 DATA QUALITY OBJECTIVES

This WP has been developed by a process that closely parallels the DQO process. The DQO process is a focused, iterative process for developing the data collection strategy to support decision making. The goal of the process is to conduct investigations in an efficient and effective manner without unnecessary precision and redundancy of data. The seven steps comprising this process are listed in Table 1-1, along with the parts of this WP that address the steps.

1.4 PROJECT ORGANIZATION

This SS phase of the project will be performed by TtNUS with support from the Navy. The Navy RPM will be:

Mr. Robert A. Sadorra (Code 1811)
Department of the Navy
Engineering Field Activity Chesapeake
Naval Facilities Engineering Command
901 M Street SE, Building 212
Washington, DC 20374-5018
(202) 685-3275
(202) 433-7018 (FAX)

The primary contact at the Facility will be:

Mr. Shawn Jorgensen, Code 046C
Indian Head Division
Naval Surface Warfare Center
Building D-327, 101 Strauss Avenue
Indian Head, MD 20640-5035
(302) 743-6745
(302) 743-4180 (FAX)
E-mail: 046C@safety.ih.navy,mil

The TtNUS project organization is shown on Figure 1-3.

1.5 DOCUMENT ORGANIZATION

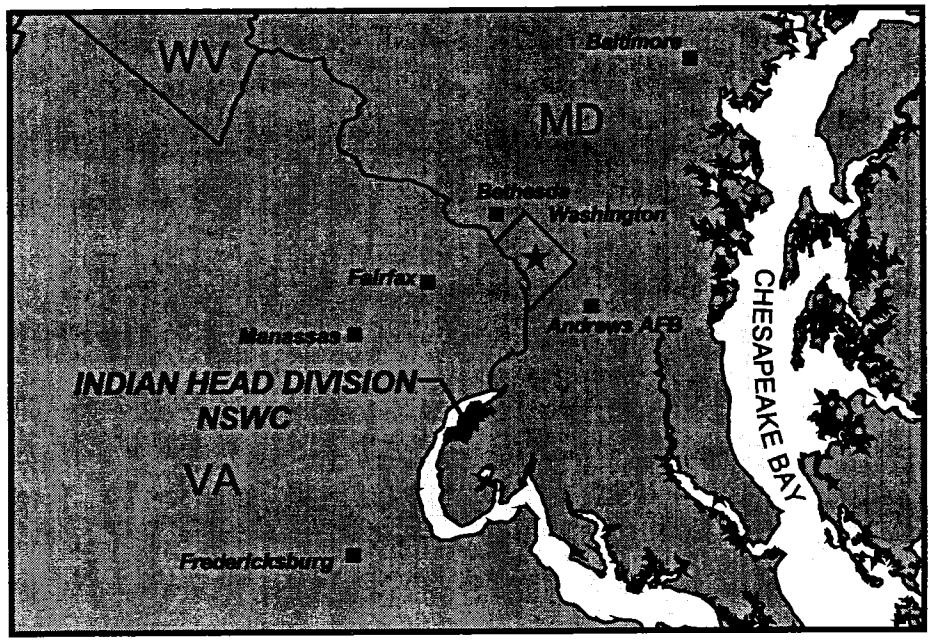
This WP is intended to be used in conjunction with the Master WP for IHDIV-NSWC. This WP includes the site-specific information to be used for sampling at the seven sites. The Master Field Sampling Plan (FSP) and the Master Quality Assurance Plan (QAP) provide general information that is applicable to all sites at IHDIV-NSWC. This site-specific WP identifies the project scope and objectives, summarizes background information, and presents the proposed sampling plan (Sections 1 through 4). Sections 5 and 6 of this document describe specific field investigation techniques to be implemented to achieve the project objectives. This WP references the master plans were appropriate.

TABLE 1-1

INTEGRATION OF DQO PROCESS INTO SITE SCREENING WORK PLAN
SEVEN SITES
INDIAN HEAD DIVISION NSWC
INDIAN HEAD, MARYLAND

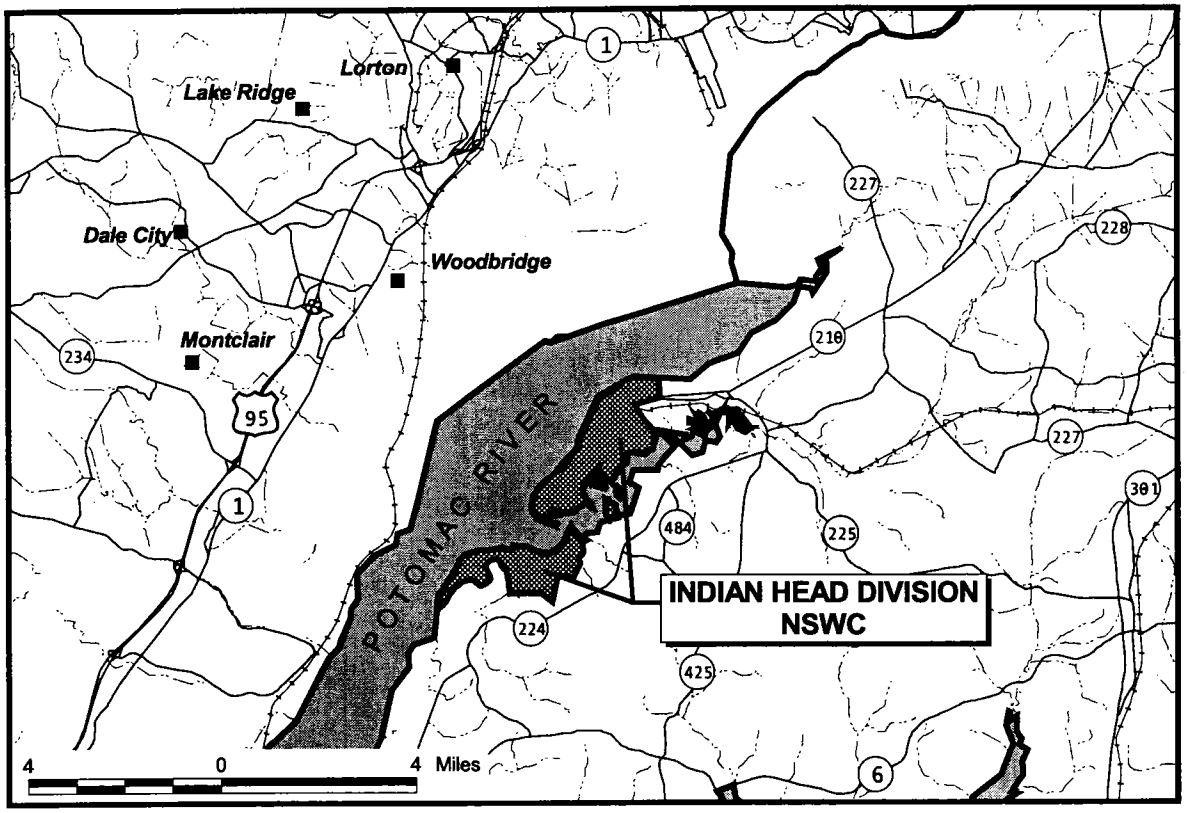
DQO Step[1]	Location in Site-Specific Work Plan Document
1. State the Problem	Section 3.3.2, Statement of the Problem Table 3-1, Development of Data Needs: • Identified Contamination • ARARs • Potential Transport/Receptors • Qualitative Potential for Risk
2. Identify the Decision	Section 3.3.3, Identify the Decision Table 3-1, Development of Data Needs: • Potential Remedial Objective • Potential Clean-Up Criteria • Potential Response Action • Potential Remedial Technologies
3. Identify the Inputs to the Decision	Section 3.4.2, Inputs to the Decision Table 3-2, Investigative Matrix: • Investigative Technologies • Sample Collection and Analysis
4. Define the Boundaries of the Study	Section 3.3.1, Study Boundaries Table 3-1, Development of Data Needs: • Define Study Boundaries
5. Develop a Decision Rule	Section 3.4.3, Decision Rules Table 3-2, Investigative Matrix • Decision Rule • Potential Remedial Actions
6. Specify Tolerable Limits on Decision Efforts	QAPP (Appendix B)
7. Optimize the Design for Obtaining Data	Section 4.0, Detailed Field Activity Table 3-2, Investigation Matrix

1 Source: U.S. EPA, 1994a



LEGEND

- City
- Highway
- Railroad
- River



DRAWN BY: J. LAMEY — DATE: 8/2/01	Tetra Tech NUS, Inc.	CONTRACT NUMBER: —	OWNER NO.: —
CHECKED BY: GJL — DATE: 8/3/01	FACILITY LOCATION MAP INDIAN HEAD DIVISION, NSWC INDIAN HEAD, MARYLAND	APPROVED BY: GJL — DATE: 8/3/01	
COST/SCHEDULE-AREA: —		APPROVED BY: — — DATE: —	
SCALE: AS NOTED		DRAWING NO.: FIGURE 1-1	REV: 0

P:\GIS\NSWC_INDIAN_HEAD\SITE_LOCATION.APR SITE LOCATION MAP 8/3/01 JAL

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QUADRANGLE LOCATION

SOURCE; INDIAN HEAD, MD.–VA. QUADRANGLE MAP
PHOTOREVISED 1978–BATHYMETRY ADDED 1982

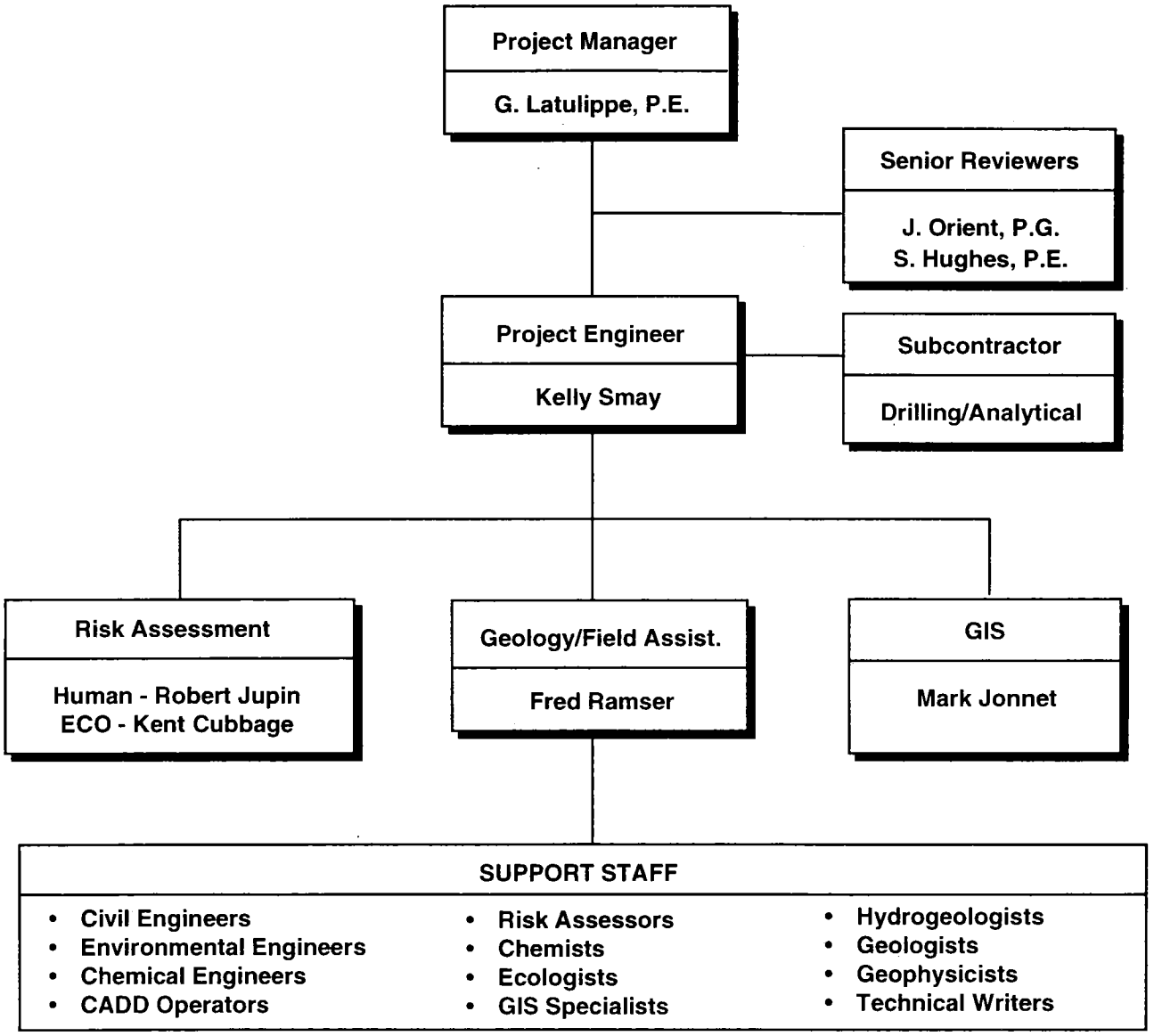
0 4000 8000
SCALE IN FEET

DRAWN BY HJP DATE 8/7/01	Tetra Tech NUS, Inc.	CONTRACT NO. 0525	OWNER NO. 0325
CHECKED BY KMS DATE 9/4/01	SITE LOCATION MAP INDIV–NSWC, INDIAN HEAD, MARYLAND	APPROVED BY [signature] DATE 9/4/01	
COST/SCHED–AREA		APPROVED BY DATE	
SCALE AS NOTED		DRAWING NO. FIGURE 1–2	REV. 0

FORM CADD NO. TtNUS_AV.DWG – REV 0 – 1/22/98

FIGURE 1-3

TtNUS PROJECT ORGANIZATION CHART
SITE SCREENING INVESTIGATION
SEVEN SITES
INDIAN HEAD DIVISION NSWC
INDIAN HEAD, MARYLAND



2.0 SITE DESCRIPTION/EXISTING INFORMATION

2.1 SITE HISTORY

2.1.1 Site 32 – Suspected Tool Burial

During the Initial Assessment Study (NEESA, 1983), one person who was interviewed believed that special beryllium-copper alloy hand tools used in explosive ordnance disposal work were described as having been buried in the vicinity of Building 31SN as shown on Figure 2-1. The area around the building was paved with asphalt. No other information was available to confirm this suspicion; however, another confirmed site is reported near Building D-21C (see Section 2.1.3).

2.1.2 Site 33 – Scrap Metal Pit

An excavation, 10 feet by 10 feet by 30 feet long, was reported to contain scrap metal in the area shown on Figure 2-2. The metal was said to consist of parts of mines, torpedoes, and other explosive-inert items. The location was approximate and no other details were available (NEESA, 1983).

2.1.3 Site 34 – Tool Burial

Beryllium-copper alloy hand tools were reported to be buried near Building D-21C in the area shown on Figure 2-3. There were two burial holes, each about 5 feet by 15 feet by 12 feet deep. The volume of tools in each pit was said to be about 5 feet by 8 feet by 2 feet. The tools were hand tools such as hammers, wrenches, screwdrivers, pliers, scrapers, and knives. These tools were used in Explosive Ordnance Disposal (EOD) work because they are nonmagnetic and nonsparking. According to interviewees, these particular tools had failed a magnetometer test and were considered unserviceable. The burial was said to have taken place in 1972 or 1973. It was noted that the magnetometer test took place in Building D-21C, which was added in 1973. A memorandum dated May 28, 1975 (Ser 113-45-75) contains a sketch showing the two test pits at 60 feet and 70 feet southeast of the building. On-site investigations confirmed subsidence of soil at these locations (NEESA, 1983).

2.1.4 Site 36 – Closed Landfill

The Initial Assessment Study (NEESA, 1983) reported that there was a landfill in the area shown on Figure 2-4. The filled area was a wetland or marsh. The filled, leveled ground occupied an area of approximately 1 to 2 acres. Grass and other low vegetation covered most of the site. The fill was believed to contain metal casings such as mines, bombs, and torpedoes. The contents were claimed to have been certified inert and did not contain any explosives or chemicals when buried. The time of the

landfill was 1972 to 1974. A site inspection revealed evidence of small metal parts in the surface soil which was a gravelly-clay fill material.

2.1.5 Site 37 – Causeway

The access road to the ranges at Stump Neck crosses a narrow neck of land which has been built up with fill materials. The location is shown on Figure 2-5. An allegation was made that the causeway fill perhaps contains hazardous materials in addition to rubble. An on-site inspection showed generous use of large concrete slabs to protect the Potomac River side of the roadway from erosion for a distance of 300 to 400 feet. There was no visual evidence of hazardous material on site (NEESA, 1983).

2.1.6 Site 51, Building 101 Dry Well and Site 52, Building 102 Dry Well

Buildings 101 and 102 are located in the restricted area of the base near Thames and Evans Roads, as shown on Figure 2-6.

Naval Ordnance Station Indian Head personnel interviewed with regard to the laboratory area buildings spoke of a flash tank room and a dry well near Building 102. There was some speculation as to whether the flash tank was used to vaporize off volatile components of a laboratory waste stream and whether the dry well had received the remaining liquid phase of the waste (NEESA, 1991).

Inspection of Department of the Navy, Bureau of Yards and Docks drawings 1028836, 1028837, and 1028839 [from the 1964 preliminary assessment (PA)] revealed dry wells at both Buildings 101 and 102. The flash tank detail, dry well detail, and the utilities site plan show a 1-inch steam condensate line leading to the dry wells. No wastewater lines lead to the dry wells. Furthermore, the crushed stone of the dry wells was two feet below grade, making them difficult to locate and access. It was therefore determined unlikely that any surface disposal took place at the well locations (NEESA, 1991). Figure 2-7 shows a detail of the building 102 floor plan and dry well location.

The flash tank/steam condensate system no longer exists (NEESA, 1991).

Conclusions were made in the PA, based on the Bureau of Yards and Docks drawings, which show only a steam condensate line leading to the dry wells, that there is a lack of evidence to indicate use for laboratory waste and that no hazardous waste was suspected in the dry wells. Therefore, the PA recommended no further work under the Navy Installation Restoration program (NEESA, 1991). However, this SS investigation is being performed at Sites 51 and 52 based on discussions among the members of the Indian Head Installation Restoration Team.

2.2 NSWC DESCRIPTION

2.2.1 Topography, Surface Water, and Drainage

The NSWC Indian Head peninsula is located in the western portion of Charles County, which lies within the Atlantic Coastal Plain Physiographic Province, approximately 8 to 10 miles east of the Fall Line that marks the western extent of the physiographic province. Indian Head has gently rolling to undulating topography, with elevations ranging from sea level to greater than a 100 feet above mean sea level (msl). The higher elevations exist in the eastern portion of the station. Generally, the land surface slopes to the southwest and southeast. The western side of the station along the Potomac River, is characterized by 20- to 100-foot bluffs, and the eastern side along Mattawoman Creek is more gently sloping.

The two principal waterways in the vicinity of NSWC Indian Head peninsula are the Potomac River and Mattawoman Creek. The Potomac River is a tidally influenced estuary that is slightly brackish. Mattawoman Creek is a tributary to the Potomac River that is also tidally influenced. Tidal marshes exist along Mattawoman Creek.

Wastewater from NSWC Indian Head is discharged directly to the Potomac River or Mattawoman Creek and from outfalls to tributaries of the Potomac River or Mattawoman Creek. The wastewaters consist of industrial, sanitary, and storm effluents or combinations thereof (NEESA, 1983).

2.2.2 Geology

The geologic units underlying the IHDIV-NSWC peninsula, in stratigraphically ascending order, are the Lower Cretaceous Potomac Group, the Tertiary age Aquia Formation and Park Hall Formation, and several Quaternary fluvial and estuarine deposits.

The Potomac Group (Lower Cretaceous) consists of three geologic units (in descending stratigraphic order): the Patapsco Formation, the Arundel Formation, and the Patuxent Formation. The lithology of the Potomac Group consists of interbedded clay, silt, sand, and gravel deposited in fluviodeltaic environments (Hiortdahl, 1990) and ranges in thickness from 650 to 750 feet (Vroblesky, 1991; Harsh, 1990). The Patapsco Formation generally consists of clays with interbedded sand units. The Arundel Formation generally consists of a variegated clay. The Patuxent Formation consists of clays with interbedded sand units.

The Aquia Formation (Upper Paleocene) consists of marine deposits of olive black to olive gray, micaceous, glauconitic quartz sand interbedded with sand, silt, and clay. The formation is approximately 0 to 80 feet thick in the NSWC Indian Head peninsula area.

The Park Hall Formation (upper Pliocene) consists of non-marine, fluvial and estuarine deposits of sand and clay interbedded with sand with gravel. It is overlain unconformably by Quaternary deposits. The thickness of this formation in the area ranges from 0 to approximately 60 feet.

The Tertiary geologic formations are missing in many locations in the NSWC Indian Head peninsula area. Where this occurs, the overlying Quarternary deposits come in contact with the underlying Cretaceous formations. The Quarternary fluvial and estuarine deposits in the NSWC Indian Head peninsula area consist of Pleistocene paleochannel deposits and Holocene alluvial deposits (Hiortdahl, 1990). These deposits consist of gravel, sand, silt, clay, and peat mixtures with irregular bedding. The aggregate thickness may range from 0 to approximately 40 feet.

2.2.3 Hydrogeology

The lower and middle sands of the Patasco Formation and the Patuxent Formation of the Potomac Group are the principal aquifers for domestic use at the IHDIV-NSWC. Potable water wells at IHDIV-NSWC are screened in one or more sand zones to an average depth of 200 to 300 feet. These potable water wells serve an approximate population of 3,350 people, including civilian and enlisted Navy employees and contractor employees. None of these wells supply reserves or residences beyond the facility boundaries. The Upper Sands of the Patasco Formation are poor producers of groundwater in the area and are not considered to be an important aquifer. The Upper Sands are considered to be a confining layer above the underlying Middle and Lower Sand Aquifers in the area and below the shallow, small-scale, surficial water-bearing zones. The Middle Sand aquifer is believed to be hydraulically connected to the Potomac River, where the river has eroded into the aquifer. Potomac River water may be partially recharging the aquifer in this area because of the heavy pumping of supply wells at Indian Head (Hiortdahl, 1990).

Shallow, unconfined to semiconfined groundwater at the IHDIV-NSWC Indian Head peninsula occurs from near surface to approximately 45 feet below ground surface (bgs), with water-table elevations ranging from sea level to approximately 65 feet above mean sea level (msl). Typically, the shallow groundwater occurs in perched water-bearing zones and is recharged from infiltration (NEESA, 1983; Slaughter and Otton, 1968). In some lowland areas, surface water intrusion may be an additional source of recharge of the shallow aquifer along the edge of water bodies and during periods of high tide. It is assumed that shallow groundwater flow follows topography and discharges into local water bodies.

2.2.4 Climate

IHDIV-NSWC is located in the Atlantic Coastal Plain on the eastern bank of the Potomac River, midway between the rigorous climate of the north and the mild climate of the south. Since IHDIV-NSWC is

located in the middle latitudes where the general atmospheric flow is from west to east across North America, it has a continental-type climate with four well-defined seasons. However, the proximity of the Potomac River and its tributaries has a considerable modifying effect on the climate, especially in moderating extreme temperatures.

Generally, the coldest period of the year is late January and early February, when the low temperatures average 21°F. The warmest period is late July, when the maximum temperatures average 89°F. The highest temperature on record in the county was 108°F, recorded at Newberg in July 1930, and the lowest was -12°F at La Plata in January 1913. Precipitation is evenly distributed through the year; either July or August is the wettest month, and February or October is the driest. The heaviest precipitation during the colder half of the year is generally the result of low-pressure systems moving northeastward along the Atlantic Coast; in summer, precipitation occurs as thunderstorms. The highest official 1-day precipitation on record is 6.45 inches, which occurred at Waldorf in August 1955. Thunderstorms occur on an average of 35 days per year, mostly from May through August.

Prevailing surface winds are from the west-northwest to northwest except during the warm months of the year, when they become more southerly. The periods with most wind occur in late winter and early spring. The growing season is approximately 187 days long.

2.2.5 Population

The population of the facility is approximately 3,300 (EnSafe/Allen & Hoshall, 1994). It includes 2,000 employees, 1,000 contracted employees, 100 Strauss Avenue residents, and 200 bachelor Enlisted Quarters residents.

2.2.6 Environmental Resources

IHDIV-NSWC is the location of several archaeological sites that contain native American artifacts dating back 12,000 years. In addition, Mattawoman Creek is a popular fishing location that is frequently used for national bass fishing tournaments. Numerous bird species, including the bald eagle, great blue heron, a variety of waterfowl, and several neotropical migratory species, feed in the approximately 300 acres of tidal and nontidal wetlands that are present.

2.3 PREVIOUS INVESTIGATIONS

As previously discussed, Sites 32, 33, 34, 36, and 37 were investigated during the IAS, and Sites 51 and 52 were investigated during the PA. However, no environmental samples were collected during these investigations to determine if a release occurred at any of the sites.

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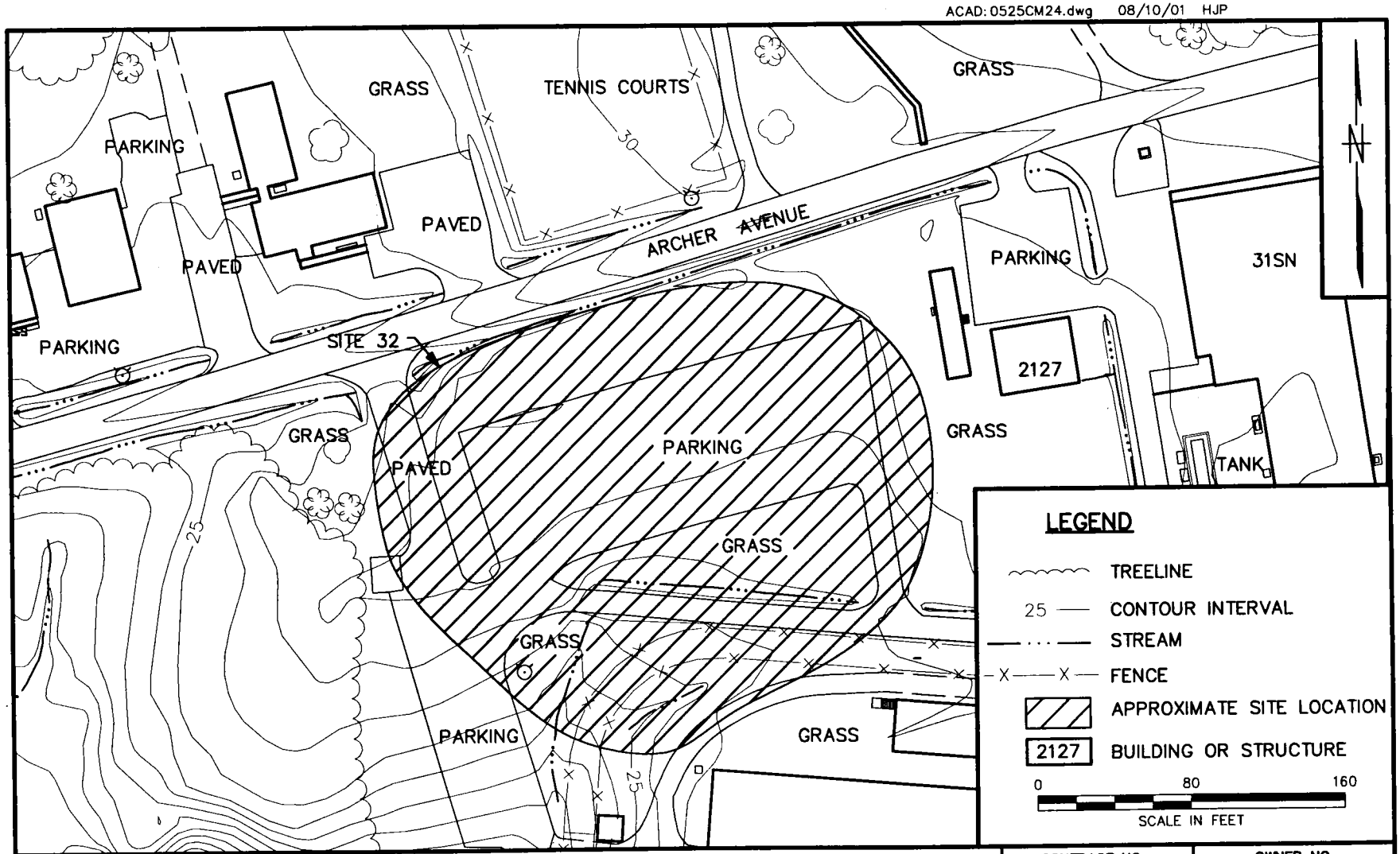

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CHECKED BY RMS DATE 9/4/01	SITE 32 – SUSPECTED TOOL BURIAL INDIV–NSWC, INDIAN HEAD, MARYLAND	APPROVED BY [signature] DATE 9/4/01	
COST/SCHED–AREA		APPROVED BY DATE	
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FORM CADD NO. TtNUS_AH.DWG - REV 0 - 1/22/98

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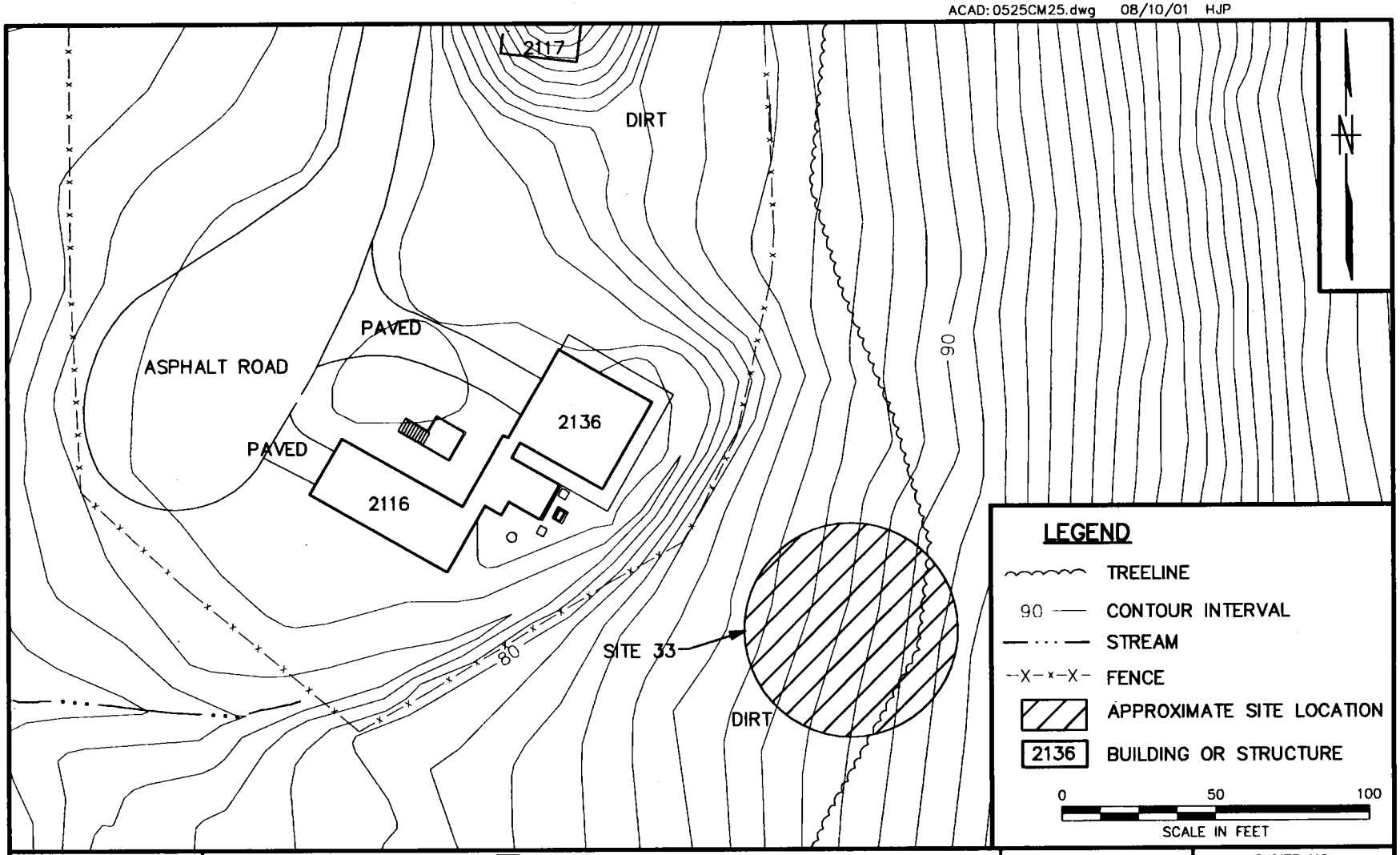

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CHECKED BY KMS DATE 9/4/01	SITE 33 – SCRAP METAL PIT INDIV–NSWC, INDIAN HEAD, MARYLAND	APPROVED BY [signature] DATE 9/4/01	
COST/SCHED–AREA		APPROVED BY DATE	
SCALE AS NOTED		DRAWING NO. FIGURE 2–2	REV. 0

FORM CADD NO. TtNUS_AH.DWG - REV 0 - 1/22/98

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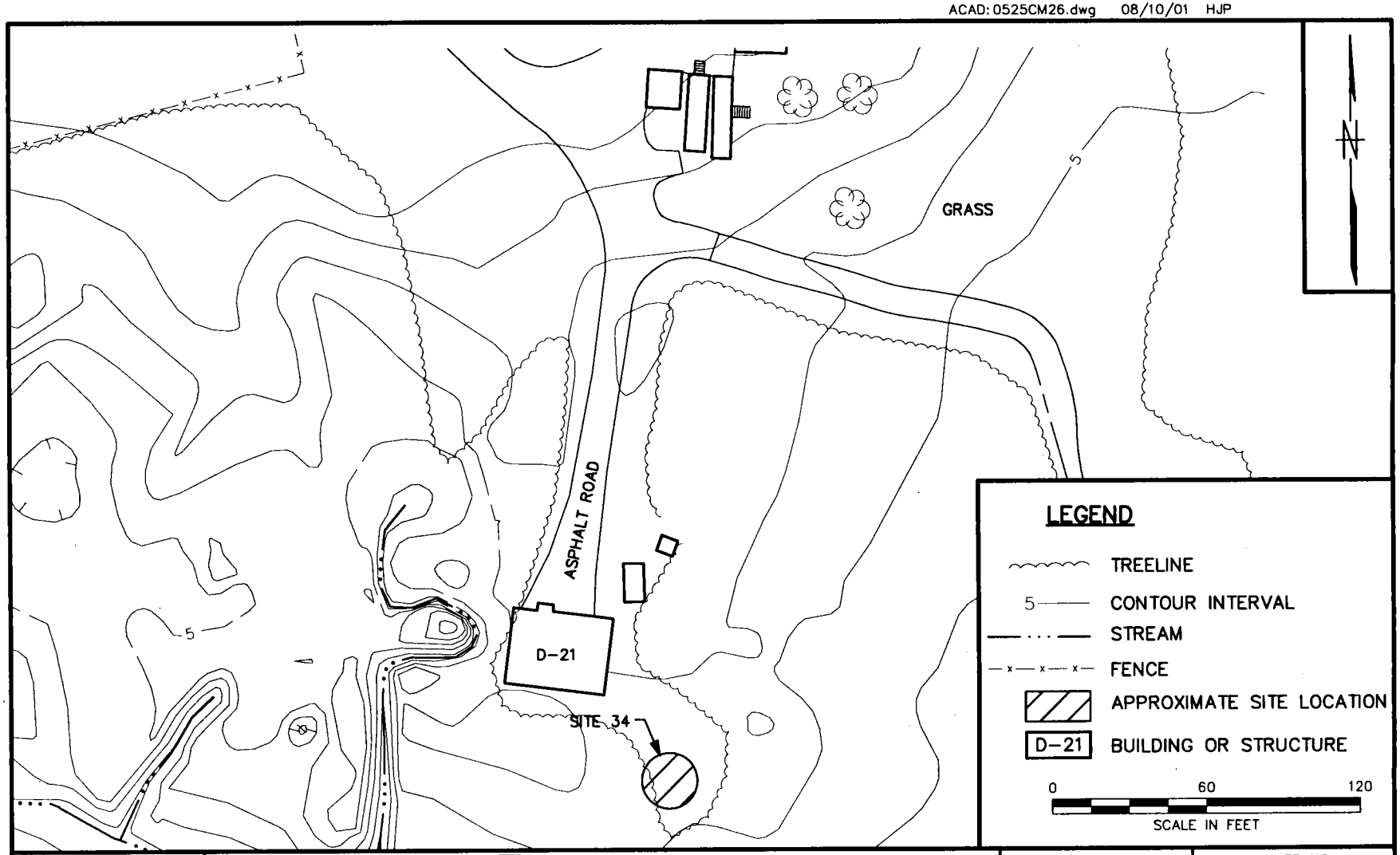
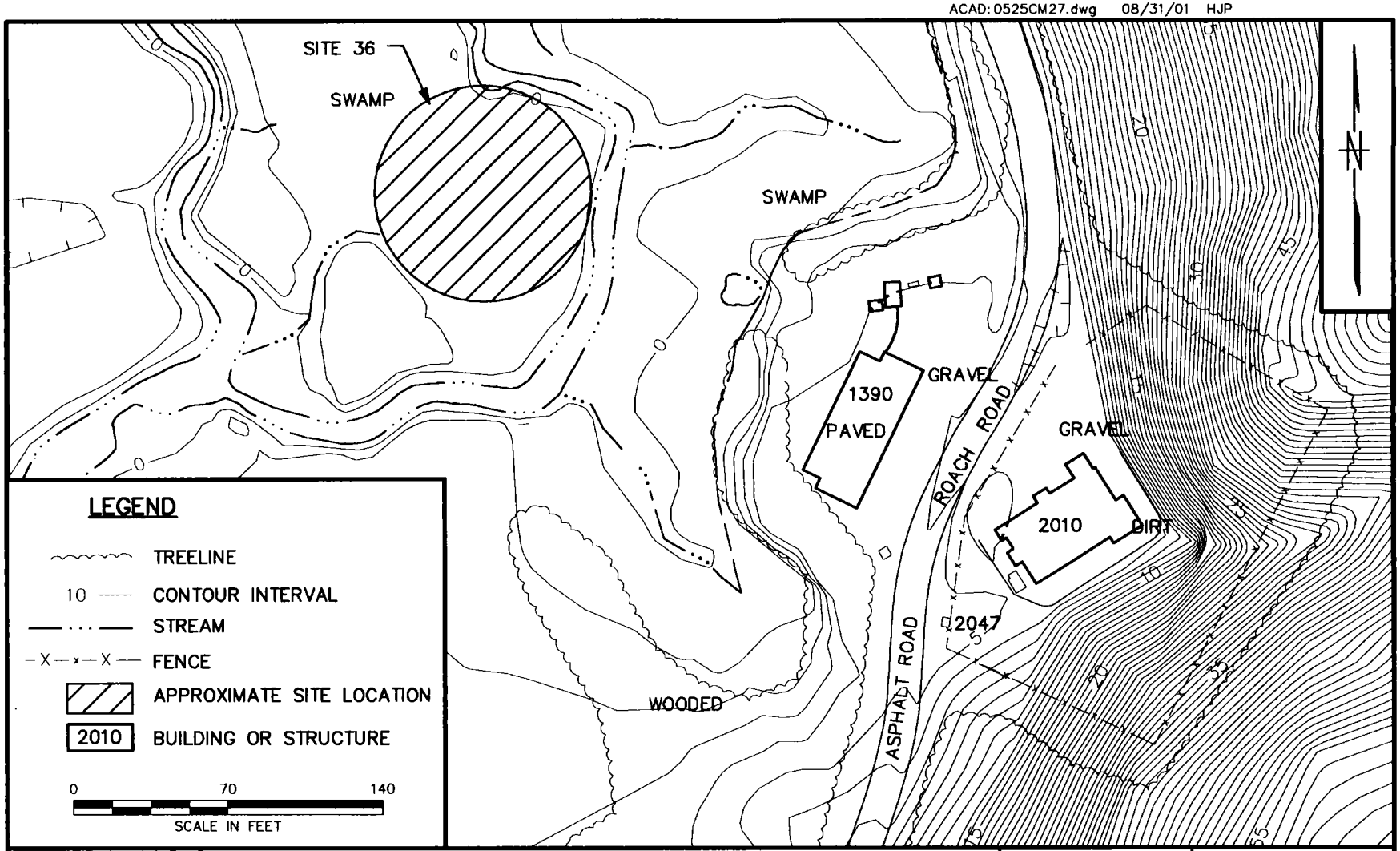


DRAWN BY HJP DATE 8/7/01	Tetra Tech NUS, Inc.	CONTRACT NO. 0525	OWNER NO. 0325
CHECKED BY KMS DATE 9/4/01	SITE 34 – TOOL BURIAL INDIV–NSWC, INDIAN HEAD, MARYLAND	APPROVED BY	DATE 9/4/01
COST/SCHED–AREA		APPROVED BY	DATE
SCALE AS NOTED		DRAWING NO. FIGURE 2–3	REV. 0

FORM CADD NO. TtNUS_AH.DWG - REV 0 - 1/22/98

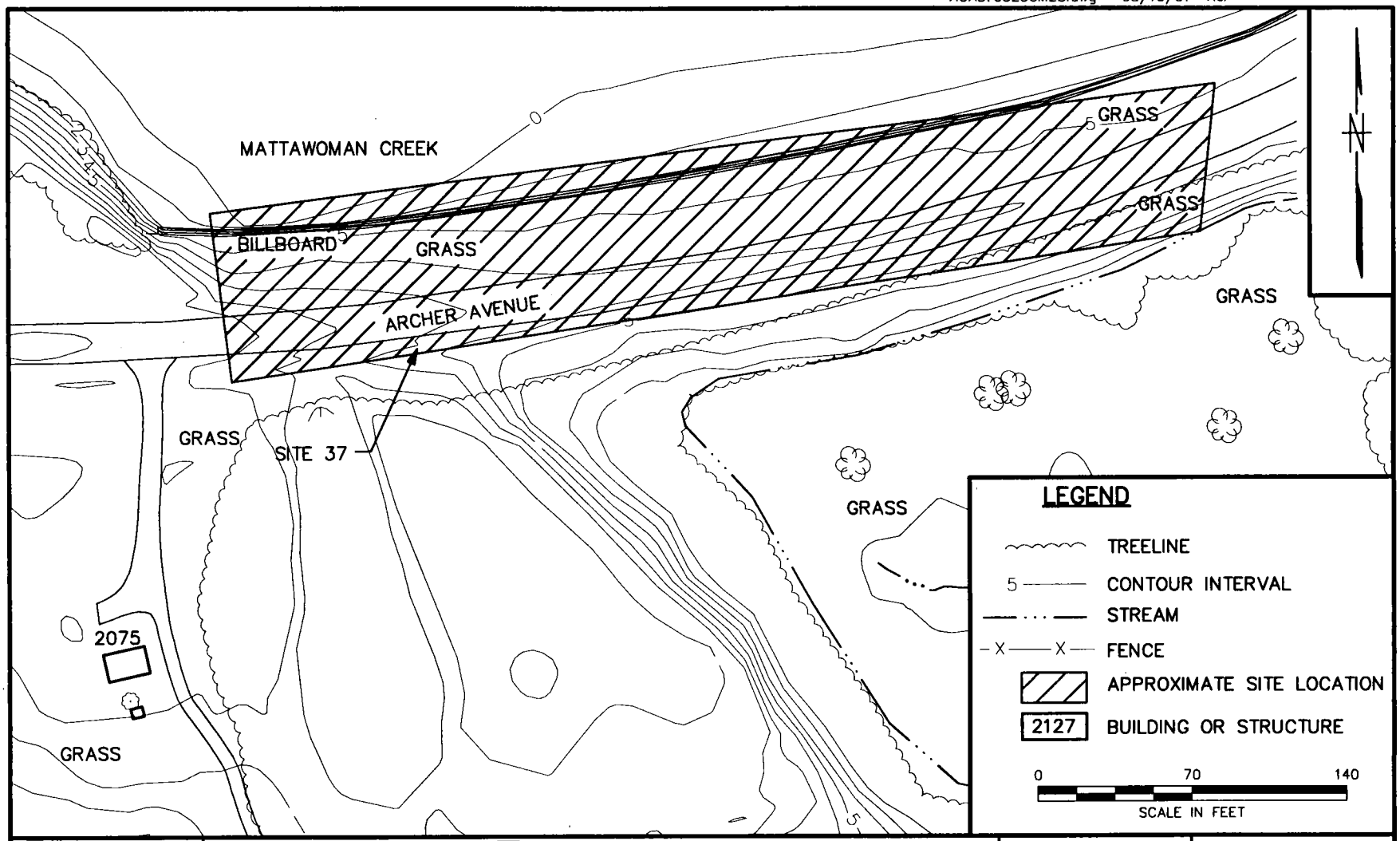
ACAD: 0525CM27.dwg 08/31/01 HJP



DRAWN BY HJP DATE 8/7/01	Tetra Tech NUS, Inc.	CONTRACT NO. 0525	OWNER NO. 0325
CHECKED BY KMS DATE 9/4/01	SITE 36 – CLOSED LANDFILL INDIV–NSWC, INDIAN HEAD, MARYLAND	APPROVED BY [signature] DATE 9/4/01	
COST/SCHED–AREA		APPROVED BY DATE	
SCALE AS NOTED		DRAWING NO. FIGURE 2–4	REV. 0

FORM CADD NO. TtNUS_AH.DWG – REV 0 – 1/22/98

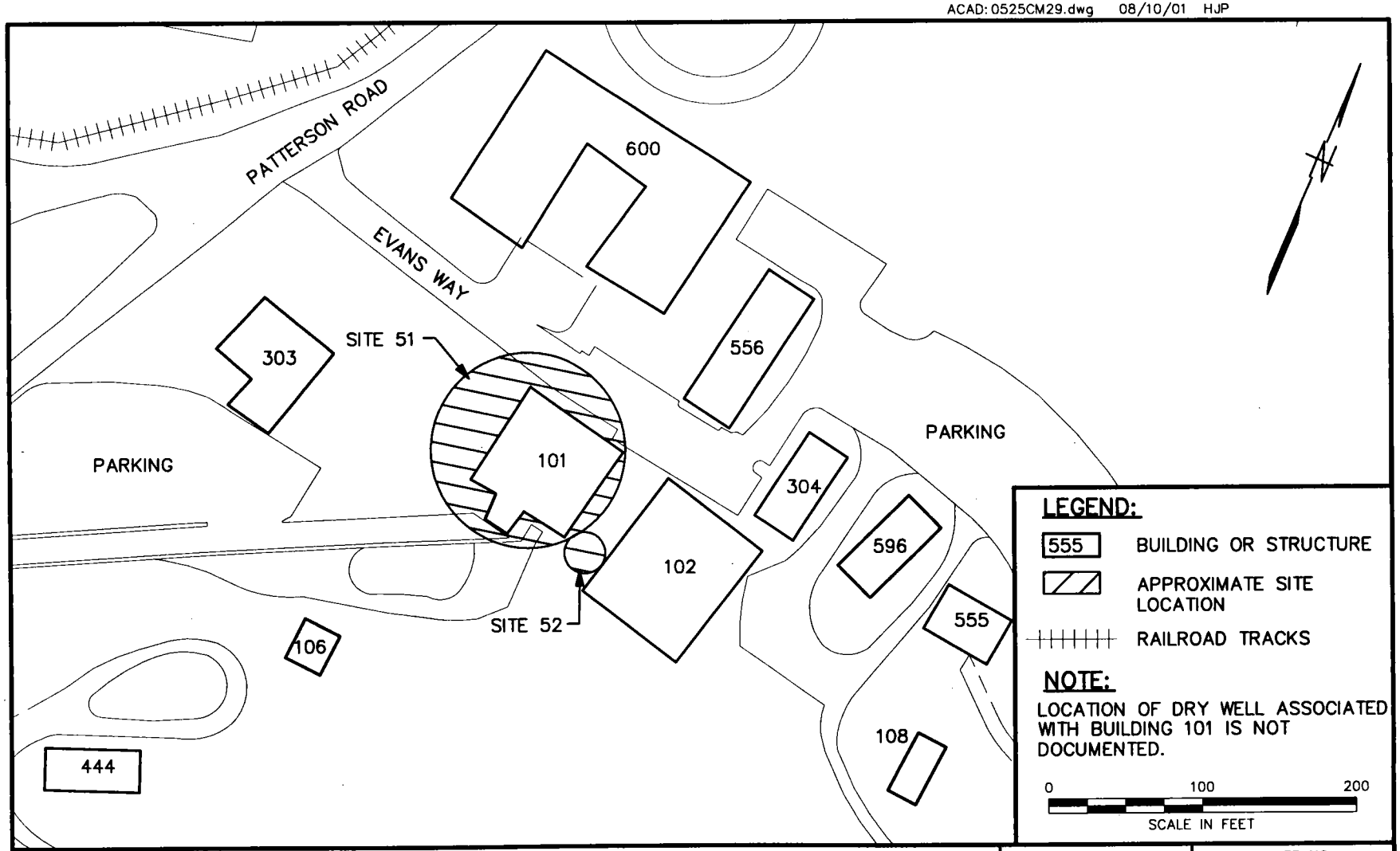
ACAD: 0525CM28.dwg 08/10/01 HJP



DRAWN BY HJP DATE 8/7/01	Tetra Tech NUS, Inc.	CONTRACT NO. 0525	OWNER NO. 0325
CHECKED BY KMS DATE 9/4/01	SITE 37 – CAUSEWAY INDIV–NSWC, INDIAN HEAD, MARYLAND	APPROVED BY	DATE 9/4/01
COST/SCHED–AREA		APPROVED BY	DATE
SCALE AS NOTED		DRAWING NO. FIGURE 2–5	REV. 0

FORM CADD NO. TtNUS_AH.DWG - REV 0 - 1/22/98

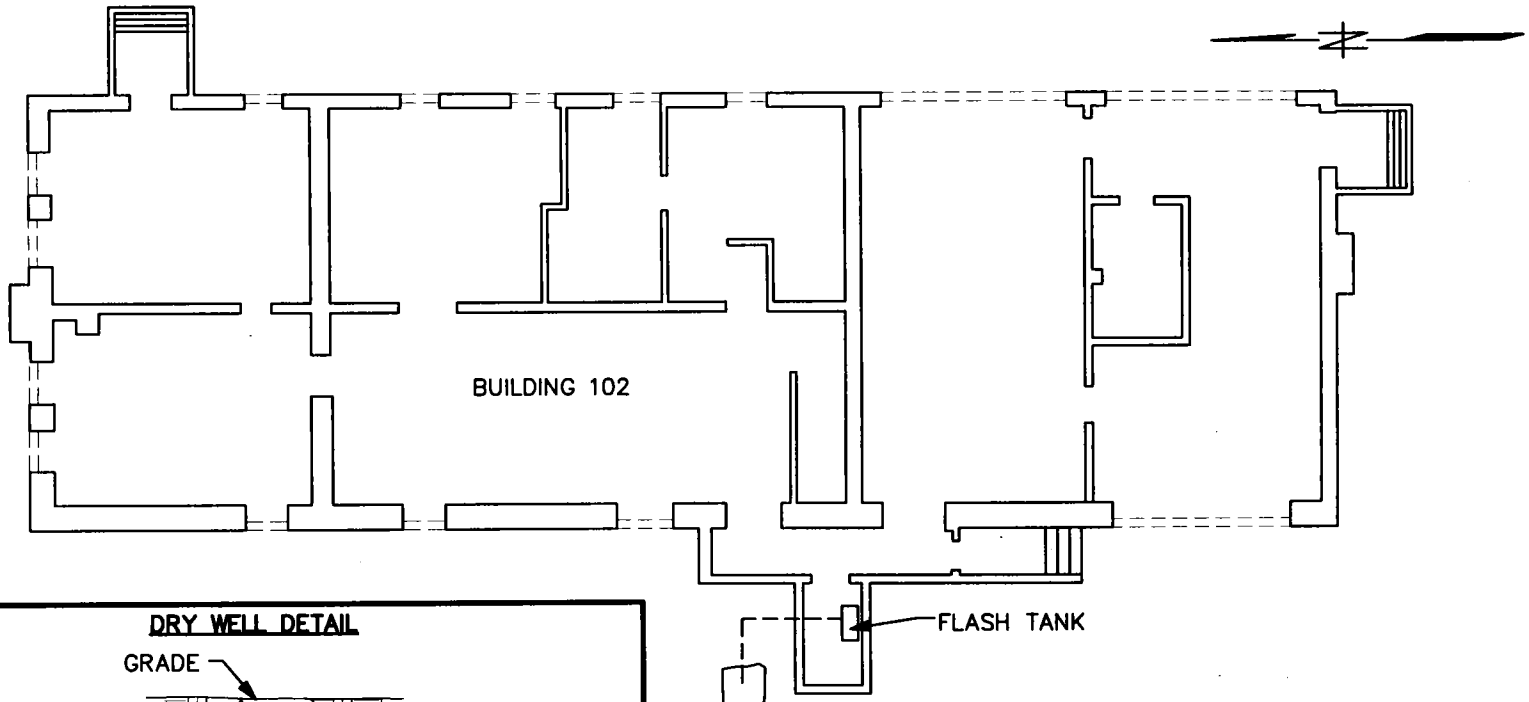
ACAD: 0525CM29.dwg 08/10/01 HJP



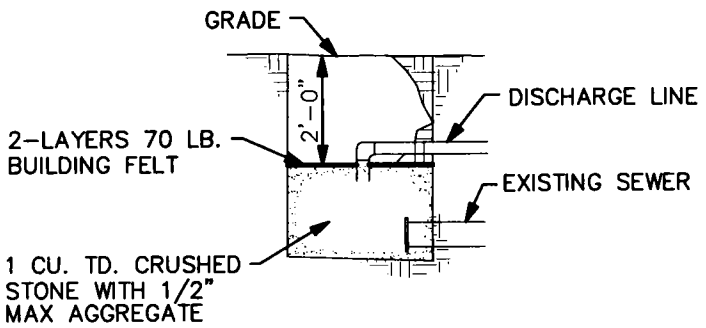
DRAWN BY HJP DATE 8/7/01	Tetra Tech NUS, Inc.	CONTRACT NO. 0525	OWNER NO. 0325
CHECKED BY KMS DATE 9/4/01	SITE 51 AND 52 – DRY WELLS INDIV–NSWC, INDIAN HEAD, MARYLAND	APPROVED BY DATE 9/4/01	
COST/SCHED–AREA		APPROVED BY DATE	
SCALE AS NOTED		DRAWING NO. FIGURE 2–6	REV. 0

FORM CADD NO. TtNUS_AH.DWG - REV 0 - 1/22/98

ACAD: 0525CM11.dwg 08/10/01 HJP



DRY WELL DETAIL



LEGEND

WINDOW

DISCHARGE LINE

BUILDING WALL

SOURCE: FROM BUREAU OF YARDS AND DOCKS DWG. NO. 1028839

DRAWN BY HJP DATE 7/12/01	Tetra Tech NUS, Inc.	CONTRACT NO. 0525	OWNER NO. 0325
CHECKED BY KMS DATE 9/4/01		APPROVED BY DATE 9/4/01	
COST/SCHED-AREA	BUILDING 102 BASEMENT FLOOR PLAN IHDIV – NSWC, INDIAN HEAD, MARYLAND	APPROVED BY DATE	
SCALE NOT TO SCALE		DRAWING NO. FIGURE 2-7	REV. 0

FORM CADD NO. TtNUS_AH.DWG - REV 0 - 1/22/98

3.0 SITE SCREENING INVESTIGATION SCOPE DEVELOPMENT

3.1 BROAD INVESTIGATION OBJECTIVES

As described in Section 1.2, the broad objective for the investigative activities described in this WP is to assemble sufficient data to determine whether a release has occurred at the seven sites and to identify sites posing immediate health or environmental threats that require emergency response.

3.2 DEVELOPMENT OF DETAILED INVESTIGATION OBJECTIVES

To determine the particular investigative activities that are necessary to address the broad objectives, it is necessary to define a set of detailed objectives that must be met to provide the needed information. In this document, the detailed objectives have been developed by application of activities that parallel the DQO process mentioned in Section 1.3. The process is documented in the text and is summarized in Table 3-1, Development of Data Needs, and Table 3-2, Investigation Matrix.

In summary, development of the detailed objectives for this investigation required the identification of the data that are as yet not available for the evaluation of the sites. Table 3-1 uses the term "Data Needs." Once the data needs were identified, they were restated as "Investigation Objectives" on Table 3-2, and specific investigative activities were identified to address each of the investigation objectives.

Tables 3-1 and 3-2 are additionally arranged to identify how the development of detailed objectives and the scoping of the investigation activities parallel the DQO process. The left side of Table 3-1 illustrates the sites being investigated according to media to establish the study boundaries. The following three columns focus on the "Statement of the Problem" by listing contamination previously identified, the potential contamination migration routes, and the potential receptors. The columns under "Identify the Decision" indicate the decision to determine if a hazardous substance is present at the site, whatever additional action is warranted, and whether an immediate threat is present. The Data Needs columns on the right side of Table 3-1 show the questions that need to be answered in order to allow a more complete evaluation of the sites.

Table 3-2 restates the "Data Needs" as "Investigation Objectives" then, under "Identify Inputs to the Decision," the specific investigative activities are summarized for addressing the objective. The "Decision Rule" column generally indicates the next step if certain conditions should arise.

3.3 DEVELOPMENT OF DATA NEEDS

The Development of Data Needs, as presented in Table 3-1, comprises four main categories: the Study Boundary, Statement of the Problem, Identification of the Decision, and the Data Needs category. The information contained in these categories is described in the following sections.

3.3.1 Study Boundaries

Study boundaries are established according to each of the seven sites and the environmental media under investigation. For the purposes of this document, the "Site Area" location is loosely defined as discussed in Section 2.1 for each site. Geophysical surveys will be conducted at Sites 32, 33, and 34 to further identify the location of the tool burial areas and scrap metal pit. Additionally, the field crew will physically inspect the area surrounding Building 101 to potentially identify the location of the Site 51 dry well. It is anticipated that the area for each site may need to be redefined when the site surveys and inspections and data reveal a more definitive pattern of site-related contamination.

The full set of study boundary categories includes surface soil, subsurface soil, surface water, sediment, and groundwater. As indicated on Tables 3-1 and 3-2, downgradient locations are also considered. The environmental media to be sampled are surface and subsurface soil, sediment, surface water and groundwater. The temporal boundaries associated with this investigation are limited to timing the field activities to weather conditions that are compatible with the activities being conducted. For example, soil samples will be collected from temporary well boreholes during temporary well installation.

3.3.2 Statement of the Problem

The statement of the problem includes the identification of contaminants known or suspected to be present as a result of past activities or investigations at each site, an indication of potential contaminant transport mechanisms that may be operating at the site, and the identification of potential receptors. These components are summarized in Table 3-1.

The following section provides a summary of the components of the "Statement of the Problem" for the specific medium identified.

3.3.2.1 Surface Soils

Surface soils have been identified in the Master Field Sampling Plan as the soils located from the ground surface to a depth not exceeding 6 inches. To date, no surface soil samples have been collected at any of the seven sites.

No surface samples are to be collected at Site 32 since the area around the building is paved. There is a potential that surface soils in the area of Site 33 have become contaminated with metals due to the disposal of scrap metal and that surface soils in the area of Site 34 have become contaminated with beryllium or copper as a result of the burial of beryllium-copper alloy hand tools. There is also a potential that surface soils in the area of Site 36 have become contaminated with volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), explosives, or metals since the site was used as a landfill due to the burial of metal casings in a filled area. There is a potential that hazardous materials in the area of Site 37 have contaminated surface soils due to allegations that the causeway contains hazardous materials in addition to rubble. No surface samples are to be collected at Sites 51 and 52 since dry wells are not considered to be associated with surface soil contamination.

Surface soil contamination has the potential to impact both human and ecological receptors through inhalation, ingestion, and dermal contact. Surface soil contamination has the potential to be transported by erosion, wind dispersion, and relocation due to physical contact. Potential surface soil contamination migration to other media may include surface soil to subsurface soil via leaching and adsorption to the subsurface soils, surface soil to groundwater via leaching, surface soil to air via volatilization, surface soil to surface water via direct contact, and surface soil to sediment via erosion.

This WP will investigate the surface soil to subsurface soil and groundwater pathways and also the surface soil to surface water and sediment pathways since it is uncertain if there is any contamination present at the sites and the sites are undergoing preliminary investigations.

3.3.2.2 Subsurface Soils

There is a potential that subsurface soils could be contaminated due to the burial activities associated with Sites 32, 33, 34, 36, and 37. Metal contamination in subsurface soils could be associated with Sites 32, 33, and 34. VOC, SVOC, explosives, and metal contamination could be associated with Site 36. It was also alleged that hazardous materials were located at Site 37 within the causeway fill material; therefore, VOC, SVOC, metals, explosives, pesticides, or polychlorinated biphenyls (PCBs) could be associated with this site. The dry wells associated with Sites 51 and 52 could have potentially leached volatile contamination to subsurface soils associated with the flash tank waste. These soils have the potential to be contaminant sources to groundwater via leaching, and they may pose a risk to human receptors during ground-disturbance activities.

3.3.2.3 Groundwater

There is a potential that metal contamination could exist in the area of Sites 32, 33, and 34 due to previous burial activities conducted in this area. In addition, there is a potential that hazardous materials

could exist at Sites 36 and 37. Currently, no groundwater monitoring wells exist at these sites, and no groundwater samples have been previously collected.

The dry wells associated with Sites 51 and 52 could have potentially leached VOC contamination to groundwater. Currently, no groundwater monitoring wells exist at these sites, and no groundwater samples have been previously collected.

Groundwater contamination has the potential to impact human and ecological receptors through inhalation, ingestion, and dermal contact if brought to the surface for use as a potential water source or if the groundwater naturally migrates to the ground surface. It is possible for groundwater contamination to be transferred to other media through groundwater to subsurface soils via direct contact, groundwater to surface water via surface outlet, and groundwater to storm drain or channel via infiltration.

Downgradient wells will also be installed at Sites 32, 33, 34, 36, and 37 and sampled to determine if contamination is migrating from the sites.

3.3.2.4 Surface Water and Sediment

Site 36 – Closed Landfill was developed in a wetland or marsh that is surrounded by several streams and swamps. The surface water and sediment in the adjacent streams near Site 36 have the potential to become contaminated if they contact contaminated media. Surface water has the potential to affect both human and ecological receptors through inhalation, ingestion, and dermal contact. Possible pathways for transferring surface water contamination to other media include surface water to surface soil via direct contact, surface water to sediment via direct contact, surface water to groundwater via infiltration, surface water to air via volatilization, and surface water to subsurface soil via infiltration and adsorption to the subsurface soils.

3.3.3 Identify the Decision

This section is summarized in Table 3-1 and includes the following categories: Hazardous Substances are Present, Further Action Warranted, and Immediate Threat Present.

The primary objective is to assemble sufficient data to determine whether a release has occurred at the sites and identify sites posing immediate health or environmental threats that require emergency response.

If it is determined that contamination is detected, additional sampling would be necessary to determine the extent of contamination and the risks associated with the contaminant concentrations.

3.3.4 Data Needs

The data needs, as presented in Table 3-1, are questions posed with the intent of identifying whether contamination is present at the site, whenever the site warrants further action, and if there is an immediate threat to human health or the environment. The concerns represented by the questions posed in these three categories are shown in Table 3-2 as a statement under the category "Investigation Objectives."

3.4 INVESTIGATION MATRIX

The Investigation Matrix, Table 3-2, comprises three main categories: the Investigation Objectives, the Inputs to the Decision, and the Decision Rule. The information contained in these categories is described in the following sections.

3.4.1 Investigation Objectives

The data needs, presented as questions in Table 3-1, are presented as investigation objectives in Table 3-2. During this investigation, it will be necessary to determine if contamination is present at the sites.

3.4.2 Inputs to the Decision

The inputs to the decision have been developed to identify the means by which data will be collected to satisfy the investigation objectives. The means by which the data will be collected are identified as the "Investigative Technique." The technique can range from conducting sampling and analysis to conducting geophysical and visual inspections in the field. When the investigation techniques have been determined, the actions to implement the techniques are presented in the section identified as "Sample Collection and Analysis." This section identifies the location of the sample to be collected, lists the figure number that graphically presents the location of the activity to be conducted, provides the quantity and type of samples to be collected, and provides the parameters that will be evaluated.

3.4.2.1 Chemical Analytical Parameters

The histories of Sites 32 and 34 indicate that beryllium-copper hand tools were buried at these sites. Therefore, samples will be collected and analyzed for beryllium and copper at these sites.

The history of Site 33 indicates that scrap metal was buried at this site. Therefore, samples will be collected and analyzed for Target Analyte List (TAL) metals.

The history of Site 36 indicates the site was a landfill believed to contain metal casings such as mines, bombs, and torpedoes. Since it is unclear if any other materials were discarded in the landfill, samples will be collected and analyzed for Target Compound List (TCL) VOCs, TCL SVOCs, TAL metals, and explosives.

An allegation was made that Site 37 contained hazardous materials in addition to rubble. Therefore, samples will be collected and analyzed for TCL VOCs, TCL SVOCs, TCL pesticides/PCBs, TAL metals, and explosives.

The histories of Sites 51 and 52 indicate that the dry wells may have received the remaining liquid phase of waste from a flash tank used to vaporize volatile components of a laboratory waste stream. Therefore, samples will be collected and analyzed for TCL VOCs.

3.4.3 Decision Rules

The final column in Table 3-2 presents a series of decision rules by which decisions will be made based on the results of the field investigations. The decision rules are in the form of "If ..., then ..." statements, which indicate the direction the investigation should take if certain conditions are present.

Why 34 & not 32? is it because of pavement?

TABLE 3-1

DEVELOPMENT OF DATA NEEDS SEVEN SITES
INDIAN HEAD DIVISION, NSWC
INDIAN HEAD, MARYLAND

STUDY BOUNDARY			STATEMENT OF THE PROBLEM			IDENTIFY THE DECISION			DATA NEEDS
Population: Contaminant Source/ Media/Path	Spatial	Temporal	Identified Contamination	Potential Transport	Potential Receptors	Hazardous Substances Present	Additional Action Warranted	Immediate Threat Present	
Surface soil (0 to 6 inches deep)	Site 33 and 34	Conduct during installation of temporary wells and soil borings.	No surface soil samples previously collected. Suspected disposal of metal tools and scrap.	Surface soil to air via volatilization and/or wind dispersion of particulates.	Human receptors via inhalation, ingestion, and dermal contact. Ecological receptors due to exposure and ingestion.	Determine if a release has occurred at the site.	Additional investigation necessary.	There is no apparent immediate threat based on available data.	Does metal contamination exist in surface soil in the site area? Where is the site located?
	Site 36	Conduct during installation of temporary wells and soil borings.	No surface soil samples previously collected. Suspected landfill used for disposal of fill containing metal and potentially other hazardous materials.	Surface soil to air via volatilization and/or wind dispersion of particulates.	Human receptors via inhalation, ingestion, and dermal contact. Ecological receptors due to exposure and ingestion.	Determine if a release has occurred at the site.	Additional investigation necessary.	There is no apparent immediate threat based on available data.	Does VOC, SVOC, metal, or explosive contamination exist in the surface soil in the site area?
	Site 37	Conduct during installation of temporary wells and soil borings.	No surface soil samples previously collected. Suspected disposal of hazardous materials.	Surface soil to air via volatilization and/or wind dispersion of particulates.	Human receptors via inhalation, ingestion, and dermal contact. Ecological receptors due to exposure and ingestion.	Determine if a release has occurred at the site.	Additional investigation necessary.	There is no apparent immediate threat based on available data.	Does VOC, SVOC, metal, pesticide/PCB, or explosive contamination exist in the surface soil in the site area?
Subsurface soil (deeper than 6 inches)	Site 32, 33, 34	Conduct during installation of temporary wells and soil borings.	No subsurface soil samples previously collected. Suspected disposal of metal tools and scrap.	Subsurface soils to groundwater via leaching.	Human receptors during ground disturbance.	Determine if a release has occurred at the site.	Additional investigation necessary.	There is no apparent immediate threat based on available data.	Does metal contamination exist in subsurface soil in the site area? Where is the site located?
	Site 36	Conduct during installation of temporary wells and soil borings	No subsurface soil samples previously collected. Suspected landfill used for disposal of fill material containing metal and potentially other hazardous materials.	Subsurface soils to groundwater via leaching.	Human receptors during ground disturbance.	Determine if a release has occurred at the site.	Additional investigation necessary.	There is no apparent immediate threat based on available data.	Does VOC, SVOC, metal, or explosive contamination exist in the subsurface soil in the site area?
	Site 37	Conduct during installation of temporary wells and soil borings.	No subsurface soil samples previously collected. Suspected disposal of hazardous materials.	Subsurface soils to groundwater via leaching.	Human Receptors during ground disturbance.	Determine if a release has occurred at the site.	Additional investigation necessary.	There is no apparent immediate threat based on available data.	Does VOC, SVOC, metal, pesticide/PCB, or explosive contamination exist in the subsurface soil in the site area?
	Site 51 and 52	Conduct during installation of temporary wells and soil borings.	No subsurface soil samples previously collected. Speculation that dry wells received liquid phase of waste from a flash tank for vaporization of volatiles.	Subsurface soils to groundwater via leaching.	Human Receptors during ground disturbance.	Determine if a release has occurred at the site.	Additional investigation necessary.	There is no apparent immediate threat based on available data.	Does VOC contamination exist in the subsurface soil in the site area? Where are the dry wells located?

TABLE 3-1

DEVELOPMENT OF DATA NEEDS SEVEN SITES
INDIAN HEAD DIVISION, NSWC
INDIAN HEAD, MARYLAND

STUDY BOUNDARY			STATEMENT OF THE PROBLEM			IDENTIFY THE DECISION			DATA NEEDS
Population: Contaminant Source/ Media/Path	Spatial	Temporal	Identified Contamination	Potential Transport	Potential Receptors	Hazardous Substances Present	Additional Action Warranted	Immediate Threat Present	
Groundwater	Site 32, 33, 34	Install and sample temporary wells.	No groundwater samples previously collected.	Groundwater to surface water.	Human receptors via incidental ingestion, dermal contact, and inhalation.	Determine if a release has occurred at the site.	Additional investigation necessary.	There is no apparent immediate threat based on available data.	What are the groundwater metal concentrations in the site area?
	Site 36	Install and sample temporary wells.	No groundwater samples previously collected.	Groundwater to surface water.	Human receptors via incidental ingestion, dermal contact, and inhalation.	Determine if a release has occurred at the site.	Additional investigation necessary.	There is no apparent immediate threat based on available data.	What are the groundwater VOC, SVOC, metal, and explosive concentrations in the site area?
	Site 37	Install and sample temporary wells.	No groundwater samples previously collected.	Groundwater to surface water.	Human receptors via incidental ingestion, dermal contact, and inhalation.	Determine if a release has occurred at the site.	Additional investigation necessary.	There is no apparent immediate threat based on available data.	What are the groundwater VOC, SVOC, metal, pesticide, PCB, and explosive concentrations in the site area?
	Site 51 and 52	Install and sample temporary wells.	No groundwater samples previously collected.	Groundwater to surface water.	Human receptors via incidental ingestion, dermal contact, and inhalation.	Determine if a release has occurred at the site.	Additional investigation necessary.	There is no apparent immediate threat based on available data.	What are the groundwater VOC concentrations in the site area?
	Downgradient from Study Area	Install and sample temporary wells at Sites 32, 33, 34, 36, and 37.	No groundwater samples previously collected.	Groundwater to surface water.	Human receptors via incidental ingestion, dermal contact, and inhalation.	Determine if there is migration of contaminated groundwater.	Additional investigation necessary.	There is no apparent immediate threat based on available data.	Does contamination exist in the groundwater downgradient of the site?
Surface water	Site 36	Sample surface water in adjacent streams.	No surface water samples previously collected.	Surface water to surface soil, surface water to sediment, surface water to groundwater, surface water to air volatilization, and surface water to subsurface soil.	Human and ecological receptors through inhalation, ingestion, and dermal contact.	Determine if there is migration of contamination to surface water.	Additional investigation necessary.	There is no apparent immediate threat based on available data.	Does contamination exist in the surface water adjacent to the site?
Sediment	Site 36	Sample sediment in adjacent streams.	No sediment samples previoulsy collected.	Sediment to surface water.	Human receptors via inhalation, ingestion, and dermal contact. Ecological receptors due to exposure and ingestion.	Determine if there is migration of contamination to sediment.	Additional investigation necessary.	There is no apparent immediate threat based on available data.	Does contamination exist in the sediment in the streams adjacent to the site?

VOCs = Volatile organic compounds

TABLE 3-2

INVESTIGATION MATRIX
SEVEN SITES
INDIAN HEAD DIVISION, NSWC
INDIAN HEAD, MARYLAND

STUDY BOUNDARY			INVESTIGATION OBJECTIVES	IDENTIFY INPUTS TO THE DECISION						DECISION RULE
				Investigative Technique	Sample Collection and Analysis					
Spatial	Population: Contaminant Source/ Medium/Path	Temporal			Location	Work Plan Figure	Quantity of Samples	Matrix	Analytical Parameter	
Site 32 Suspected burial	Subsurface soil (deeper than 6 inches)	Conduct prior to any sampling.	Determine the location of the previous burial area.	EM61 metal detector.	Perform survey of suspected burial area as shown on figure.	4-1	NA	NA	NA	If suspected burial area is located, continue with sampling and analysis. If suspected burial area cannot be located at least approximately, terminate further investigation.
		Conduct during installation of temporary wells and soil borings.	Determine if detectable concentrations of beryllium and copper contamination exist in subsurface soil in the site area.	Subsurface soil samples to determine if beryllium and copper contamination exists.	Collect samples at approximately the 2- to 4-foot and 4- to 6-foot depth intervals at locations S32SB001 through S32SB003.	4-1	6	Soil	Beryllium and copper	If beryllium and copper contamination is detected in the soil samples, then additional sampling will be necessary to determine the extent of contamination.
	Groundwater	Install and sample temporary wells.	Determine if there are detectable concentrations of beryllium and copper in groundwater in the site area.	Install temporary groundwater wells and sample groundwater to determine if groundwater contamination exists.	Collect samples from S32TW001 and S32TW002.	4-1	2	Water	Beryllium and copper	If beryllium and copper contamination is detected in the groundwater of the site, then an additional round of sampling may be necessary to verify analytical results and a field investigation will be necessary if the source is to be determined.
	Groundwater downgradient from Study Area	Install and sample a temporary well downgradient of site.	Determine if site-related contamination exists in the groundwater downgradient of the site.	Install a down gradient temporary well and sample groundwater to determine if down gradient groundwater contains beryllium and copper contamination.	Downgradient of site at location S32TW003.	4-1	1	Water	Beryllium and copper	If beryllium and copper contamination is detected in the downgradient groundwater, then an additional round of sampling may be necessary to verify the analytical results and additional wells will be necessary if the extent of the plume is to be determined.
Site 33 Seep metal pit	Surface soil (0 to 6 inches deep)	Conduct prior to any sampling.	Determine the location of the previous excavation.	EM61 metal detector.	Perform survey of suspected burial area as shown on figure.	4-2	NA	NA	NA	If suspected burial area is located, continue with sampling and analysis. If suspected burial area cannot be located at least approximately, terminate further investigation.
		Conduct during installation of temporary wells and soil borings.	Determine if detectable concentrations of metal contamination exist in surface soil in the site area.	Surface soil samples to determine if metal contamination exists.	Collect surface soil samples at soil boring locations S33SB001 through S33SB003.	4-2	3	Soil	TAL metals	If metal contamination is detected in the surface soil samples, an additional round of sampling will be necessary to determine the extent of contamination.
	Subsurface soil (deeper than 6 inches)	Conduct during installation of temporary wells and soil borings.	Determine if detectable concentrations of metal contamination exist in subsurface soil in the site area.	Subsurface soil samples to determine if metal contamination exists.	Collect samples approximately the 3- to 5-foot and 8- to 10-foot depths at locations S33SB001 through S33SB003.	4-2	6	Soil	TAL metals	If metal contamination is detected in the soil samples, then additional sampling will be necessary to determine the extent of contamination.
	Groundwater	Install and sample temporary wells.	Determine if there are detectable concentrations of metals in the groundwater in the site area.	Install temporary groundwater wells and sample groundwater to determine if groundwater contamination exists.	Collect samples from S33TW001 and S33TW002.	4-2	2	Water	TAL Metals	If metal contamination is detected in the groundwater of the site, then an additional round of sampling may be necessary to verify analytical results, and a field investigation will be necessary if the source is to be determined.
	Groundwater downgradient from Study Area	Install and sample a temporary well downgradient of site.	Determine if site related contamination exists in the groundwater downgradient of the site.	Install a downgradient temporary well and sample groundwater to determine if downgradient groundwater contains metal contamination.	Downgradient of site at location S33TW003.	4-2	1	Water	TAL Metals	If metal contamination is detected in the downgradient groundwater, then an additional round of sampling may be necessary to verify the analytical results and additional wells will be necessary if the extent of the plume is to be determined.

TABLE 3-2

INVESTIGATION MATRIX
SEVEN SITES
INDIAN HEAD DIVISION, NSWC
INDIAN HEAD, MARYLAND

STUDY BOUNDARY			INVESTIGATION OBJECTIVES	IDENTIFY INPUTS TO THE DECISION						DECISION RULE
				Investigative Technique	Sample Collection and Analysis					
Spatial	Population: Contaminant Source/ Medium/Path	Temporal			Location	Work Plan Figure	Quantity of Samples	Matrix	Analytical Parameter	
Site 34 Sod Burial	Surface soil (0 to 6 inches deep)	Conduct prior to any sampling.	Determine the location of the previous burial areas.	EM61 metal detector.	Perform survey of suspected burial area as shown on figure.	4-3	NA	NA	NA	If suspected burial area is located, continue with sampling and analysis. If suspected burial area cannot be located, at least approximately, terminate further investigation.
		Conduct during installation of temporary wells and soil borings.	Determine if detectable concentrations of beryllium and copper contamination exist in the surface soil in the site area.	Surface soil samples to determine if beryllium and copper contamination exists.	Collect surface soil samples at soil boring locations S34SB001 through S34SB003.	4-3	3	Soil	Beryllium and copper	If contamination is detected in the surface soil samples, an additional round of sampling will be necessary to determine the extent of contamination.
	Subsurface soil (deeper than 6 inches)	Conduct during installation of temporary wells and soil borings.	Determine if detectable concentrations of beryllium and copper contamination exist in subsurface soil in the site area.	Subsurface soil samples to determine if beryllium and copper contamination exists.	Collect samples at approximately the 4- to 6-foot and 10- to 12-foot depth intervals at locations S34SB001 through S34SB003.	4-3	6	Soil	Beryllium and copper	If beryllium and copper contamination is detected in the soil samples, then additional sampling will be necessary to determine the extent of contamination.
	Groundwater	Install and sample temporary wells.	Determine if there are detectable concentrations of beryllium and copper in the groundwater in the site area.	Install temporary groundwater wells and sample groundwater to determine if groundwater contamination exists.	Collect samples from S34TW001 and S34TW002.	4-3	2	Water	Beryllium and copper	If beryllium and copper contamination is detected in the groundwater of the site, then an additional round of sampling may be necessary to verify analytical results and a field investigation will be necessary if the source is to be determined.
	Groundwater downgradient from Study Area	Install and sample a temporary well downgradient of site.	Determine if site-related contamination exists in the groundwater downgradient of the site.	Install a downgradient temporary well and sample groundwater to determine if downgradient groundwater contains beryllium and copper contamination.	Downgradient of site at location S34TW003.	4-3	1	Water	Beryllium and copper	If beryllium and copper contamination is detected in the downgradient groundwater, then an additional round of sampling may be necessary to verify the analytical results and additional wells will be necessary if the extent of the plume is to be determined.
Site 36 Closed Landfill	Surface Soil (0 to 6 inches deep)	Conduct during installation of temporary wells and soil borings.	Determine if detectable concentrations of VOC, SVOC, metal, or explosive contamination exist in the surface soil in the site area.	Surface soil samples to determine if contaminants exist.	Collect samples at soil boring locations S36SB001 through S36SB004.	4-4	4	Soil	TCL VOCs, TCL SVOCs, TAL metals, explosives	If contamination is detected in the surface soil samples, an additional round of sampling will be necessary to determine the extent of contamination.
	Subsurface soil (deeper than 6 inches)	Conduct during installation of temporary wells and soil borings.	Determine if detectable concentrations of VOC, SVOC, metal, or explosive contamination exist in the subsurface soil in the site area.	Subsurface soil samples to determine if contamination exists.	Collect samples at approximately the 2- to 4-foot and 4- to 6-foot depth intervals at locations S36SB001 through S36SB004.	4-4	8	Soil	TCL VOCs, TCL SVOCs, TAL metals, and explosives	If contamination is detected in the soil samples, then additional sampling will be necessary to determine the extent of contamination.
	Groundwater	Install and sample temporary wells.	Determine if there are detectable concentrations of VOC, SVOC, metal, and explosive concentrations in the groundwater in the site area.	Install temporary groundwater wells and sample groundwater to determine if groundwater contamination exists.	Collect samples from S36TW001 and S36TW002.	4-4	2	Water	TCL VOCs, TCL SVOCs, TAL metals, and explosives	If contamination is detected in the groundwater of the site, then an additional round of sampling may be necessary to verify analytical results and a field investigation will be necessary if the source is to be determined.
	Groundwater downgradient from Study Area	Install and sample a temporary well downgradient of Site 36.	Determine if site-related contamination exists in the groundwater downgradient of the site.	Install a downgradient temporary well and sample groundwater to determine if downgradient groundwater contamination exists.	Downgradient of site at location S36TW003.	4-4	1	Water	TCL VOCs, TCL SVOCs, TAL metals, and explosives	If contamination is detected in the downgradient groundwater, then an additional round of sampling may be necessary to verify the analytical results and additional wells will be necessary if the extent of the plume is to be determined.

TABLE 3-2

INVESTIGATION MATRIX
SEVEN SITES
INDIAN HEAD DIVISION, NSWC
INDIAN HEAD, MARYLAND

STUDY BOUNDARY			INVESTIGATION OBJECTIVES	IDENTIFY INPUTS TO THE DECISION						DECISION RULE
				Investigative Technique	Sample Collection and Analysis					
Spatial	Population: Contaminant Source/ Medium/Path	Temporal			Location	Work Plan Figure	Quantity of Samples	Matrix	Analytical Parameter	
Site 36 (continued)	Surface water	Sample surface water in nearby streams.	Determine if detectable concentrations of contamination exist in the surface water of adjacent streams at the site.	Surface water samples to determine if contamination exists.	Collect samples from locations S37SW001 through S37SW003.	4-4	3	Surface Water	TCL VOCs, TCL SVOCs, TAL metals, and explosives	If contamination is detected in the surface water, then additional sampling may be required to verify the contamination and determine the source.
	Sediment	Sample sediment in nearby streams.	Determine if detectable concentrations of contamination exist in the sediment of adjacent streams at the site.	Sediment samples to determine if contamination exists.	Collect samples from locatoions S37SD001 through S37SW003.	4-4	3	Sediment	TCL VOCs, TCL SVOCs, TAL metals, and explosives	If contamination is detected in the sediment, then additional sampling may be required to verify the contamination and determine the source.
Site 37 Causeway	Surface Soil (0 to 6 inches deep)	Conduct during installation of temporary wells and soil borings.	Determine if detectable concentrations of VOC, SVOC, metal or pesticide/PCB contamination exist in the surface soil in the site area.	Surface soil samples to determine if contaminants exist.	Collect samples at soil boring locations S37SB001 through S37SB003.	4-5	3	Soil	TCL VOCs, TCL SVOCs, TCL pesticide/PCBs, TAL metals, and explosives.	If contamination is detected in the surface soil samples, an additional round of sampling will be necessary to determine the extent of contamination.
	Subsurface soil (deeper than 6 inches)	Conduct during installation of temporary wells and soil borings.	Determine if detectable concentrations of VOC, SVOC, metal, pesticide/PCB, or explosive contamination exist in the subsurface soil in the site area.	Subsurface soil samples to determine if contamination exists.	Collect samples at approximately the 2- to 4-foot and 4- to 6-foot depth intervals at locations S37SB001 through S37SB003.	4-5	6	Soil	TCL VOCs, TCL SVOCs, TCL pesticide/PCBs, TAL metals, and explosives.	If contamination is detected in the soil samples, then additional sampling will be necessary to determine the extent of contamination.
	Groundwater	Install and sample temporary wells.	Determine if there are detectable concentrations of VOC, SVOC, metal, pesticide/PCB, and explosives in groundwater in the site area.	Install temporary groundwater wells and sample groundwater to determine if groundwater contamination exists.	Collect samples from S37TW001 and S37TW002.	4-5	2	Water	TCL VOCs, TCL SVOCs, TCL pesticide/PCBs, TAL metals, and explosives.	If contamination is detected in the groundwater of the site, then an additional round of sampling may be necessary to verify analytical results and a field investigation will be necessary if the source is to be determined.
	Groundwater downgradient from Study Area	Install and sample temporary wells downgradient of Site 37.	Determine if there are detectable concentrations of site-related contamination in the groundwater downgradient of the site.	Install a down gradient temporary well and sample groundwater to determine if down gradient groundwater contamination exists.	Downgradient of site at location S37TW003.	4-5	1	Water	TCL VOCs, TCL SVOCs, TCL pesticide/PCBs, TAL metals, and explosives.	If contamination is detected in the downgradient groundwater, then an additional round of sampling may be necessary to verify the analytical results and additional wells will be necessary if the extent of the plume is to be determined.
Site 51 and 52 Dry wells	Subsurface soil (deeper than 6 inches)	Conduct prior to any sampling.	Determine location of dry wells.	Site visit and interview of present employees.	Investigate areas shown on figure.	4-6	NA	NA	NA	If the dry wells are located, continue with sampling and analysis. If the dry wells cannot be located at least approximately, terminate further investigation.
		Conduct during installation of temporary wells and soil borings.	Determine if detectable concentrations of VOC contamination exist in the site area.	Subsurface soil samples to determine if metal contamination exists.	Collect samples from bottom and side of dry wells at locations S51SB001 through S51SB003 and S52SB001 through S52SB003.	4-6	6	Soil	TCL VOCs	If volatile contamination is detected in the soil samples, then additional sampling will be necessary to determine the extent of contamination.
	Groundwater	Install and sample temporary wells.	Determine if there are detectable concentrations of volatiles in the site area.	Install temporary groundwater wells and sample groundwater to determine if groundwater contamination exists.	Collect samples from S51TW001 and S52TW001.	4-6	2	Water	TCL VOCs	If volatile contamination is detected in the groundwater of the site, then an additional round of sampling may be necessary to verify analytical results and a field investigation will be necessary if the source is to be determined.

4.0 DETAILED FIELD ACTIVITIES

This section provides information regarding the specific field activities to be conducted to obtain the data required to prepare the SS report. Table 3-1, Development of Data Needs, and Table 3-2, Investigation Matrix, show in tabular form the development of detailed investigation objectives and the activities planned to address those objectives. Table 4-1, Summary of Investigation Activities, presents a gross summary of the samples planned for field collection. Table 4-2, Environmental Sampling and Analysis Summary, lists each of the environmental samples planned for collection and the analyses anticipated for each. Figures 4-1 through 4-6 show the proposed sample locations to be collected at each site. Taken together, these tables and figures are intended to provide a view of the overall SS investigation activities and their rationale.

The following subsections are not intended to reiterate information already presented in the tables and figures. The text that follows is intended to complement the tables and figures by clarifying points not specifically covered by them. This section, along with the tables and figures, provides a comprehensive view of the SS investigation.

4.1 FIELD INVESTIGATIONS

Prior to any sampling proposed at the seven sites, many of the sites will require some investigation to locate the potential areas in the field. The sites will require the following field investigations:

- Site 32, 33, and 34 - A geophysical investigation consisting of the use of an EM61 metal detector will be used to locate the suspected burial areas. In addition, existing personnel working in the areas will be interviewed and historical information will be reviewed to obtain any information to aid in the determination of the areas.

- Site 51 and 52 - A thorough visual observation will be made of the areas surrounding Building 101 and 102 to locate the potential dry wells. In addition, existing personnel working in the area will be interviewed and historical information will be reviewed to obtain any further information to aid in the determination of the dry well locations.

If the proposed locations discussed above cannot at least be approximately located, further investigation of the site in question will be terminated.

What will these mean under the FFA?

4.2 SURFACE SOILS INVESTIGATION

As proposed, surface soil sampling consists of collecting the initial (0 to 6 inches) sample from the soil borings and monitoring well borings.

4.3 SUBSURFACE SOILS INVESTIGATION

Soil borings appear on the figures for all sites. Soil samples are to be collected from a boring in which a temporary well will be installed, as well as from additional soil boring locations. The locations will have both a temporary well designation and a soil boring designation. The dual designation permits sample numbers to reflect the matrix sampled, which subsequently facilitates manipulation of the analytical database.

Table 4-2 indicates specific depth intervals for collecting subsurface soil samples. Those depth intervals are approximate. When selecting the actual soil samples for delivery to the analytical laboratory, field personnel will utilize a photoionization detector (PID) to select the samples with the highest PID readings for VOC laboratory analysis (Site 36 and 37) or at mid- and bottom-depth intervals at the metal burial areas (Sites 32, 33, and 34). Samples will be collected at Sites 51 and 52 from the bottom of the dry well and from the walls of the dry well.

4.4 GROUNDWATER INVESTIGATION

Temporary monitoring wells will be installed at all seven sites. Of the three temporary wells to be installed at Sites 32, 33, 34, 36, and 37, one will be a downgradient well. The downgradient direction will initially be determined based on surface topography. Only one well will be installed at Sites 51 and 52 close to the dry well locations. The locations of the wells are shown on the site figures and are tentative. The wells will be installed during the field investigation based on topography and features indicated during the soil boring installation, visual inspections, geophysical investigations and historical data review as being the most likely locations of contamination. The wells will be installed such that the screen is placed at the top of the shallow confining layer at a depth to be determined in the field.

4.5 SURFACE WATER AND SEDIMENT INVESTIGATION

As shown on Figure 4-4, surface water and sediment samples will be collected from the streams located adjacent to Site 36. The samples will be collected from areas where surface water and sediment are apparent based on field conditions observed during the field investigation.

4.6 CHEMICAL ANALYSES

Samples collected from the seven sites will be subjected to the chemical analysis described below.

- Sites 32 and 34 - All samples will be analyzed for beryllium and copper based on historical information that these areas were used as burial sites for special beryllium-copper alloy hand tools.

- Site 33 - All samples will be analyzed for TAL metals based on historical information that scrap metal was buried at this site.

- Site 36 - All samples will be analyzed for TCL VOCS, TCL SVOCs, TAL metals, and explosives at based on historical information that this site was a landfill and the fill material was believed to contain metal casings and potentially other materials.

- Site 37 - All samples will be analyzed for TCL VOCs, TCL SVOCs, TCL pesticides/PCBs, TAL metals, and explosives based on allegations that the causeway contains hazardous materials.

- Sites 51 and 52 - All samples will be analyzed for TCL VOCs based on historical information that the dry wells may have been used near a flash tank room where volatiles were vaporized.

Low-concentration detection limits are presented in the site-specific quality assurance project plan (QAPP) (Appendix B) and will be used for groundwater samples. The samples will be analyzed for low concentration since no historical data are available and concentrations may be too low to be detected using mid-concentration detection limits. All soil samples will be analyzed using mid-concentration detection limits.

TABLE 4-1

SUMMARY OF SITE SCREENING INVESTIGATION ACTIVITIES
SEVEN SITES
INDIAN HEAD DIVISION NSWC
INDIAN HEAD, MARYLAND

	Geophysical Investigation	Soil Sampling			Groundwater Sampling		Surface Water Sampling	Sediment Sampling	
Site Name	**EM61 Metal Detector**	**Surface Soil Samples**	**Number of Soil Borings[1]**	**Subsurface Soil Samples**	**Number of New Wells [2]**	**Number of GW samples**	**Surface Water Samples**	**Sediment Samples**	**Comments / Other Work**
Site 32	Yes	---	3	6	3 Temporary	3	---	---	Boring logs for site geology.
Site 33	Yes	3	3	6	3 Temporary	3	---	---	Boring logs for site geology.
Site 34	Yes	3	3	6	3 Temporary	3	---	---	Boring logs for site geology.
Site 36	Yes	4	4	8	3 Temporary	3	3	3	Boring logs for site geology.
Site 37	No	3	3	6	3 Temporary	3	---	---	Boring logs for site geology.
Site 51	No	---	---	3	1 Temporary	1	---	---	Samples to be collected from soil beneath and from sides of dry well.
Site 52	No	---	---	3	1 Temporary	1	---	---	Samples to be collected from soil beneath and from sides of dry well.
Total Samples[3]	---	13	16	38	17	17	3	3	---

1 Some soil borings and temporary wells are actually the same boring (see Figures 4-1 through 4-6).
2 One temporary well will be a downgradient well.
3 Totals do not include QA/QC samples. QA/QC samples include the following:
Field Duplicates: One field duplicate per 10 investigative samples or one per matrix per day, whichever is greater.
Trip Blanks: One trip blank per shipping container containing samples to be evaluated for VOCs.
Field Blanks: One field blank per potable and DI water source used for decontamination.
Equipment Rinsate / Field Blanks: One rinsate blank per type of sampling equipment used per day, with a minimum frequency of 10 percent.
Matrix Spike/Matrix Spike Duplicate (MS/MSD): One MS/MSD sample per 20 investigative samples of each sample matrix will be submitted to the laboratory. No extra volume is required for soil samples; however, aqueous samples require triple the volume for VOCs and double the volume for extractable organics.

TABLE 4-2

ENVIRONMENTAL SAMPLING AND ANALYSIS SUMMARY
SEVEN SITES
INDIAN HEAD DIVISION NSWC
INDIAN HEAD, MARYLAND
PAGE 1 OF 6

Sample Location	Sample Designation	Sample Depth (feet below ground surface) [1]	Sample Analysis					
			TCL VOCs	TCL SVOCs	TAL Metals[2]	Beryllium and Copper[2]	TCL Pesticides/ PCBs	Explosives (with nitrocellulose, nitroguanidine, and nitroglycerine)
SURFACE SOIL								
S33SB001/S33TW001	S33SS0010101	0 - 0.5			●			
S33SB002/S33TW002	S33SS0020101	0 - 0.5			●			
S33SB003	S33SS0030101	0 – 0.5			●			
S34SB001/S34TW001	S34SS0010101	0 - 0.5				●		
S34SB002/S34TW002	S34SS0020101	0 - 0.5				●		
S34SB003	S34SS0030101	0 – 0.5				●		
S36SB001/S36TW001	S36SS0010101	0 - 0.5	●	●	●			●
S36SB002/S36TW002	S36SS0020101	0 - 0.5	●	●	●			●
S36SB003	S36SS0030101	0 - 0.5	●	●	●			●
S36SB004	S36SS0040101	0 - 0.5	●	●	●			●
Blind Duplicate	S36SSDUP0101 (Typical)	0 – 0.5	●	●	●			●
S37SB001/S37TW001	S37SS0010101	0 - 0.5	●	●	●		●	●
S37SB002/S37TW002	S37SS0020101	0 - 0.5	●	●	●		●	●
S37SB003	S37SS0030101	0 - 0.5	●	●	●		●	●

TABLE 4-2

ENVIRONMENTAL SAMPLING AND ANALYSIS SUMMARY
SEVEN SITES
INDIAN HEAD DIVISION NSWC
INDIAN HEAD, MARYLAND

Sample Location	Sample Designation	Sample Depth (feet below ground surface) [1]	Sample Analysis					
			TCL VOCs	TCL SVOCs	TAL Metals[2]	Beryllium and Copper[2]	TCL Pesticides/ PCBs	Explosives (with nitrocellulose, nitroguanidine, and nitroglycerine)
SUBSURFACE SOIL								
S32SB001 / S32TW001	S32SB0010101	2 – 4				●		
S32SB001 / S32TW001	S32SB0010201	4 – 6				●		
S32SB002 / S32TW002	S32SB0020101	2 – 4				●		
S32SB002 / S32TW002	S32SB0020201	4 – 6				●		
S32SB003	S32SB0030101	2 – 4				●		
S32SB003	S32SB0030201	4 – 6				●		
S33SB001 / S33TW001	S33SB0010101	3 – 5			●			
S33SB001 / S33TW001	S33SB0010201	8 – 10			●			
S33SB002 / S33TW002	S33SB0020101	3 – 5			●			
S33SB002 / S33TW002	S33SB0020201	8 – 10			●			
Blind Duplicate	S33SBDUP0201	8 – 10			●			
S33SB003	S33SB0030101	3 – 5			●			
S33SB003	S33SB0030201	8 – 10			●			
S34SB001/S34TW001	S34SB0010101	4 – 6				●		
S34SB001/S34TW001	S34SB0010201	10 – 12				●		
S34SB002 / S34TW002	S34SB0020101	4 – 6				●		

TABLE 4-2

ENVIRONMENTAL SAMPLING AND ANALYSIS SUMMARY
SEVEN SITES
INDIAN HEAD DIVISION NSWC
INDIAN HEAD, MARYLAND
PAGE 3 OF 6

Sample Location	Sample Designation	Sample Depth (feet below ground surface) [1]	Sample Analysis					
			TCL VOCs	TCL SVOCs	TAL Metals[2]	Beryllium and Copper[2]	TCL Pesticides/ PCBs	Explosives (with nitrocellulose, nitroguanidine, and nitroglycerine)
S34SB002 / S34TW002	S34SB0020201	10 – 12				●		
S34SB003	S34SB0030101	4 – 6				●		
S34SB003	S34SB0030201	10 – 12				●		
S36SB001/S36TW001	S36SB0010101	2 – 4	●	●	●			●
S36SB001/S36TW001	S35SB0010201	4 – 6	●	●	●			●
Blind Duplicate	S35SBDUP0201	4 – 6	●	●	●			●
S36SB002/S36TW002	S36SB0020101	2 – 4	●	●	●			●
S36SB002/S36TW002	S36SB0020201	4 – 6	●	●	●			●
S36SB003	S36SB0030101	2 – 4	●	●	●			●
S36SB003	S36SB0030201	4 – 6	●	●	●			●
S36SB004	S36SB0040101	2 – 4	●	●	●			●
S36SB004	S36SB0040201	4 – 6	●	●	●			●
S37SB001 / S37TW001	S37SB0010101	2 – 4	●	●	●		●	●
S37SB001 / S37TW001	S37SB0010201	4 – 6	●	●	●		●	●
S37SB002 / S37TW002	S37SB0020101	2 – 4	●	●	●		●	●
S37SB002 / S37TW002	S37SB0020201	4 – 6	●	●	●		●	●
Blind Duplicate	S37SBDUP0201	4 - 6	●	●	●		●	●

TABLE 4-2

ENVIRONMENTAL SAMPLING AND ANALYSIS SUMMARY
SEVEN SITES
INDIAN HEAD DIVISION NSWC
INDIAN HEAD, MARYLAND
PAGE 4 OF 6

Sample Location	Sample Designation	Sample Depth (feet below ground surface) [1]	Sample Analysis					
			TCL VOCs	TCL SVOCs	TAL Metals[2]	Beryllium and Copper[2]	TCL Pesticides/ PCBs	Explosives (with nitrocellulose, nitroguanidine, and nitroglycerine)
S37SB003	S37SB0030101	2 – 4	●	●	●		●	●
S37SB003	S37SB0030201	4 – 6	●	●	●		●	●
S51SB001	S51SB0010x0x	From bottom of dry well	●					
S51SB002	S51SB0020x0x	From side of dry well	●					
S51SB003	S51SB0030x0x	From side of dry well	●					
S52SB001	S52SB0010x0x	From bottom of dry well	●					
S52SB002	S52SB0020x0x	From side of drywell	●					
S52SB003	S52SB0030x0x	From side of dry well	●					
TEMPORARY WELLS								
S32TW001	S32TW0010001	--				●		
S32TW002	S32TW0020001	--				●		
S32TW003	S32TW0030001	--				●		
S33TW001	S33TW0010001	--			●			
S33TW002	S33TW0020001	--			●			
S33TW003	S33TW0030001	--			●			

TABLE 4-2

ENVIRONMENTAL SAMPLING AND ANALYSIS SUMMARY
SEVEN SITES
INDIAN HEAD DIVISION NSWC
INDIAN HEAD, MARYLAND

Sample Location	Sample Designation	Sample Depth (feet below ground surface) [1]	Sample Analysis					
			TCL VOCs	TCL SVOCs	TAL Metals[2]	Beryllium and Copper[2]	TCL Pesticides/ PCBs	Explosives (with nitrocellulose, nitroguanidine, and nitroglycerine)
S34TW001	S34TW0010001	--				●		
S34TW002	S34TW0020001	--				●		
S34TW003	S34TW0030001	--				●		
S36TW001	S36TW0010001	--	●	●	●			●
Blind Duplicate	S36TWDUP0001	--	●	●	●			●
S36TW002	S36TW0020001	--	●	●	●			●
S36TW003	S36TW0030001	--	●	●	●			●
S37TW001	S37TW0010001	--	●	●	●		●	●
S37TW002	S37TW0020001	--	●	●	●		●	●
S37TW003	S37TW0030001	--	●	●	●		●	●
S51TW001	S51TW0010001	--	●					
S52TW001	S52TW0010001	--	●					
SURFACE WATER								
S36SW001	S36SW0010001	--	●	●	●			●
S36SW002	S36SW0020001	--	●	●	●			●
S36SW003	S36SW0030001	--	●	●	●			●

TABLE 4-2

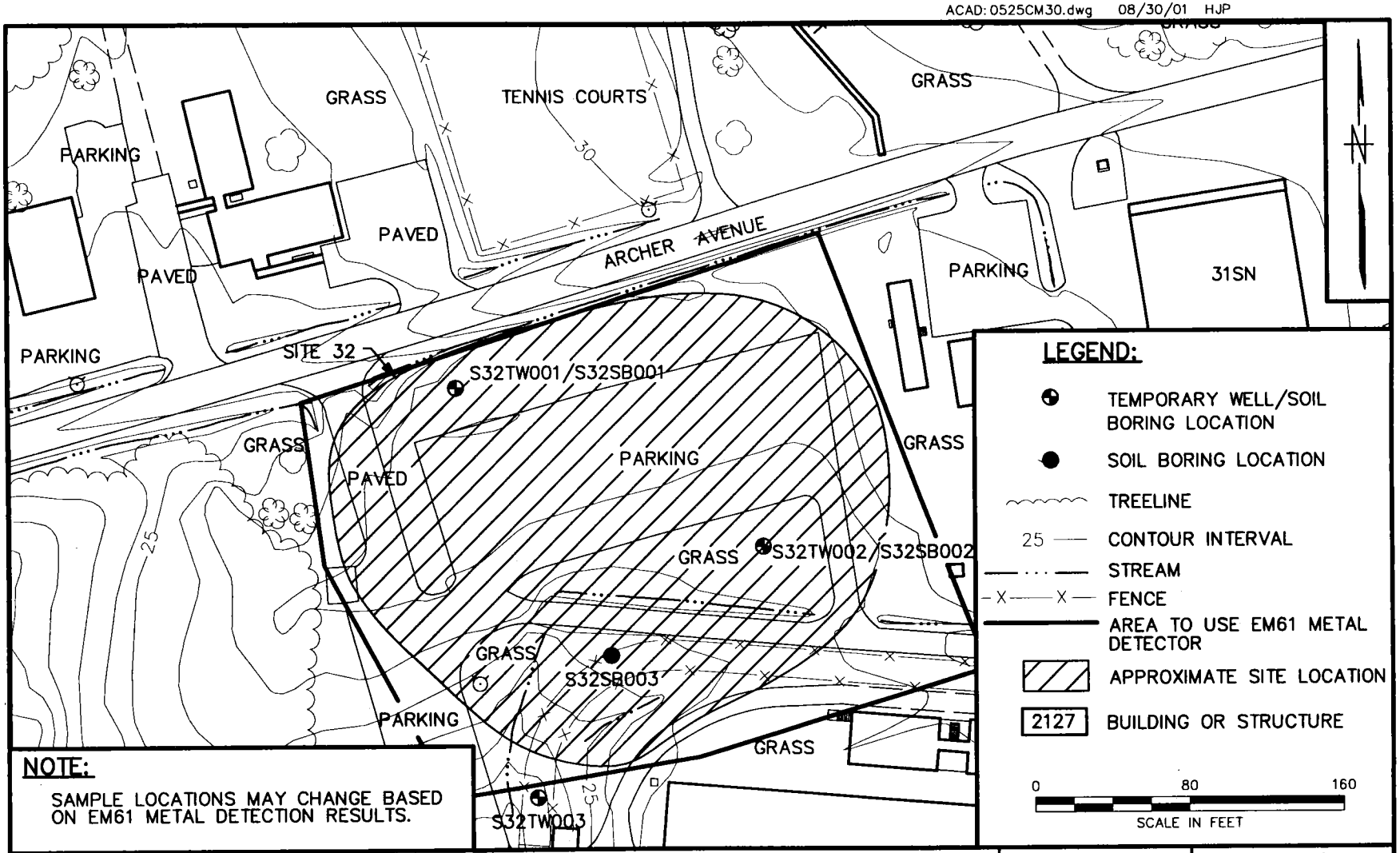
ENVIRONMENTAL SAMPLING AND ANALYSIS SUMMARY
SEVEN SITES
INDIAN HEAD DIVISION NSWC
INDIAN HEAD, MARYLAND

Sample Location	Sample Designation	Sample Depth (feet below ground surface) [1]	Sample Analysis					
			TCL VOCs	TCL SVOCs	TAL Metals[2]	Beryllium and Copper[2]	TCL Pesticides/ PCBs	Explosives (with nitrocellulose, nitroguanidine, and nitroglycerine)
SEDIMENT								
S36SD001	S36SD0010001	--	●	●	●			●
S36SD002	S36SD0020001	--	●	●	●			●
S36SD003	S36SD0030001	--	●	●	●			●

Notes:

1 Sample depth to be verified in the field.
2 Groundwater samples will be analyzed for total and filtered metals.

ACAD: 0525CM30.dwg 08/30/01 HJP



NOTE:

SAMPLE LOCATIONS MAY CHANGE BASED ON EM61 METAL DETECTION RESULTS.

DRAWN BY HJP DATE 8/14/01	Tetra Tech NUS, Inc.	CONTRACT NO. 0525	OWNER NO. 0325
CHECKED BY KMS DATE 9/4/01	PROPOSED SAMPLE LOCATION MAP SITE 32 – SUSPECTED TOOL BURIAL INDIV–NSWC, INDIAN HEAD, MARYLAND	APPROVED BY [signature] DATE 9/4/01	
COST/SCHED–AREA		APPROVED BY DATE	
SCALE AS NOTED		DRAWING NO. FIGURE 4–1	REV. 0

FORM CADD NO. T+NUS_AH.DWG - REV 0 - 1/22/98

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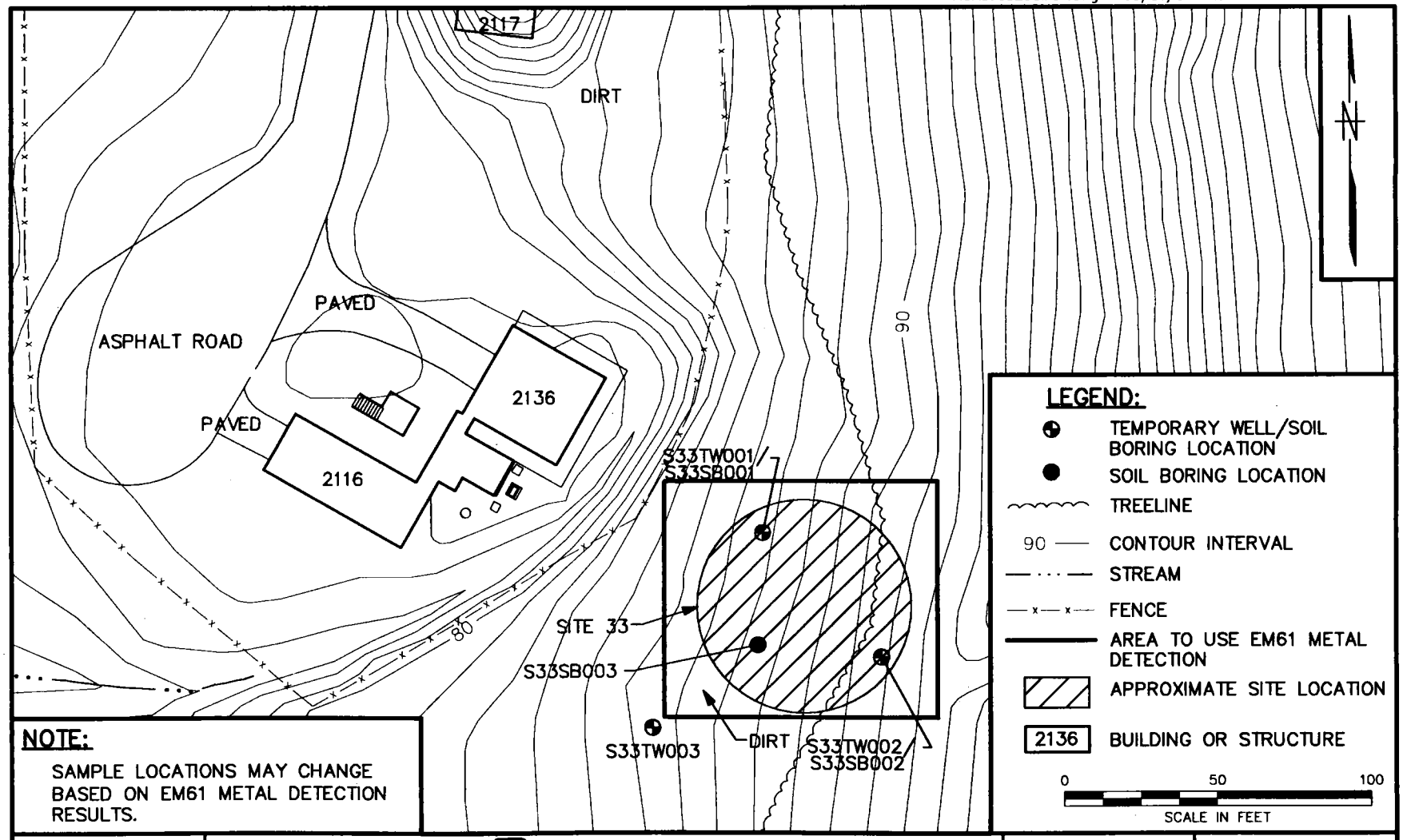


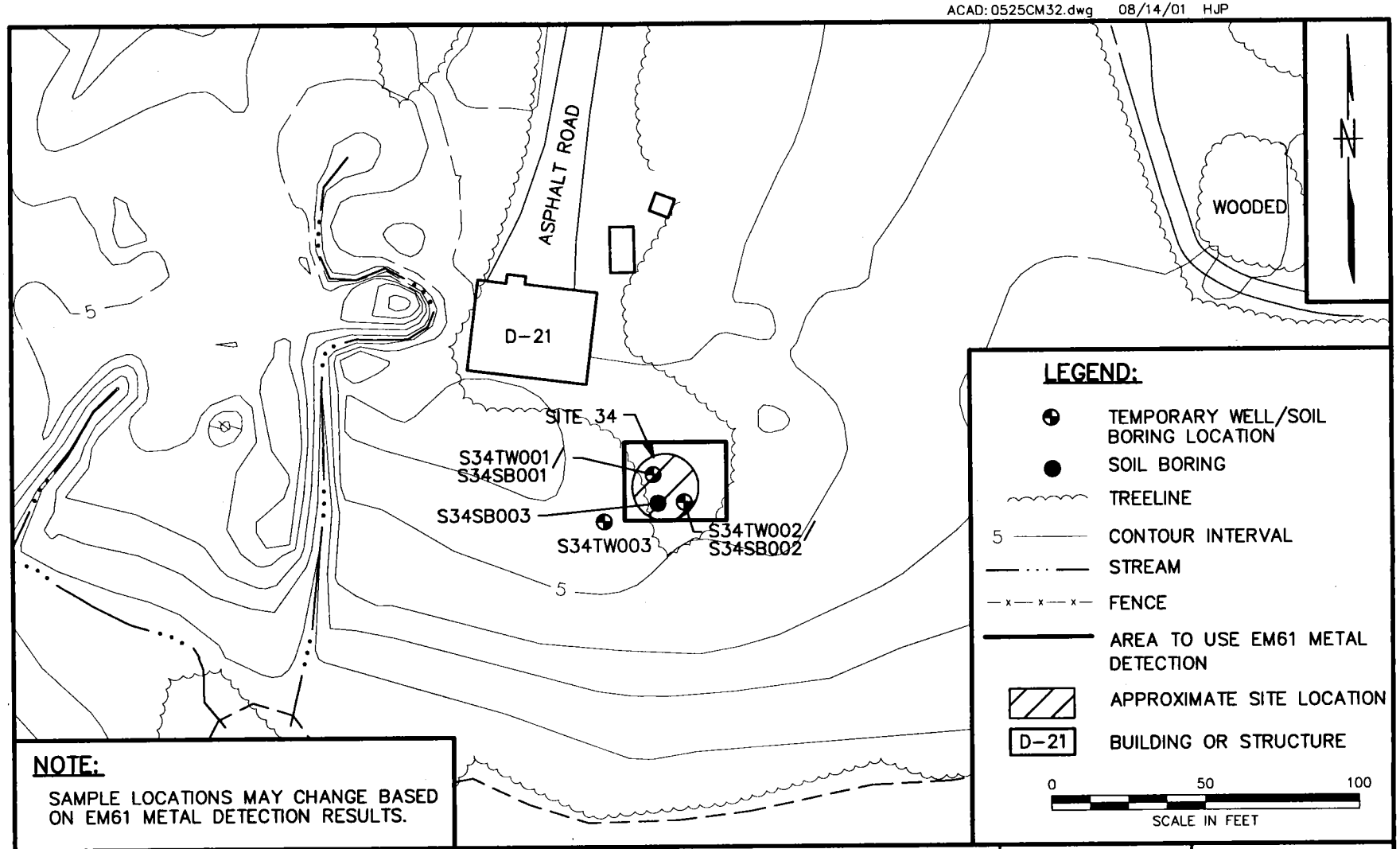
NOTE:

SAMPLE LOCATIONS MAY CHANGE BASED ON EM61 METAL DETECTION RESULTS.

DRAWN BY HJP DATE 8/14/01	Tetra Tech NUS, Inc.	CONTRACT NO. 0525	OWNER NO. 0325
CHECKED BY KMS DATE 9/4/01	PROPOSED SAMPLE LOCATION MAP SITE 33 – SCRAP METAL PIT INDIV–NSWC, INDIAN HEAD, MARYLAND	APPROVED BY DATE 9/4/01	
COST/SCHED–AREA		APPROVED BY DATE	
SCALE AS NOTED		DRAWING NO. FIGURE 4–2	REV. 0

FORM CADD NO. TtNUS_AH.DWG - REV 0 - 1/22/98

ACAD: 0525CM32.dwg 08/14/01 HJP



NOTE:

SAMPLE LOCATIONS MAY CHANGE BASED ON EM61 METAL DETECTION RESULTS.

DRAWN BY HJP DATE 8/7/01	Tetra Tech NUS, Inc.	CONTRACT NO. 0525	OWNER NO. 0325
CHECKED BY KMS DATE 9/4/01	PROPOSED SAMPLE LOCATION MAP SITE 34 – TOOL BURIAL INDIV–NSWC, INDIAN HEAD, MARYLAND	APPROVED BY [signature] DATE 9/4/01	
COST/SCHED–AREA		APPROVED BY DATE	
SCALE AS NOTED		DRAWING NO. FIGURE 4–3	REV. 0

FORM CADD NO. T:NUS_AH.DWG - REV 0 - 1/22/98

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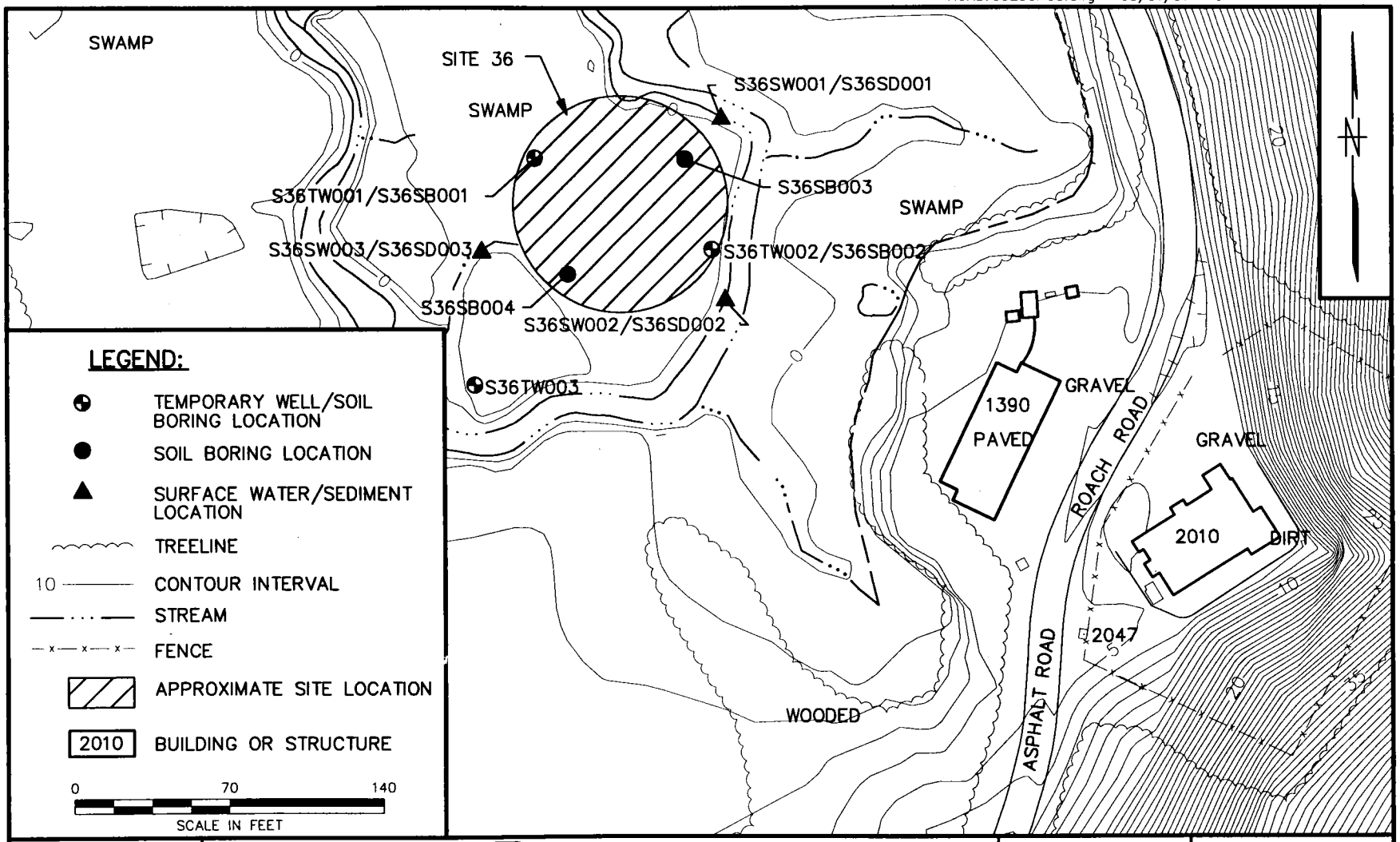

DRAWN BY HJP DATE 8/14/01	Tetra Tech NUS, Inc.	CONTRACT NO. 0525	OWNER NO. 0325
CHECKED BY KMS DATE 9/14/01	PROPOSED SAMPLE LOCATION MAP SITE 36 – CLOSED LANDFILL INDIV–NSWC, INDIAN HEAD, MARYLAND	APPROVED BY DATE 9/14/01	
COST/SCHED–AREA		APPROVED BY DATE	
SCALE AS NOTED		DRAWING NO. FIGURE 4–4	REV. 0

FORM CADD NO. TtNUS_AH.DWG - REV 0 - 1/22/98

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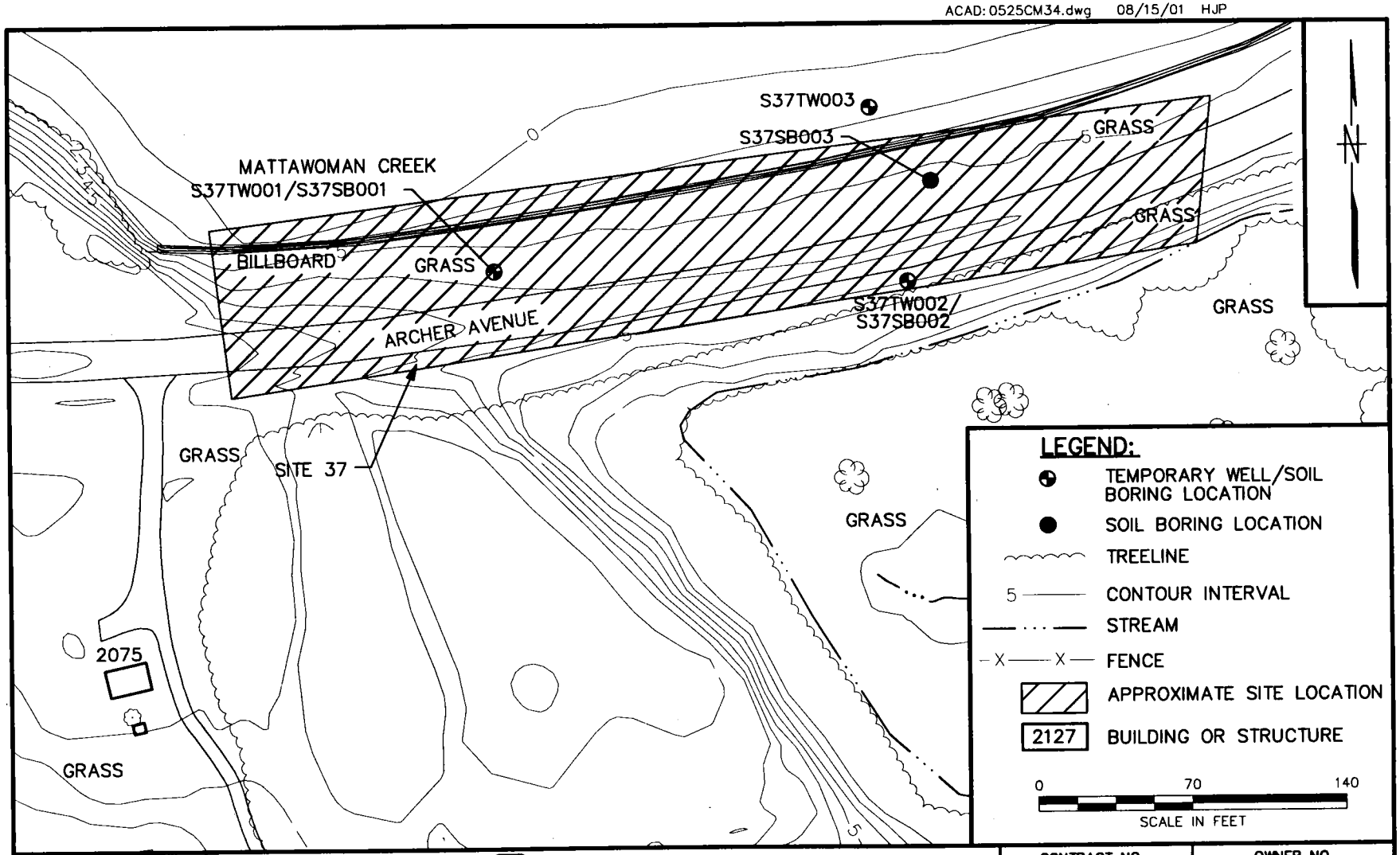
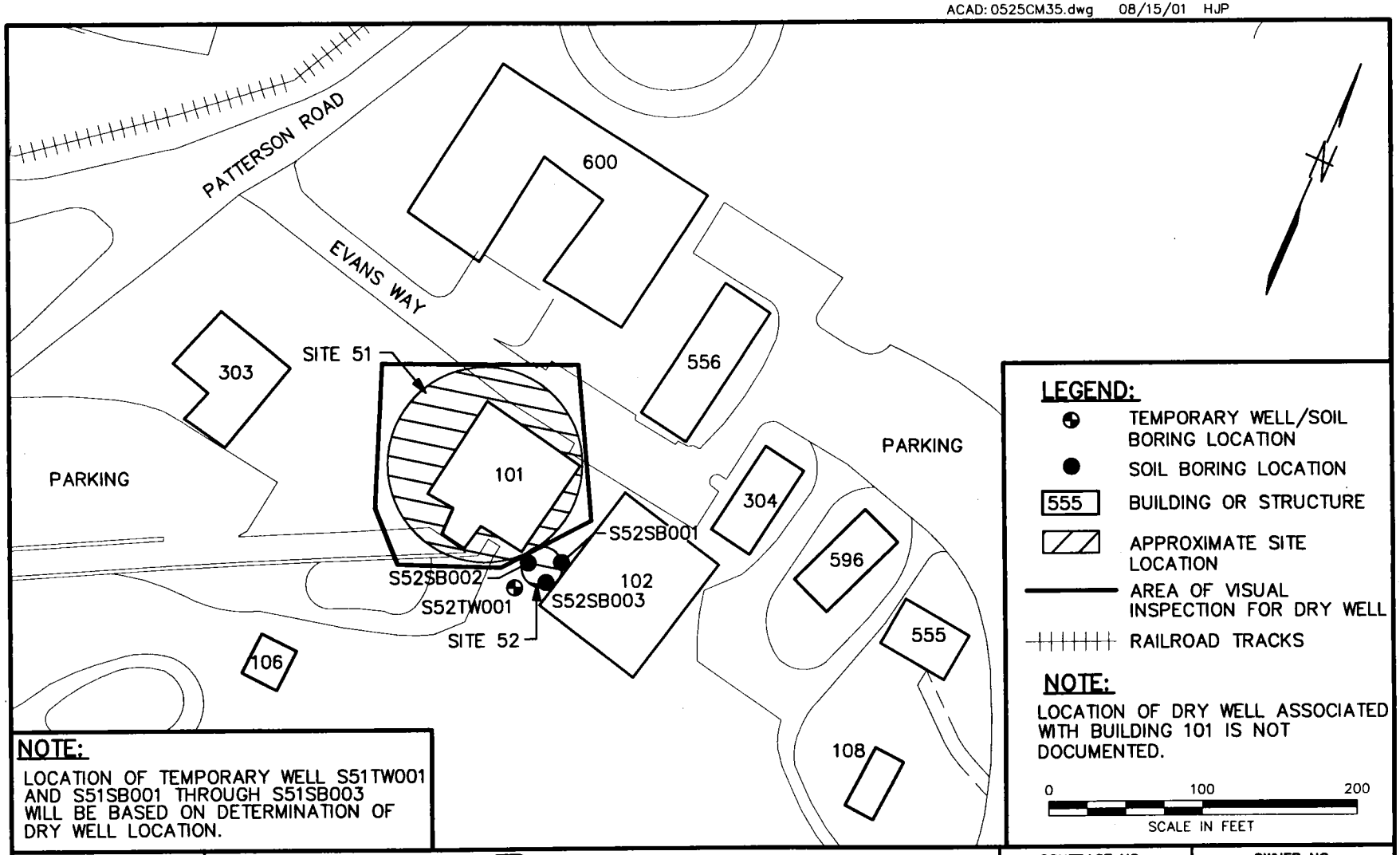


DRAWN BY DATE HJP 8/15/01	Tetra Tech NUS, Inc.	CONTRACT NO. 0525	OWNER NO. 0325
CHECKED BY DATE KMS 9/4/01	PROPOSED SAMPLE LOCATION MAP SITE 37 – CAUSEWAY INDIV–NSWC, INDIAN HEAD, MARYLAND	APPROVED BY DATE 9/4/01	
COST/SCHED–AREA		APPROVED BY DATE	
SCALE AS NOTED		DRAWING NO. FIGURE 4–5	REV. 0

FORM CADD NO. TtNUS_AH.DWG - REV 0 - 1/22/98

ACAD: 0525CM35.dwg 08/15/01 HJP



DRAWN BY HJP DATE 8/15/01	Tetra Tech NUS, Inc.	CONTRACT NO. 0525	OWNER NO. 0325
CHECKED BY KMS DATE 9/4/01	PROPOSED SAMPLE LOCATION MAP SITE 51 AND 52 – DRY WELLS INDIV–NSWC, INDIAN HEAD, MARYLAND	APPROVED BY	DATE 9/4/01
COST/SCHED–AREA		APPROVED BY	DATE
SCALE AS NOTED		DRAWING NO. FIGURE 4–6	REV. 0

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5.0 FIELD OPERATIONS

A wide range of site evaluation techniques will be used to collect data during the SS investigations conducted at the seven sites. The Master Field Sampling Plan (FSP) (B&R Environmental, 1997) and Station Standard Operating Procedures (SOPs) describe the general techniques that may be used to collect the environmental samples and field data and document field activities.

This section provides specific field operations, methods, and procedures that will be conducted for this SS field effort.

5.1 MOBILIZATION/DEMOBILIZATION

The field crew will consist of a field operations leader (FOL), site geologist, a qualified environmental technician, and specialized subcontractor personnel. The technician will be assigned the role of site safety officer for the SS. The drilling subcontractor field crew will consist of a Maryland-licensed driller and a helper. Mobilization and demobilization operations will be performed as described in the Master FSP, Section 2.1.1.

Security badges will be required for all field crew members in order to gain access to the study areas; the badges will be obtained at the main front gate office (Building 3). Prior to the arrival of the field crew at the Facility main gate office, the TtNUS project manager will provide the Facility Environmental Division with the names and Social Security numbers of the TtNUS and subcontractor personnel to ensure that the security badges are obtained without delaying the project.

The field crew will be required to attend a hazard control briefing administered by the Environmental Division Point of Contact. In addition, prior to commencing work, the field crew members will receive a pre-construction safety briefing, coordinated through the Environmental Division Point of Contact, from the Station Safety Department. Field-personnel-operated vehicles entering the site will be inspected by the Station Safety Department. The vehicles must pass Department of Transportation (DOT) regulations for vehicular operation and be in good working condition (i.e., with headlights, turning signals, horn, etc.).

5.2 MONITORING WELL INSTALLATION

The following procedures and construction specifications will be used for installation of temporary monitoring wells. Additional guidance for well installation can be found in the Master FSP, Section 2.3.1, and Station SOP GH-12.

5.2.1 Temporary Monitoring Well

Temporary monitoring well points will be installed using direct-push drilling techniques in accordance with the procedures provided in the Master FSP, Section 2.2.3. Temporary wells will be constructed using 1.5-inch Inside Diameter (ID), polyvinyl chloride (PVC) riser and 1.5-inch ID, PVC factory slotted screen. The temporary well points will be installed in the hole produced with a direct-push large-core sampling tool with a nominal 2-inch diameter. After the sampling tool has been advanced to approximately 3 to 4 feet below the water table, a 5-foot-long screen attached to the riser pipe will be lowered to the bottom of the hole. The saturated formation material may collapse around the screen, and the remaining annular space around the screen will be filled with a silica sand to the ground surface. The annular space at the ground surface will be covered with plastic sheeting around the riser to prevent infiltration of surface runoff or rain water into the annulus.

The temporary wells will be surveyed by TtNUS personnel using a theodolite tied into a permanent site feature such as a building foundation to be surveyed at a later time by a registered land surveyor. The elevation of the top of the riser pipe of the temporary wells will be surveyed to establish relative elevations.

Temporary monitoring wells will be abandoned in accordance with state of Maryland regulations (Title 26, Subtitle 04, Chapter 04, Section 11, Abandonment Standards).

5.3 SOIL BORING INSTALLATION

Direct-push drilling methods will be used to install soil borings during the field investigation. Additional guidance for soil boring installation and abandonment can be found in Sections 2.2.1 and 2.2.3 of the Master FSP and in Station SOP GH-03.

A 4-foot long solid tube (macro-core) sampling device with disposable plastic liners will be used to obtain the subsurface soil samples using direct-push drilling methods.

5.4 WATER-LEVEL MEASUREMENTS

One round of synoptic water-level measurements will be taken at each site from all newly installed temporary wells during the field investigation, in accordance with procedures provided in Section 2.4 of the Master FSP and Station SOP GH-02.

5.5 EM61 METAL DETECTOR

An EM61 metal detector will be used at Sites 32, 33, and 34 by an experienced contractor to further define the burial areas prior to establishing sampling locations. The EM61 is a time-domain metal detector that

detects both ferrous and non-ferrous metals. A grid will be established around the potential burial areas and the system will be used to identify any currents in nearby metallic objects. The instrument will be used based on the manufacturer's instructions.

5.6 SITE RESTORATION

Site restoration may be required as a result of the drilling activities during the field investigation and will be performed in accordance with procedures provided in Section 2.1.2 of the Master FSP.

5.7 DECONTAMINATION

Decontamination activities will be conducted during the field investigation in accordance with procedures provided in Section 2.10 of the Master FSP, with the following exception: the nitric acid rinse will be omitted and isopropyl alcohol will be used as the solvent rinse.

5.8 INVESTIGATION-DERIVED WASTE HANDLING

The handling and disposal of investigation-derived waste (IDW) at the Facility are discussed in detail in Section 2.11 of the Master FSP and Station SOP SA-13. The IDW that will be produced during this investigation includes borehole cuttings, drill cuttings from monitoring well installation, development and purge water, decontamination fluids, and personal protective equipment (PPE), including miscellaneous trash.

5.8.1 Borehole Cuttings

The soil removed during subsurface soil sampling activities via direct-push method will be placed in DOT-approved drums, or a roll-off box, for subsequent disposal, in accordance with Master FSP Section 2.11.

5.8.2 Development and Purge Water

All development and purge water will be containerized in DOT-approved drums, or a temporary storage tank, separately from solid materials for subsequent disposal, in accordance with Master FSP Section 2.11.

5.8.3 Decontamination Fluids

Fluids generated during the decontamination of sampling equipment will be disposed in the same manner as described for development and purge water.

5.8.4 PPE and Miscellaneous Trash

PPE and any miscellaneous trash (i.e., paper towels, disposable trowels free of loose soil, etc.) will be disposed in accordance with Master FSP Section 2.11.

5.9 SURVEYING

Surveying of the sample locations and temporary wells will be conducted by a subcontractor licensed in the state of Maryland. The survey will include all planimetric features and topography in the investigated area. Existing survey monuments within the Facility will be utilized as reference points. Horizontal locations will be surveyed to Maryland State Plane coordinates and vertical elevations will be referenced to 1929 North American Datum.

6.0 ENVIRONMENTAL SAMPLING PROCEDURES

This section describes the procedures for environmental sampling and sample-handling requirements.

6.1 SAMPLING PROCEDURES

This section details the field sampling procedures to be used to collect environmental samples for the seven sites at IHDIV-NSWC undergoing SS field investigations. General field sampling procedures are described in both the Master FSP (Master Plans for Remedial Investigations B&R Environmental, April 1997) and Station SOPs.

6.1.1 Surface Soil Sampling

Surface soil samples will be collected in accordance with the Master FSP, Section 3.1.3, except at soil boring locations, where surface soil samples will be collected using a split-spoon and stainless-steel trowel.

6.1.2 Subsurface Soil Sampling

Subsurface soil samples will be collected using procedures described in the Master FSP, Section 3.1.4.

6.1.3 Groundwater Sampling

Groundwater samples will be collected from temporary monitoring wells in accordance with the low-purge sampling method provided in the Facility SOP SA-01, Section 5.7. The purpose of low-flow purging and sampling is to collect groundwater samples that are as representative as possible of natural flow conditions. The low-flow technique is a minimum-stress procedure emphasizing negligible water-level drawdown and low pumping rates in order to collect samples with minimal alteration in water chemistry. A peristaltic pump with 1/4-inch Teflon tubing will be used for the well purging and groundwater sample collection. The VOC aliquot will be collected from the sampling tube before the water passes through the pump. The VOC sample containers will be filled in the following manner:

- A column of water will be drawn into the sampling tubing.
- The tubing will be pinched at the input side of the peristaltic pump and withdrawn from the well.
- The sample containers will be filled by gravity flow from the tubing.

The TAL metal sample aliquot will be submitted to the laboratory as a filtered (total metal) sample and an unfiltered (dissolved metal) sample in separate containers. The filtered sample is prepared in the field by

passing the groundwater through a high-capacity 0.45 µm filter into a pre-preserved container using the peristaltic pump.

6.1.4 Surface Water Sampling

The surface water samples to be collected at Site 36 will be collected in accordance with the procedures in the Master FSP Section 3.1.2. Additional guidance for sampling surface water is provided in the Facility SOP SA-02. Immediately prior to sampling, the temperature, pH, conductivity, turbidity, dissolved oxygen, and salinity of the water will be measured and recorded on the sample log sheet. Samples will be obtained using the direct fill method or by using a stainless-steel beaker.

6.1.5 Sediment Sampling

The sediment samples to be collected at Site 36 will be collected in accordance with the procedures detailed in the Master FSP Section 3.1.5. Additional guidance for sampling sediment is provided in the Facility SOP SA-02.

6.1.6 QA/QC Samples

To assure data obtained during the investigation are accurate, various Quality Assurance/Quality Control (QA/QC) requirements have been established for conducting the field work, laboratory analysis of the samples collected, and validation of the analytical results obtained from the laboratory. Detailed information regarding this subject is presented in the Master QAPP. Information relevant to this site is presented in the site-specific QAPP in Appendix B.

The field quality control samples consist of field duplicates, field blanks, trip blanks, and equipment (rinsate) blanks. Each of these types of field quality control samples will undergo the same preservation, analysis, and reporting procedures as the related environmental samples. A detailed description of each type of sample is presented in the Master QAPP in Section 3.6. The frequency and type of field QA/QC samples to be collected for this investigation are as follows:

Type of Sample	Organic	Inorganic
Field Duplicate	1/10 samples/medium	1/10 samples/medium
Field Blank	1/source/sample event	1/source/sample event
Trip Blank (VOCs only)	1/cooler containing VOC samples	NA
Equipment Rinsate Blank[1]	1/20/sampling equipment	1/20/sampling equipment

1 The identified number of equipment rinsate blanks can be substituted by collecting one batch sample for every day sampling is conducted and submit every other blank collected for analysis.

The quality control measures the laboratory needs to follow are outlined in detail during the procurement process; however, it is necessary to collect additional volume for laboratory matrix spike/matrix spike duplicate (MS/MSD) analysis of aqueous samples. All other internal checks will be conducted using the provided samples. The additional aqueous sample required for MS/MSD analysis is three times the volume for VOC analysis and two times the volume for extractable organics. One MS/MSD will be analyzed for every 20 or fewer investigative samples.

Validation of the analytical results is discussed in detail in Section 9.0 of the Master QAPP. The generated data are validated in accordance with the EPA National Functional Guidelines and subsequent amendments.

6.2 SAMPLE HANDLING

This section details sample-handling procedures including the field-related considerations concerning the selection of sample containers, preservatives, and allowable holding times for analyses requested. In addition, sample identification, packaging, and shipping will be addressed in this section.

6.2.1 Field Documentation

Field documentation will be conducted as described in the Master FSP Section 3.2.1. Completed chains-of-custody (COCs) will be faxed to the TtNUS project manager on a daily basis. Samples to be submitted to the laboratory for analytical results within 24 hours will be clearly identified on the COCs, and the laboratory will be notified that a full data package is not required for these samples.

6.2.2 Sample Nomenclature

Each collected sample will be assigned a unique sample tracking number. The sample tracking number will consist of a 12-digit alpha-numeric code, in accordance with station SOP CT-02. Any other pertinent information regarding sample identification will be recorded in the field logbooks and on the sample log sheet.

The alpha-numeric code to be used in the sample system is explained below:

Character Type:

A	=	Alpha
N	=	Numeric
E	=	Either alpha or numeric

(ANN)	(AA)	(EEE)	(NN)	(NN)
[Site]	[Sample Type]	[Location]	[Depth]	[Round]

No dashes are to be used in the sample number.

Site:
- S32
- S33
- S34
- S36
- S37
- S51
- S52

Sample Type :

SS	=	Surface soil sample
SB	=	Subsurface soil sample
TW	=	Groundwater sample collected from a temporary monitoring well
SW	=	Surface Water sample
SD	=	Sediment sample

This field may also be used for QA/QC designation:

TB	=	Trip blank
FB	=	Field blank
RB	=	Rinsate blank

Sample location :

EEE	=	Assigned sample number for each sample location of a particular media; QA/QC sample will be numbered sequentially in the order of collection, beginning with 001.

Example of the second rinsate blank collected during the first field effort at Site 32:

S32RB0020001

Sample Depth:

NN = Number sequentially in the order the sample is collected from a single location and representing a unique sampling depth.

For example, three subsurface soil samples are collected for chemical analysis from soil boring number two; they would be designated as

Sample from 2 to 4 feet: S32SB0020101
Sample from 4 to 6 feet: S32SB0020201
Sample from 6 to 8 feet: S32SB0020301

Sampling round:

NN = The sampling round is straightforward. It can range from 01 to 99.

Duplicate samples will be reported blind to the laboratory. The three-digit sample location identifier field will be assigned with the designation "DUP." The sample depth field will be assigned the duplicate number collected for that specific matrix. The time designated on the sample label and COC will be 0000 hours. The location at which the duplicate is collected will be noted on the sample log sheet and in the field notebook.

For example, the third groundwater duplicate sample collected during the first field effort would be labeled:

S32MWDUP0301

Additional guidance is provided in the Facility SOP CT-02.

6.2.3 Sample Containers, Preservatives, and Holding Times

The EPA User's Guide to the Contract Laboratory Program (EPA, December 1986), and the Federal Register (EPA, October 26, 1984) address the topics of containers and sample preservations. Table 6-1 provides a summary of the analysis, methodology, bottle requirements, preservation requirements, and holding times for the sampling to be submitted for analysis.

6.2.4 Sample Packaging and Shipping

Samples will be packaged in accordance with the Master FSP Section 3.2.4 and Facility SOPs SA-6.1. When the samples are containerized, they will be placed on ice and in a cooler and, within a reasonable period of time, relinquished to the fixed-base laboratory carrier at the Facility main gate. Sample containers provided by the laboratory are pre-preserved. The FOL will be responsible for completion of the following forms:

- Sample labels
- Chain-of-custody forms
- Chain-of-custody labels

6.3 SAMPLE CUSTODY

Custody of samples must be maintained and documented at all times. Chain-of-custody begins with the collection of the samples in the field. The Master FSP Section 3.3 and the station SOPs SA-12 provide additional guidance for sample custody procedures. A chain-of-custody form provided by the subcontracted laboratory will be used during the sample-handling process.

TABLE 6-1

SUMMARY OF ANALYSIS, METHODOLOGY, BOTTLE REQUIREMENTS, PRESERVATION REQUIREMENTS, AND HOLDING TIMES
SEVEN SITES
INDIAN HEAD DIVISION NSWC
INDIAN HEAD, MARYLAND

Analysis	Analytical Method	Number of Samples[1]	Number of Containers per Sample	Container Type	Preservation Requirements	Holding Times
SOIL MATRIX						
TCL VOCs	CLP SOW OLM0 4.2	20	2	2-oz glass jars with Teflon liners	Cool to 4°C	14 days to analysis
TCL SVOCs	CLP SOW OLM0 4.2	24	1	8-oz glass jar with Teflon liner.	Cool to 4°C	7 days to extraction: 40 days after extraction
TCL Pest/PCBs	CLP SOW OLM0 4.2	9	1	8-oz glass jar with Teflon liner.	Cool to 4°C	7 days to extraction: 40 days after extraction
Explosives	SW-846 8330 or 8321 A	23	1	8-oz wide mouth glass	Cool to 4°C	7 days to extraction: 40 days after extraction
Beryllium and Copper	CLP SOW ILMO 4.1	12	1	8-oz wide mouth glass	Cool to 4°C	6 months to analysis
TAL Metals (Total)	CLP SOW ILM0 4.1	33	1	8-oz wide mouth glass	Cool to 4°C	6 months to analysis
WATER MATRIX						
TCL VOCs	CLP SOW OLC0 2.1	11	3	40-ml VOA vials (Borosilicate glass)	Cool to 4°C HCL to ≤ 2	14 days to analysis
TCL SVOCs	CLP SOW OLC0 2.1	9	2	1-liter amber glass jar	Cool to 4°C	7 days to extraction; 40 days after extraction
TCL Pest/PCBs	CLP SOW OLC0 2.1	3	2	1-liter amber glass jar	Cool to 4°C	7 days to extraction; 40 days after extraction
Explosives	SW-846 8330 or 8321A	9	1	1-liter amber glass jar	Cool to 4°C 0.008% $Na_2S_2O_3$	7 days to extraction; 40 days after extraction

TABLE 6-1

SUMMARY OF ANALYSIS, METHODOLOGY, BOTTLE REQUIREMENTS, PRESERVATION REQUIREMENTS, AND HOLDING TIMES
SEVEN SITES
INDIAN HEAD DIVISION NSWC
INDIAN HEAD, MARYLAND

Analysis	Analytical Method	Number of Samples[(1)]	Number of Containers per Sample	Container Type	Preservation Requirements	Holding Times
Beryllium and Copper (Total)	SW-846 6010B or CLP SOW ILM04.1	6	1	1-liter high-density polyethylene	HNO3 to pH $\leq$ 2	6 months to analysis
Beryllium and Copper (Dissolved)	SW-846 6010B or CLP SOW ILM04.1	6	1	1-liter high-density polyethylene	HNO3 to pH $\leq$ 2	6 months to analysis
TAL Metals (Total)	CLP SOW ILM0 4.1	12	1	1 liter high-density polyethylene	HNO3 to pH $\leq$ 2	6 months to analysis
TAL Metals (Dissolved)	CLP SOW ILM0 4.1	12	1	1 liter high-density polyethylene	HNO3 to pH $\leq$ 2	6 months to analysis

1 Number does not include QA/QC samples to be analyzed.

VOCs Volatile organic compounds.
SVOCs Semivolatile organic compounds.
PCBs Polychlorinated biphenyls.
HCL Hydrochloric acid.
HNO_3 Nitric acid.
$Na_2S_2O_3$ Sodium bisulfite.

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