Section: 02.05
Site 20903-5640 (White Oak)
Doc. #: 0005

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DRAFT

Engineering Evaluation Cost Analysis (EE/CA)

for

Site 3

at the former Naval Surface Warfare Center - White Oak

Silver Spring and Adelphi, Maryland

Engineering Field Activity Chesapeake
Naval Facilities Engineering Command

Contract Number N62472-90-D-1298
Contract Task Order 0324

February 2000

TETRA TECH NUS, INC.

Section: 02.05
Site 20903-5640 (White Oak)
Doc. #: W/0005

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February 18, 2000

Project Number 0398

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Engineering Field Activity Chesapeake
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Reference: Clean Contract No. N62472-90-D-1298
Contract Task Order No. 0324

Subject: Draft Engineering Evaluation/Cost Analysis
Site 3 – Pistol Range Landfill
Former Naval Surface Warfare Center – White Oak, Silver Spring, Maryland

Dear Ms. Grigg:

Enclosed please find one copy of the draft Engineering Evaluation/Cost Analysis (EE/CA) for Site 3, the Pistol Range Landfill. The EE/CA identifies removal action objectives, reviews site conditions, and evaluates various removal action alternatives based on the criteria of effectiveness, implementability, and cost. The most appropriate removal action is recommended. The document has been submitted to members of the BCT as indicated below.

If you have any questions regarding this information, please call me at your earliest convenience at 412-921-8640.

Very truly yours,

Loraine M. Shipley-Yalch
Project Manager

LMY/kf
Enclosure

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Project File 0398

020014/P

ENGINEERING EVLUATION/COST ANALYSIS (EE/CA) FOR SITE 3

AT THE FORMER
NAVAL SURFACE WARFARE CENTER - WHITE OAK
SILVER SPRING AND ADELPHI, MARYLAND

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Submitted to:
Engineering Field Activity Chesapeake
Environmental Branch Code 18
Naval Facilities Engineering Command
Washington Navy Yard, Building 212
Washington, D.C. 20374-2121

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ACRONYMS

ALC	Adelphi Laboratory Center
ARAR	Applicable or Relevant and Appropriate Requirement
bgs	below ground surface
B&R	Brown & Root
CAA	Clean Air Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CLEAN	Comprehensive Long-Term Environmental Action Navy
COMAR	Code of Maryland Regulations
CTO	Contract Task Order
CWA	Clean Water Act
cy	cubic yard
DVS	Design Verification Study
EE/CA	Engineering Evaluation/Cost Analysis
EFACHES	Engineering Field Activity Chesapeake
EM	Electromagnetic
EM31	EM-31 Terrain Conductivity Meter
EOD	Explosive Ordnance Disposal
EPA	U. S. Environmental Protection Agency
GSA	General Services Administration
HASP	Health and Safety Plan
HI	Hazard Index
HNUS	Halliburton NUS
IAS	Initial Assessment Study
ICR	Incremental Cancer Risk
IR	Installation Restoration
LDPE	Low Density Polyethylene
LDR	Land Disposal Restriction
MCL	Maximum Contaminant Level
msl	mean sea level
NEESA	Naval Energy and Environmental Support Activity
NCP	National Oil and Hazardous Substances Contingency Plan
NSWC	Naval Surface Warfare Center
OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Waste and Emergency Response

PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PCOC	Potential Contaminant of Concern
RBC	Risk-Based Concentration
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RfD	Reference Dose
RFI	RCRA Facility Investigation
RI	Remedial Investigation
RME	Reasonable Maximum Exposure
SACM	Superfund Accelerated Cleanup Model
SSL	Soil Screening Level
SVE	Soil Vapor Extraction
SVOC	Semivolatile Organic Compound
TAL	Target Analyte List
TBC	To Be Considered
TCE	Trichloroethylene
TCL	Target Compound List
TOC	Total Organic Carbon
TOX	Total Organic Halogen
TSCA	Toxic Substances Control Act
TtNUS	Tetra Tech NUS, Inc.
USNR	U.S. Naval Reserve
UXO	Unexploded Ordnance
VOC	Volatile Organic Compound
WSSC	Washington Suburban Sanitary Commission

EXECUTIVE SUMMARY

The Naval Surface Warfare Center – White Oak was a Navy-owned and -operated facility for naval surface warfare research. The facility has been closed and the property transferred to the General Services Administration and the U.S. Army.

Site 3, the Pistol Range Landfill, is located in the eastern portion of the facility and was used from the late 1940s until the mid-1970s as a landfill.

As the lead agency, the Navy has determined that a time-critical removal action, under the Comprehensive Environmental Response, Compensation, and Liability Act, is appropriate for Site 3. This Engineering Evaluation/Cost Analysis develops, evaluates, and recommends an appropriate removal action to address waste and contaminated soil at Site 3.

REMOVAL ACTION OBJECTIVES

The removal action objectives for Site 3 are to prevent direct contact with the landfill contents, limit the site's potential to act as a source for groundwater and surface water contamination, minimize the human health risks to future land users, and mitigate impact to Westfarm Branch.

IDENTIFICATION, ANALYSIS, AND COMPARATIVE ANLAYSIS OF REMOVAL ACTION ALTERNATIVES FOR SITE 3

A preliminary screening of soil technologies was conducted to eliminate process options that are not suitable for use at Site 3. The technologies and process options retained from the preliminary screening were used to develop the following removal action alternatives:

- Alternative 1: No Action
- Alternative 2: Excavation, Off-Site Treatment or Off-Site Landfill Disposal, and Site Restoration
- Alternative 3: Containment and Institutional Controls

Alternatives were evaluated based on the criteria of effectiveness, implementability, and cost. A comparative analysis was then conducted to evaluate these alternatives and identify the most appropriate removal action. The capital costs associated with these alternatives are as follows: Alternative 1 - no cost; Alternative 2 - $3,200,000; Alternative 3 -$2,150,000. Alternative 3 also has annual maintenance and monitoring costs of $25,000 per year. The total present-worth cost of Alternative 3 is $2,500,000. There are no long-term operation, maintenance, or monitoring costs associated with Alternatives 1 or 2.

RECOMMENDED REMOVAL ACTION ALTERNATIVE FOR SITE 3

Based on the identification and comparative analysis of removal action alternatives, Alternative 2 was identified as the most appropriate removal action. It most effectively meets the removal action objectives, complies with ARARs, and is more easily implemented.

1.0 INTRODUCTION

The Northern Division of the Naval Facilities Engineering Command has issued Contract Task Order (CTO) 324 to Tetra Tech NUS, Inc. (TtNUS) [formerly Brown & Root (B&R) Environmental] under Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract No. N62472-90-D-1298. Under CTO 324, TtNUS is performing an Engineering Evaluation/Cost Analysis (EE/CA) for Site 3, the Pistol Range Landfill at the former Naval Surface Warfare Center (NSWC) White Oak, located in Silver Spring and Adelphi, Maryland. CTO 324 is administered by the Engineering Field Activity Chesapeake (EFACHES).

The work is part of the Navy's Installation Restoration (IR) Program, which is designed to identify contamination of Navy and Marine Corps facilities resulting from past operations and to institute corrective measures, as needed. The Navy has determined that a time-critical removal action under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) is appropriate for Site 3. This EE/CA develops, evaluates, and recommends a time-critical removal action to address contaminated soil and solid waste at Site 3. Contamination of other media (groundwater, surface water, and/or sediment) at Site 3 is being addressed in a Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) and will not be addressed in this document.

1.1 FACILITY DESCRIPTION

NSWC-White Oak was a Navy-owned and -operated facility for naval surface warfare research. The facility is located approximately 5 miles north of Washington, D.C., off New Hampshire Avenue in Silver Spring and Adelphi, Maryland (see Figure 1-1). The former NSWC-White Oak covers approximately 710 acres and is located in both Prince George's and Montgomery Counties. Adjacent to the southern corner of the property is the U.S. Army's Adelphi Laboratory Center (ALC) and the United States Naval Reserve (USNR) Training Center. A mixture of residential, park, industrial, and commercial properties border the remainder of the facility. When the facility was closed, the property was transferred to the General Services Administration (GSA) and the U.S. Army. The GSA-managed property is now called the Federal Research Center at White Oak. Figure 1-2 identifies the location of Site 3.

1.2 SITE DESCRIPTION AND BACKGROUND

The Pistol Range Landfill is located in the eastern half of the facility, north of Dahlgren Road. The landfill is bordered to the east by Perimeter Road, to the north by the property boundary and to the west by Westfarm Branch and a wetland. A Washington Suburban Sanitary Commission (WSSC) sewer right-of-way is west of Westfarm Branch. The landfill is estimated to be 1.5 acres in size. The ground surface

slopes gently to the west, with steeper slopes near Westfarm Branch. Some areas of exposed waste/fill are present within the stream. Figure 1-3 provides a site layout map.

The site was operated as a landfill from the late 1940s until the mid-1970s. Based on a review of topographic maps that pre-date landfill operations, fill materials were pushed into the stream valley of Westfarm Branch from Perimeter Road. Wastes reportedly disposed in the landfill include solid wastes, ordnance cases, solvents, oils possibly containing polychlorinated biphenyls (PCBs), sodium nitrate, and miscellaneous metallic objects. An estimated 8,000 gallons of solvents and oils were reportedly disposed at the site during the 30-year period (Kearney/Centaur, 1990). The landfill is estimated to contain 15,000 cubic yards (cy) of waste and fill. Refer to Section 1.11.3 for detailed discussion of this volume estimate. Potential unexploded ordnance (UXO) has also been observed along the face and toe of the western landfill slope.

1.3 TOPOGRAPHY

Prior to landfill operations at Site 3, the topography of the area was similar to what currently exists to the west of the stream. There was a wide floodplain with an approximate elevation of 215 feet above mean sea level (msl). The site sloped from the floodplain at 215 msl upwards to 250 feet msl at Perimeter Road (slope approximately equal to 30 percent). Perimeter Road was not paved at that time and had a more northernward bearing, as compared to its present northeastward bearing. Beginning at the 250 feet msl elevation, the slope leveled off to approximately 15 percent. This area includes the current location of Perimeter Road. A copy of the appropriate section of NSWC-White Oak map QYC 907-59, showing the former location of Perimeter Road and the site topography, is provided in Appendix A as Figure A-1.

Slopes of 50 percent or more now form the western and northern site boundaries. The central portion of the site is relatively flat, sloping gently (approximately 10 percent) from an elevation of 260 feet msl in the northeastern corner adjacent to Perimeter Road toward Westfarm Branch. Existing site topography is shown on Figure 1-3.

1.4 SURFACE WATER HYDROLOGY

NSWC-White Oak lies entirely within the drainage basin of Paint Branch, a 12-mile-long tributary to the northeast branch of the Anacostia River. Like other streams in the region, Paint Branch is a gaining stream, because it is perennially supported by shallow groundwater discharge from small springs and seeps along its length. Paint Branch has been designated as a Class III stream by the state of Maryland and may support a natural trout population.

Westfarm Branch, which forms the western Site 3 boundary, flows through the eastern portion of the facility. It originates approximately 1 mile north of the property and joins Paint Branch just south of the facility.

1.5 CLIMATE

Summers at NSWC-White Oak are warm and humid, and winters are mild. Seasonal temperature variation is about 43° F. The warmest weather occurs in July, with the average daily temperatures ranging from 69° F to 88° F. The coldest weather occurs in late January and early February, with daily temperatures ranging from 28° F to 44° F. The average annual precipitation is approximately 44 inches. Seasonal variation in precipitation is not pronounced, gradually fluctuating between a typical minimum of 3 inches in February to a typical maximum of 5 inches in August. Snowfall accumulations of more than 10 inches are rare, with the greatest snowfalls occurring in January and February.

The mean annual wind speed varies between 8 miles per hour in August and 11 miles per hour in March. The prevailing wind direction is from the south most of the year, except for northwesterly winds that occur during December, January, and February.

1.6 GEOLOGY

Test pits excavated along the eastern edge of the landfill during the Design Verification [Halliburton NUS Corporation (HNUS), 1995a] found the fill to be a mixture of sand with silt and gravel. Test pit locations are shown in Figure 1-3. Figure 1-4 illustrates a generalized east-west cross section through the center of Site 3. The thickness of the landfill material was estimated from the topography prior to landfill activities and the present topography.

Based on findings of the RFI, the landfill rests on the sand facies of the Potomac Group, the surficial geologic unit at Site 3 (TtNUS, 1999). The sand facies of the Potomac Group extends from the surface to a depth of approximately 7 to 10 feet below ground surface (bgs) and consists of brown to light-brown silty sand with quartz pebbles and cobbles, or clayey gravel. Underlying the Potomac Group is the saprolite and fractured gneiss of the Wissahickon Formation. The saprolite ranges in thickness from 4 feet in the west to 22 feet in the east. The bedrock is slightly to moderately fractured and the fractures are filled with clay. Water-bearing fractures within the bedrock were encountered at approximately 65 feet bgs in monitoring well 13GW04, 35.5 feet bgs in well 03GW102, and 20 feet bgs in well 03GW104 (TtNUS, 1999).

1.7 HYDROGEOLOGY

Groundwater exists under unconfined conditions within the Potomac Group and saprolite units. Depths to water vary from 3 to 4.7 feet bgs along Westfarm Branch to 16 to 24 feet bgs along the eastern edge of Site 3. Groundwater flow beneath the site is predominantly to the west toward Westfarm Branch with hydraulic gradients ranging between 0.15 and 0.20 feet per foot (TtNUS, 1999).

1.8 SURROUNDING LAND USE

Site 3 is located immediately south of the northern facility boundary, so it is completely surrounded by the former NSWC-White Oak land to the east, west, and south. Undeveloped land borders the former NSWC-White Oak north of Site 3. The land is privately owned and the portion northeast of Site 3 is used as a stone and gravel quarry.

1.9 ECOLOGICAL SETTING

The landfill cover supports old field vegetation with narrow strips of successional hardwood forest along the top edge of the northern landfill slope and on the steep western slope. The stream valley at the bottom of the western side slope supports old field vegetation intermixed with small clumps of hardwood saplings, primarily tulip poplar. Areas of oak-hickory forest separating the landfill cover from Dahlgren Road have been delineated. The area approximately 50 feet west of the stream has been delineated as deciduous forest (HNUS, 1995b).

Saplings and small trees of black locust, black cherry, Virginia pine, and red maple dominate successional hardwood forest. This habitat type also has a variably dense understory of common greenbrier, Japanese honeysuckle, poison ivy, and old field grasses and forbs.

Oak-hickory forest is relatively dry and the soil is often sandy. The trees are generally widely spaced, with low undergrowth of shrubs and vines. Plants in this forest type include pitch pine, tulip poplar, shagbark hickory, and mockernut hickory. Northern red, blackjack, and white and bur oak are found in the canopy layer. Shrub species include eastern redbud, flowering dogwood, northern spicebush, American hazel, rhododendron, and mountain laurel. Typical understory species include birdfoot violet, goat's rue, climbing bittersweet, wild geranium, big merrybells, Solomon's zigzag, and moccasin flower.

Animal species associated with this habitat type include opossum, gray squirrel, eastern chipmunk, eastern cottontail, raccoon, gray fox, white-tailed deer, broad-winged hawk, ruffed grouse, wild turkey, whip-poor-will, red-bellied woodpecker, common flicker, blue jay, red-eyed vireo, scarlet tanager, summer tanager, and rose-breasted grosbeak. No comprehensive survey for endangered animal species has

been conducted at the former NSWC-White Oak, although no endangered species are known to exist at the facility (EFACHES, 1999).

A wetland measuring 0.08 acre has been delineated at Site 3, as shown on Figure 1-3. The wetland includes Westfarm Branch and its stream valley. The stream channel is sharply defined by banks and nowhere do wetlands extend outside the banks. The roughly 100-foot-wide floodplain west of the stream lacks wetlands (HNUS, 1995b).

1.10 PREVIOUS INVESTIGATIONS

Findings of investigations and studies that have been performed to date at Site 3 are summarized below.

1.10.1 Initial Assessment Study

The Naval Energy and Environmental Support Activity (NEESA) performed the Initial Assessment Study (IAS) in 1984. The IAS investigated past hazardous waste disposal methods at NSWC-White Oak. The IAS included a records search and an on-site survey. The IAS identified wastes that were potentially disposed at Site 3 and the period of time during which the site was active. Based on the available information, Site 3 was recommended for further study (NEESA, 1984).

1.10.2 Confirmation Study/Verification Phase

The Confirmation Study/Verification Phase for NSWC-White Oak was conducted in September 1985 by Malcolm-Pirnie (Malcolm-Pirnie, 1987). The study was conducted to confirm the findings of the IAS and to obtain additional information to characterize site hazards. Three groundwater monitoring wells were sampled and three surface water and six stream sediment samples were collected. The analytical data collected in this investigation suggested that leachate from the landfill was migrating from the landfill to shallow groundwater. However, the sampling results did not conclusively indicate that leachate from the landfill was discharging into the stream. Slight volatile organic compound (VOC) and metals contamination was found in the shallow groundwater. Sampling of groundwater and surface water also indicated low levels of total organic halogen (TOX) and total organic carbon (TOC) were present.

1.10.3 Phase I and Phase II Remedial Investigations

The Phase I Remedial Investigation (RI) was performed in 1989. Surface water and sediment samples were collected from four locations within Westfarm Branch. Low concentrations of metals were found in the stream both upgradient and downgradient of the landfill. Four monitoring wells, including one newly installed well, were sampled. Groundwater analytical results confirmed the presence of VOCs and metals.

A vadose zone investigation included collecting two surface soil samples (3SL1 and 3SL2) and performing a soil gas survey adjacent to the landfill. A soil gas sampling grid was also established west and south of the landfill to measure the release of VOCs. The soil gas survey indicated the presence of VOCs in the soils, with the highest concentrations along the western boundary of the landfill and in the area south of Dahlgren Road. The surface soil sample results confirmed the presence of metals contamination along the face of the landfill. Semivolatile organic compounds (SVOCs) were also identified in the surface soil.

In 1991, Phase II of the RI was performed. Two additional surface soil samples (3SL3 and 3SL4) were collected. The SVOCs detected in Phase I RI surface soil samples were not identified during Phase II. The four surface soil locations are shown on Figure 1-3.

Three additional monitoring wells were installed and seven groundwater samples were collected. Various VOCs and metals were detected at concentrations above Maximum Contaminant Levels (MCLs) (Malcolm-Pirnie, 1992).

1.10.4 Phase II RCRA Facility Assessment

The RCRA Facility Assessment (RFA) was performed in 1990. Although no documented releases from the site were found in the file material, given the waste management practices (disposal directly onto or into soil), it was determined that releases of contaminants may have occurred (Kearney/Centaur, 1990). Samples were not collected as part of the RFA, but data collected during the Phase I RI were referenced and included in the document. The site was recommended for further study.

1.10.5 Design Verification Study

The Design Verification Study (DVS) was conducted in 1995. The purpose of the DVS at Site 3 was to determine the eastern boundary of the landfill through an electromagnetic (EM) survey and subsurface trenching (HNUS, 1995a).

The EM survey of Site 3 was conducted along Perimeter Road to determine the eastern boundary of the landfill (see Figure 1-3). The survey grid was approximately 60 feet wide and 300 feet long, with a 10-foot grid spacing. A Geonics EM-31 Terrain Conductivity Meter (EM31) was used to measure the ground conductivity in the immediate vicinity of the instrument to a depth of approximately 10 feet. The survey indicated that EM anomalies were present in several locations along the western boundary of the survey grid. These anomalies appear to indicate that the edge of the fill material does not extend Perimeter

Road. The remainder of the site showed no significant EM anomalies. Appendix B includes the field data collected during the EM survey.

Seven test trenches were excavated along Perimeter Road, as shown on Figure 1-3, in an attempt to define the limits of waste placement. Trenches were excavated to a depth of approximately 5 feet past. Test pit logs are provided in Appendix C. A well-defined waste/natural soil interface was evident in the trenches.

To identify the waste/natural soil interface along the western face of the landfill, several hand excavations and auger borings were attempted. Due to the high volume of waste material and debris along the landfill face, only one excavation and boring could be advanced to a depth of 2 feet. Fill material was encountered during excavation; it included large amounts of construction and demolition debris. The depth to the soil/waste interface could not be determined.

1.10.6 Wetland and Forest Stand Delineation

Wetlands delineation and forest stand delineation were conducted at Site 3 during the DVS implementation. The wetland delineation identified and characterized wetlands and other waters of the United States regulated under the Clean Water Act (CWA) and the Maryland Nontidal Wetlands Protection Act. The forest stand delineation identified and characterized forested areas regulated under the Maryland Forest Conservation Act (HNUS, 1995b). Findings of the study were presented in Section 1.9.

1.10.7 Conceptual Analysis - Remedial Options

In 1995, B&R Environmental evaluated available remedial options to mitigate risks at Site 3. The evaluation was revisited in 1997; six options were evaluated, including various configurations for regrading Site 3 and constructing a cap, installing a partial cap, and clean closing the site. The options analysis considered effects on groundwater, implementation costs, health and safety considerations, and site end use. Based upon these considerations, clean closure was recommended for Site 3. The basis for selection of this option included eliminating capital costs associated with cap construction, minimizing operation and maintenance costs, removing groundwater contaminant source, removing a potential UXO hazard, and overall reduction of the total area of waste disposal within the facility (B&R Environmental, 1997).

1.10.8 RCRA Facility Investigation

In 1999, TtNUS performed an RFI at seven sites at NSWC-White Oak. Site 3 was included in the investigation. Thirteen surface soil and five subsurface soil samples were collected at Site 3. Ten groundwater samples were collected from newly installed and existing wells. Five surface water and sediment samples were also collected. Sample locations are shown on Figure 1-3.

The human health risk assessment concluded that there were minimal risks for full-time workers, maintenance/utility workers, construction workers, adult recreational users, adolescent trespassers, and daycare center children. Cumulative Hazard Indices (HIs) for child and adult residents exceeded unity, primarily due to exposure to manganese in sediment and iron and manganese in groundwater. Cumulative incremental cancer risk (ICR) for future residents exceeded $1X10^{-04}$, primarily due to exposure to carcinogenic polycyclic aromatic hydrocarbons (PAHs) in soil, arsenic in sediment, and arsenic, trichloroethylene (TCE), vinyl chloride, and RDX in groundwater (TtNUS, 1999).

1.11 NATURE AND EXTENT OF CONTAMINATION

This section includes a discussion of visual observations of the extent of buried waste, a discussion of surface and subsurface soil contamination, and an estimate of the total volume of waste at Site 3 based on existing and historic site topography.

1.11.1 Visual Observations

The seven test pits excavated during the DVS ranged in depth from 1 to 6 feet bgs. Test pit 5 contained only natural, native material, with no evidence of burial activities. The remaining test pits all contained a well-defined waste/native material interface and the interface sloped from Perimeter Road toward Westfarm Branch. The presence of this interface provides further evidence that waste disposal activities filled in a natural stream valley adjacent to Westfarm Branch. Materials discovered during test pit excavation included sand, gravel, asphalt, glass, construction debris (wood, nails), and municipal-type waste. Five UXO objects (fuses) were discovered during excavation of test pit 3. Test pit logs are provided in Appendix C.

1.11.2 Analytical Data

Data collected during the RFI were screened against U.S. Environmental Protection Agency (EPA) Region 3 residential risk-based concentrations (RBCs). There is no RBC value for lead, so data were screened against the Office of Solid Waste and Emergency Response's (OSWER) residential standard for lead (400 mg/kg). Table 1-1 presents surface soil data and Table 1-2 presents subsurface soil data. Summary tables of all positive detections in surface and subsurface soil are provided in Appendices D.1

and D.2, respectively. Shaded cells indicate that the maximum concentration of a parameter exceeded the screening criteria. Locations of exceedances of residential RBCs and detected concentrations are shown on the tag map provided on Figure 1-5. Inorganics for which there are no RBC values, specifically calcium, magnesium, potassium, and sodium, are not shown on the tag map. EPA industrial RBCs are also included in the tables for information purposes.

Background concentrations for NSWC-White Oak are also provided on both tables. Exceedances of background are shown for information purposes. Background concentrations were developed in the Background Investigation Report (B&R Environmental, 1998).

1.11.2.1 Surface Soil

Thirteen surface soil samples were collected during the RFI and analyzed for Target Compound List (TCL) VOCs, TCL SVOCs, Target Analyte List (TAL) metals, TCL pesticides/PCBs, and explosives. SVOCs, pesticides, and inorganics were detected in the samples. VOCs and explosives were not detected in surface soil samples. Of the SVOCs, the majority of compounds detected were PAHs. All PAHs had their maximum detection in sample 3SS1110100. No PAHs were detected in more than three samples. The only SVOC detected at a concentration in excess of residential RBCs was benzo(a)pyrene. Benzo(b)fluoranthene was detected in excess of background but did not exceed its residential RBC.

Seven pesticides and two PCBs (Aroclor 1254 and 1260) were detected in surface soil samples. Maximum concentrations were distributed among several samples. The compounds 4,4'-DDE, 4,4'-DDT, and endosulfan sulfate were only detected in sample 3SS1150100. Heptachlor epoxide was only detected in 3SS1120100. Aroclor 1260 had the maximum concentration of all pesticides/PCBs (0.43 mg/kg) and the greatest frequency of detection (8 of 13 samples). Alpha-chlordane was detected in seven samples with a maximum concentration of 0.012 mg/kg. Only Aroclor 1260 was detected at concentrations in excess of residential RBCs.

Twenty-one inorganics were detected in surface soil. The maximum detections were distributed among several samples. Antimony, cadmium, and mercury were each detected in only one sample. Aluminum, arsenic, iron, and manganese were detected at concentrations in excess of residential RBCs. It should be noted that of the 21 inorganics detected in surface soil, 14 were detected at concentrations in excess of background.

Surface soil analytical data from the Phase I and II RI were not included because the validity of these data is suspect. A summary of the RI data is presented in Appendix D.3. Similar parameters were detected in these historic samples, specifically PAHs and inorganics, including cadmium, chromium,

copper, lead, mercury, and zinc. The two VOCs detected in samples 3SL3 and 3SL4, acetone and methylene chloride, are common laboratory contaminants.

1.11.2.2 Subsurface Soil

Five subsurface soil samples were collected during the RFI and analyzed for TCL VOCs, TCL SVOCs, TAL metals, TCL pesticides/PCBs, and explosives. VOCs, SVOCs, pesticides, explosives, and inorganics were detected in subsurface soil.

Three VOCs, 2-butanone, acetone, and toluene, were detected in subsurface soils. Phenol was the only SVOC detected in subsurface soil samples. Three pesticides were detected, 4,4'-DDE, alpha-chlordane, and gamma-chlordane, and one explosive (RDX) was detected. The VOCs, SVOC, and pesticides were all detected in sample 3SU1050300. All of these parameters were detected at concentrations below residential RBCs.

Seventeen inorganics were detected in subsurface soil. Maximum concentrations of seven metals were detected in sample 3SU1070300, and eight inorganics had their maximum detection in sample 3SU1050300. Thirteen of the metals were detected in all five samples. Only aluminum, arsenic, and manganese were detected at concentrations in excess of residential RBCs. However, barium, calcium, lead, and nickel had maximum concentrations in excess of background.

1.11.3 Volume Estimate

Using the historic and existing site topographies, as presented on Figures A-1 and 1-3, respectively, the volume of waste and fill material placed at Site 3 was estimated. Figure A-2 in Appendix A provides a map with both sets of topographic data. Six cross sections were cut through the site at 50-foot intervals; they are shown on Figures A-3 through A-5. The average cross-sectional area of each section was multiplied by the cross section width (50 feet) to calculate a volume. The volumes were summed to arrive at a volume estimate for the landfill. The estimated volume of material at Site 3 is 20,400 cy. The calculations are provided in Appendix A.

1.12 REPORT ORGANIZATION

This section contains the introduction, presents the general site characteristics, and discusses the nature and extent of contamination at Site 46. Section 2.0 presents the streamlined risk assessment, identifies the removal action objectives, including a discussion of compliance with Applicable or Relevant and Appropriate Requirements (ARARs), presents a screening of available technologies, and selects the removal action alternatives. Section 3.0 presents a description and evaluation of each of the alternatives.

Sections 4.0 and 5.0 present a comparative analysis of alternatives and recommendations, respectively. Supporting data, including cost estimates, are provided in the appendices.

TABLE 1-1

SUMMARY ANALYTICAL DATA AND SCREENING CRITERIA - SURFACE SOIL
SITE 3 EE/CA
FORMER NSWC-WHITE OAK, SILVER SPRING AND ADELPHI, MARYLAND

Parameter	Frequency of Detection	Range of Detection	Location of Maximum	Screening Criteria: Residential RBC[1]	Screening Criteria: Industrial RBC[1]	Screening Criteria: Background Value[2]
SEMIVOLATILES (mg/kg)						
Anthracene	1/12	0.067	3SS1110100	2300	61000	0.108
Benzo(a)anthracene	2/12	0.068 - 0.31	3SS1110100	0.87	7.8	0.34
Benzo(a)pyrene	3/12	0.055 - 0.23	3SS1110100	**0.087**	0.78	0.265
Benzo(b)fluoranthene	3/12	0.048 - 0.3	3SS1110100	0.87	7.8	**0.275**
Benzo(g,h,i)perylene	1/12	0.085	3SS1110100	160[3]	4100[3]	0.22
Benzo(k)fluoranthene	2/12	0.049 - 0.11	3SS1110100	8.7	78	0.335
Chrysene	3/12	0.044 - 0.31	3SS1110100	87	780	0.4
Fluoranthene	2/12	0.11 - 0.73	3SS1110100	310	8200	0.8
Indeno(1,2,3-cd)pyrene	1/12	0.11	3SS1110100	0.87	7.8	0.2
Phenanthrene	2/12	0.11 - 0.49	3SS1110100	160[3]	4100[3]	0.57
Phenol	1/12	0.046	3SS1060100	4700	120000	N/A
Pyrene	3/12	0.059 - 0.6	3SS1110100	230	6100	0.63
PESTICIDES/PCBs (mg/kg)						
4,4'-DDE	1/13	0.0041	3SS1150100	1.9	17	0.081
4,4'-DDT	1/12	0.011	3SS1150100	1.9	17	0.049
Alpha-Chlordane	7/13	0.0025 - 0.012	3SS1110100	1.8[4]	16[4]	**0.0026**
Aroclor-1254	2/13	0.058 - 0.061	3SS1020100	0.32[5]	2.9[5]	NA
Aroclor-1260	8/13	0.05 - 0.43	3SS1120100	**0.32[6]**	2.9[5]	NA
Endosulfan Sulfate	1/13	0.0028	3SS1150100	47[6]	1200[6]	NA
Endrin Aldehyde	5/12	0.0084 - 0.016	3SS1120100	2.3[7]	61[7]	NA
Gamma-Chlordane	3/13	0.0057 - 0.0063	3SS1110100	1.8[4]	16[4]	**0.0015**
Heptachlor Epoxide	1/13	0.0018 - 0.0019	3SS1120100	0.070	0.63	0.0024
INORGANICS (mg/kg)						
Aluminum	13/13	4360 - 13700	3SS1140100	**7800**	200000	14953
Antimony	1/13	1.3	3SS1110100	3.1	82	NA
Arsenic	13/13	2 - 7.1	3SS1150100	**0.43**	3.8	**5.11**
Barium	13/13	22.9 - 60.1	3SS1040100	550	14000	**59.5**
Cadmium	1/13	0.3	3SS1150100	7.8[8]	200[9]	NA
Calcium	13/13	530 - 3700	3SS1140100	--	--	**1040**
Chromium	13/13	8.4 - 22.5	3SS1140100	23[10]	610[10]	29.35
Cobalt	13/13	2.3 - 13.2	3SS1070100	470	12000	**11.81**
Copper	13/13	8.3 - 31.1	3SS1120100	310	8200	**11.52**
Iron	13/13	7510 - 22900	3SS1070100	**2300**	61000	**18946**
Lead	13/13	7.9 - 308	3SS1110100	400[11]	750[12]	**60.2**
Magnesium	13/13	433 - 2620	3SS1070100	--	--	**1183**
Manganese	13/13	34.8 - 644	3SS1070100	**160[13]**	4100[14]	**490**
Mercury	1/13	0.14	3SS1090100	2.3[15]	61[15]	0.142
Nickel	12/13	4.6 - 18	3SS1070100	160	4100	**14.56**
Potassium	13/13	296 - 1510	3SS1070100	--	--	**845**
Selenium	9/13	0.73 - 1.6	3SS1140100	39	1000	**0.68**
Silver	2/13	0.23 - 0.69	3SS1140100	39	1000	1.15
Sodium	10/13	21.9 - 44.1	3SS1140100	--	--	NA
Vanadium	13/13	13.6 - 43.9	3SS1140100	55	1400	**30.08**
Zinc	13/13	19.4 - 121	3SS1150100	2300	61000	**30.67**

1 EPA Region 3, 1999.
2 Background Concentrations for Surface Soil at NSWC-White Oak. B&R Environmental, 1998.
3 Value for naphthalene used.
4 Value for chlordane used.
5 Total for all PCB congeners (Aroclors).
6 Value for endosulfan used.
7 Value for endrin used.
8 The RBC calculated using the reference dose (RfD) for food is presented. The RBC calculated using the RfD for water is 39 mg/kg.
9 The RBC calculated using the RfD for food is presented. The RBC calculated using the RfD for water is 100 mg/kg.
10 Value for hexavalent chromium used.
11 Office of Solid Waste and Emergency Response (OSWER) Standard for Lead, Residential.
12 Technical Review Workgroup for Lead, Guidance Document April 1999, Industrial (non-residential) standard for lead.
13 The RBC calculated using the RfD for nonfood is presented. The RBC using the RfD for food is 11,000 mg/kg.
14 The RBC calculated using the RfD for nonfood is presented. The RBC calculated using the RfD for food is 290,000 mg/kg.
15 Value for mercuric chloride used.
-- No value available.
NA - Not applicable.
Shaded cell indicates maximum concentration exceeded screening value for that parameter.

Associated Samples: 3SS1020100, 2SS1040100, 3SS1050100, 3SS1060100, 3SS1070100, 3SS1080100, 3SS1090100, 3SS1100100, 3SS111010 3SS1120100, 3SS1120100-D, 3SS1130100, 3SS1140100, 3SS1150100.

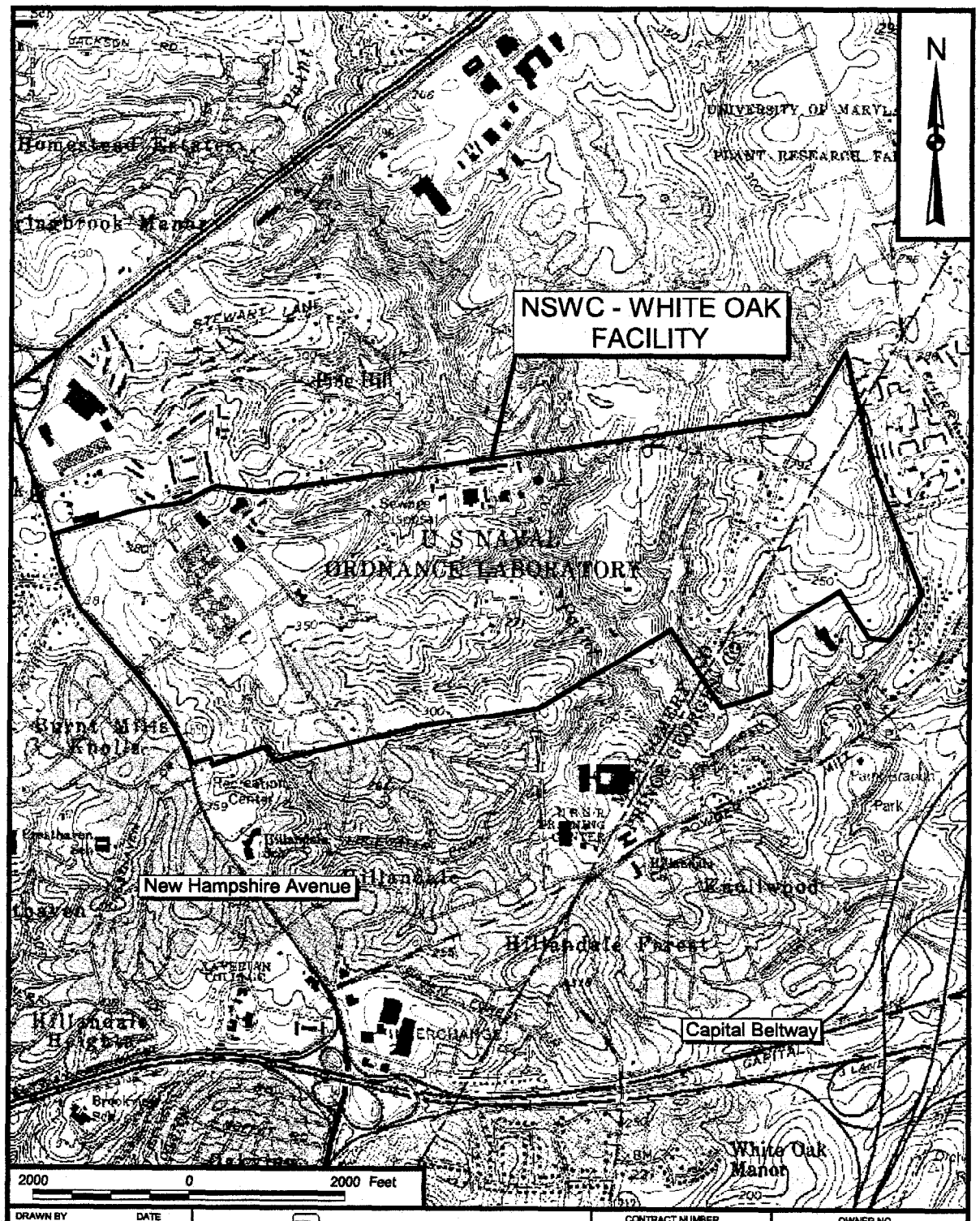
TABLE 1-2

SUMMARY ANALYTICAL DATA AND SCREENING CRITERIA - SUBSURFACE SOIL
SITE 3 EE/CA
FORMER NSWC-WHITE OAK, SILVER SPRING AND ADELPHI, MARYLAND

Parameter	Frequency of Detection	Range of Detection	Location of Maximum	Screening Criteria: Residential RBC[1]	Screening Criteria: Industrial RBC[1]	Screening Criteria: Background Value[2]
VOLATILES (mg/kg)						
2-Butanone	1/5	0.01	3SU1050300	4700	120000	N/A
Acetone	1/5	0.055	3SU1050300	780	20000	N/A
Toluene	1/5	0.001	3SU1050300	1600	41000	N/A
SEMIVOLATILES (mg/kg)						
Phenol	1/5	0.089	3SU1050300	4700	120000	N/A
PESTICIDES/PCBs (mg/kg)						
4,4'-DDE	1/5	0.0024	3SU1050300	1.9	17	N/A
Alpha-Chlordane	1/5	0.013	3SU1050300	1.8[3]	16[3]	N/A
Gamma-Chlordane	1/5	0.015	3SU1050300	1.8[3]	16[3]	N/A
EXPLOSIVES (mg/kg)						
RDX	1/5	0.04	3SU1040300	5.8	52	N/A
INORGANICS (mg/kg)						
Aluminum	5/5	3160 - 11700	3SU1070300	**7800**	200000	20961
Arsenic	4/5	1.7 - 3.3	3SU1050300	**0.43**	3.8	12.15
Barium	5/5	12 - 82.9	3SU1050300	550	14000	**40.09**
Calcium	2/5	284 - 632	3SU1050300	N/A	N/A	**247**
Chromium	5/5	6.1 - 18.1	3SU1070300	23[4]	610[4]	41.05
Cobalt	5/5	2.3 - 7.4	3SU1050300	470	12000	16.6
Copper	5/5	3 - 17.8	3SU1070300	310	8200	21.62
Iron	5/5	4100 - 17600	3SU1070300	2300	61000	28681
Lead	5/5	5.5 - 23.2	3SU1050300	400[5]	750[6]	**21.23**
Magnesium	5/5	274 - 2200	3SU1070300	N/A	N/A	2987
Manganese	5/5	31.2 - 412	3SU1050300	**160[7]**	4100[8]	503
Nickel	5/5	2.3 - 16.8	3SU1050300	160	4100	**13.84**
Potassium	5/5	174 - 862	3SU1070300	N/A	N/A	2792
Selenium	1/5	1.5	3SU1020200	39	1000	2.73
Sodium	4/5	34.3 - 49.4	3SU1060300	N/A	N/A	69.4
Vanadium	5/5	7.6 - 26.9	3SU1070300	55	1400	44.31
Zinc	5/5	19.4 - 40.9	3SU1050300	2300	61000	84.2

1 EPA Region 3, 1999.
2 Background Concentrations for Subsurface Soil at NSWC-White Oak. B&R Environmental, 1998.
3 Value for chlordane used.
4 Value for hexavalent chromium used.
5 Office of Solid Waste and Emergency Response (OSWER) Standard for Lead, Residential.
6 Technical Review Workgroup for Lead, Guidance Document April 1999, Industrial (non-residential) standard for lead.
7 The RBC calculated using the RfD for nonfood is presented. The RBC using the RfD for food is 11,000 mg/kg.
8 The RBC calculated using the RfD for nonfood is presented. The RBC calculated using the RfD for food is 290,000 mg/kg.
-- No value available.
NA - Not applicable.
Shaded cell indicates maximum concentration exceeded screening value for that parameter.

Associated Samples: 3SU1020200, 3SU1040300, 3SU1050300, 3SU1060300, 3SU1070300.



DRAWN BY MJJ	DATE 10/18/96	Tetra Tech NUS, Inc.	CONTRACT NUMBER 0398 / OWNER NO. 0324
CHECKED BY	DATE	FACILITY VICINITY MAP SITE 3 EE/CA FORMER NSWC - WHITE OAK SILVER SPRING AND ADELPHI, MARYLAND	APPROVED BY Lorraine Ripley-Yates DATE 2/18/00
COST/SCHEDULE-AREA			APPROVED BY SN DATE 2/10/00
SCALE AS NOTED			DRAWING NO. FIGURE 1-1 / REV 0

P:\GIS\WHITEOAK\7773.APR\LAYOUT 3 JCB 2/7/00

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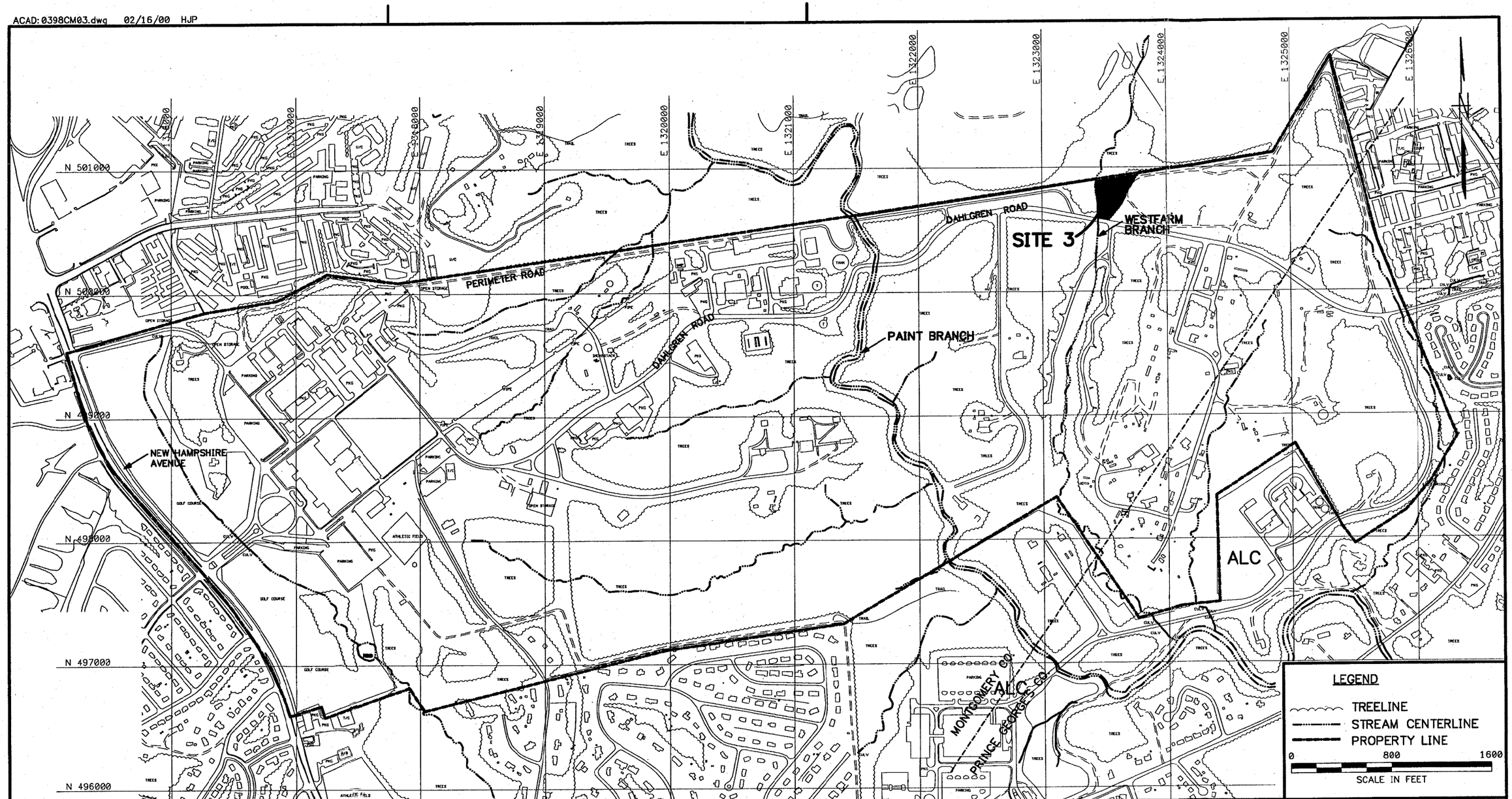


NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY MF DATE 2/9/00
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

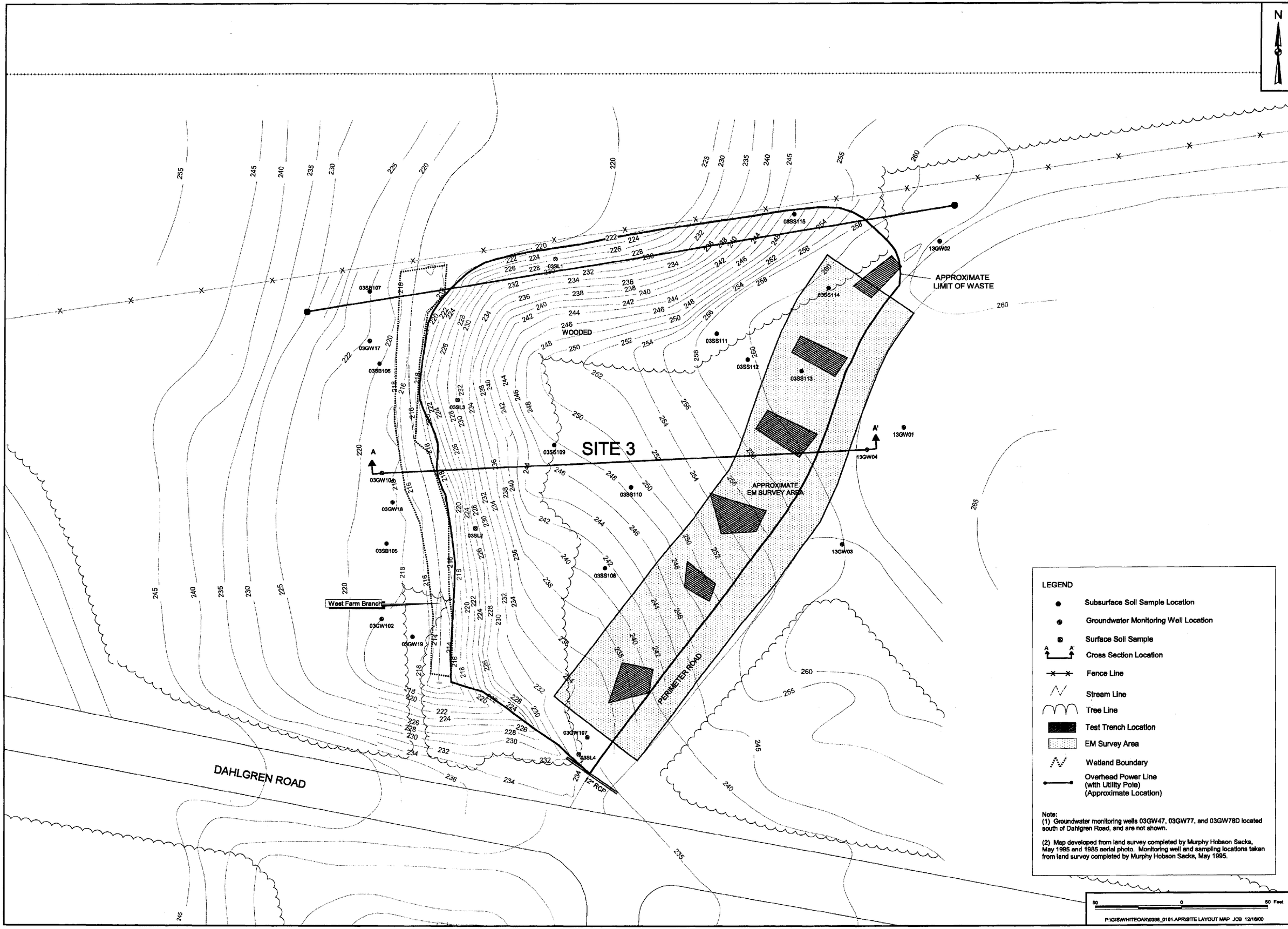
Tetra Tech NUS, Inc.

SITE LOCATION MAP
SITE 3 EE/CA
FORMER NSWC-WHITE OAK
SILVER SPRING AND ADELPHI, MARYLAND

CONTRACT NO. 0398
OWNER NO. 0324
APPROVED BY DATE 2/10/00
APPROVED BY SN DATE 2/10/00
DRAWING NO. FIGURE 1-2
REV. 0

FORM CADD NO. SOUTH_BH.DGN - REV 0 - 02/11/97

00502A012



REVISIONS

SYMBOL	DESCRIPTION	DATE	APPROVED
09A	403		
D4	404		
E.I.C.	405		
401	406		
402	DMB	DATE	REVIEWED BY NAVFAC

Tetra Tech NUS, Inc.

DRAWN: J. BELLONE
CHK.
DATE
SUBMITTED BY: PROGRAM MANAGER
DATE
APPROVED: RPO FOR COMMANDER, NAVFAC
DATE

NAVAL FACILITIES ENGINEERING COMMAND
DEPARTMENT OF THE NAVY
CHESAPEAKE DIVISION

SITE LAYOUT MAP
SITE 3 EE/CA
FORMER NSWC-WHITE OAK
SILVER SPRING AND ADELPHI, MARYLAND

CODE I.D. NO. 80091
DRAWING SIZE: D
CONST. CONT. NO.
SPEC.
NAVFAC DRAWING NO.
SHEET _ OF _

FIGURE 1-3

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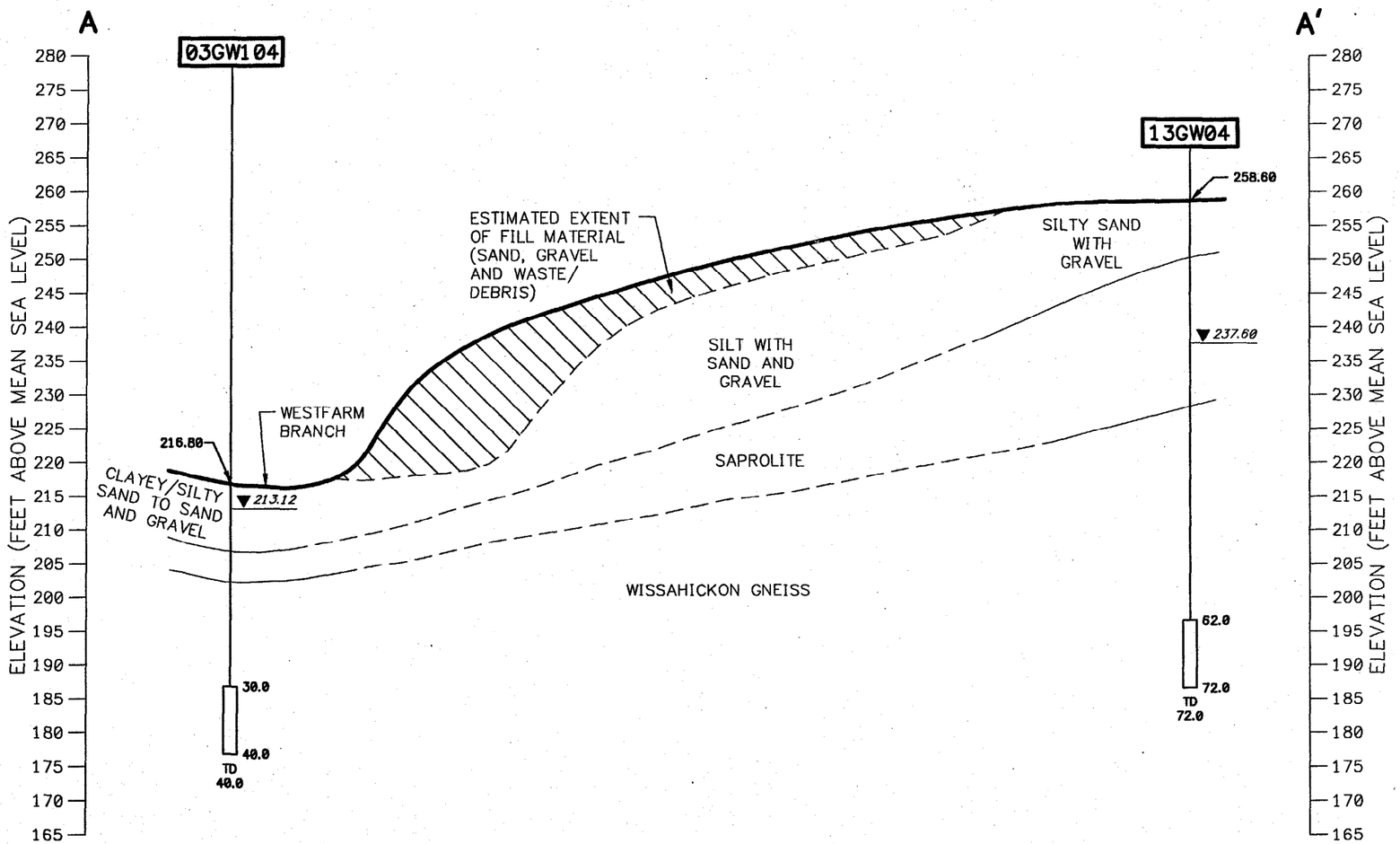

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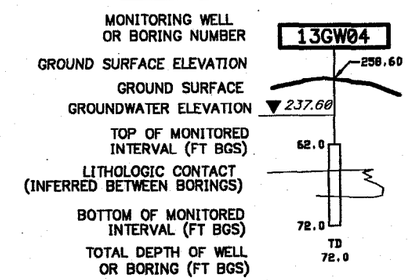


0 40 80
HORIZONTAL SCALE IN FEET
0 20 40
VERTICAL SCALE IN FEET

NOTE:

DEPTH OF LANDFILL BOTTOM ESTIMATED FROM TOPOGRAPHY PRIOR TO FILL ACTIVITIES (NAVAL ORDNANCE LABORATORY MAP QYC 907-52)

NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY MF DATE 2/9/00
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

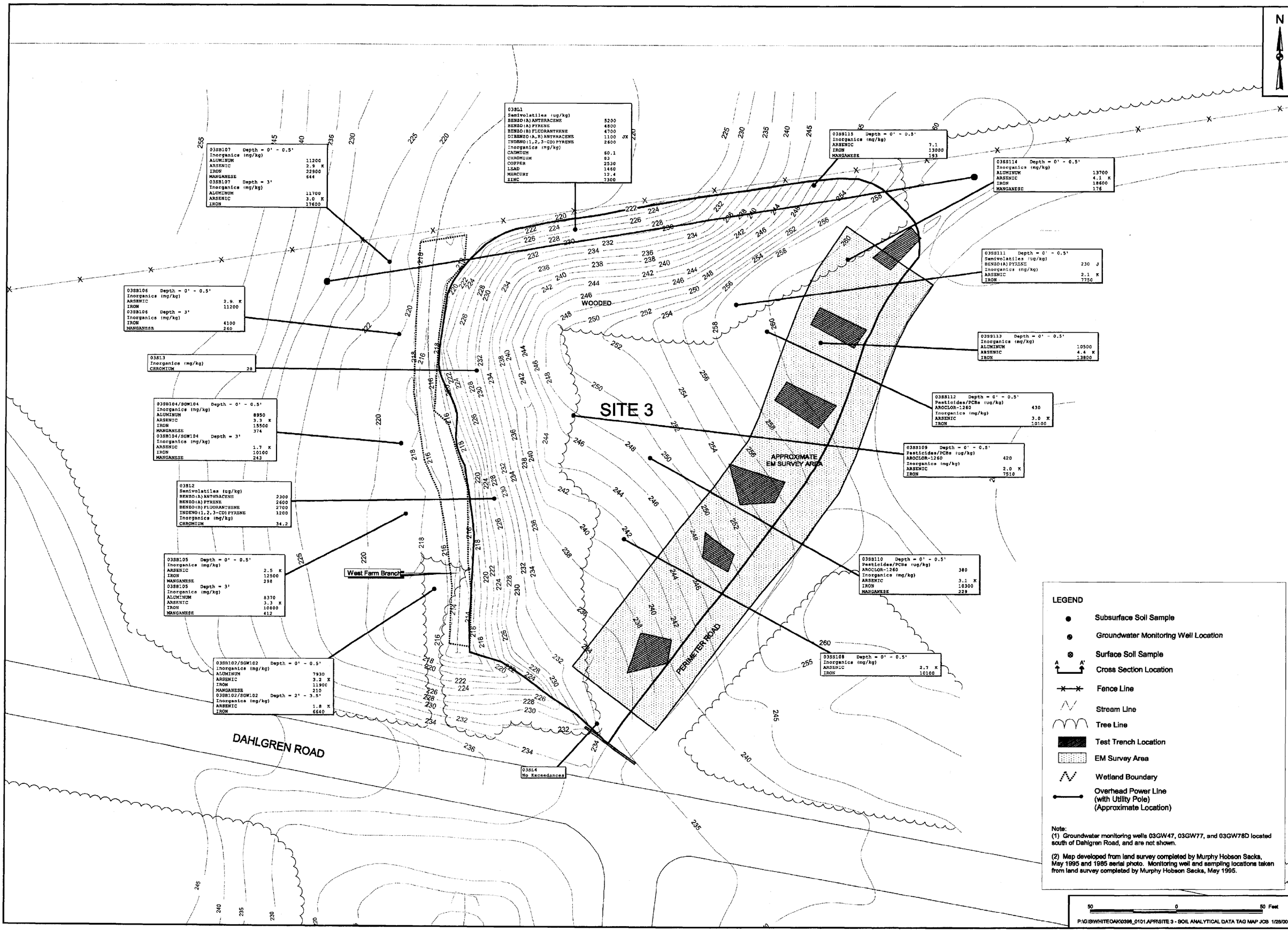
Tetra Tech NUS, Inc.

CROSS SECTION A-A'
SITE 3 EE/CA
FORMER NSWC-WHITE OAK
SILVER SPRING AND ADELPHI, MARYLAND

CONTRACT NO. 0398
OWNER NO. 0324
APPROVED BY [signature] DATE 2/8/00
APPROVED BY SN DATE 2/10/00
DRAWING NO. FIGURE 1-4
REV. 0

FORM CADD NO. TTNUS-BH.DWG - REV 0 - 9/9/98

00502A032



SYMBOL	DESCRIPTION	DATE	APPROVED

REVISIONS

08A	403		
04	404		
E.I.C.	405		
	406		
401	0403		
402			

DATE REVIEWED BY NCDCC

Tetra Tech NUS, Inc.
10 DENTON PLAZA
BY: FREDERICK, MD 21703
PITTSBURGH, PA 15205

DSL | CK. | FIELD LOAD | TRL | DSK.

SUBMITTED BY: PROGRAM MANAGER DATE

APPROVED DATE

NAVAL FACILITIES ENGINEERING COMMAND

DEPARTMENT OF THE NAVY

CHESAPEAKE DIVISION

EXCEEDANCES OF RESIDENTIAL RBCs
SITE 3 EE/CA
FORMER NSWC-WHITE OAK
SILVER SPRING AND ADELPHI, MARYLAND

CODE I.D. NO. 80091

DRAWING SIZE: D

CONST. CONT. NO.

SPEC.

NAVFAC DRAWING NO.

SHEET - OF -

FIGURE 1-5

2.0 IDENTIFICATION OF REMOVAL ACTION OBJECTIVES AND TECHNOLOGY SCREENING

The removal action objectives are developed to provide guidelines for evaluating the removal action and ensuring that the action complies with regulatory requirements. This section presents a summary of the human health risk assessment for soil that was developed during the RFI, evaluates ARARs, discusses the removal action objectives, schedule, and statutory limits, and screens applicable technologies for Site 3.

2.1 RISK ASSESSMENT

A baseline human health risk assessment was conducted for all media at Site 3 as part of the RFI (TtNUS, 1999). The findings of the baseline human health risk assessment, as they relate to soil, are summarized here.

2.1.1 Identification of Potential Contaminants of Concern

Potential contaminants of concern (PCOCs) for surface soil (0 to 6 inches) and surface/subsurface soil were identified. PCOCs for surface soil are those chemicals reported at maximum concentrations greater than EPA Region 3 RBC screening levels for residential soil ingestion, EPA Soil Screening Levels (SSLs) for inhalation (transfer from soil to air), and basewide background levels. Carcinogenic PAHs [as benzo(a)pyrene equivalents] and Aroclor 1260 were retained as PCOCs in surface soil.

PCOCs in surface/subsurface soil are those chemicals reported at maximum concentrations greater than EPA Region 3 RBC screening levels for residential soil ingestion, EPA SSLs for inhalation (transfer from soil to air), and basewide background levels. Carcinogenic PAHs [as benzo(a)pyrene equivalents], manganese, and Aroclor 1260 were retained as PCOCs in surface/subsurface soil.

No PCOCs exceeded EPA SSLs for inhalation. Consequently, risks from inhalation of vapors and particulates from soil emissions are not quantified in the risk assessment.

2.1.2 Exposure Assessment

Several potential human receptors were evaluated for exposure to soil at Site 3. These include full-time workers, maintenance/utility workers, construction workers, adult recreational users, adolescent trespassers, daycare center children, and child and adult residents. Maintenance/utility workers and construction workers were assumed to be exposed to surface and subsurface soil, and the other receptors were assumed to be exposed to surface soil only.

2.1.3 Quantitative Risk Estimates

Quantitative risk estimates for potential human receptors were developed for those chemicals identified as PCOCs. Both noncarcinogenic and carcinogenic risks were evaluated.

Cumulative HIs for the full-time worker, maintenance/utility worker, construction worker, adult recreational user, adolescent trespasser, and daycare center child under the Reasonable Maximum Exposure (RME) scenario are less than unity, indicating that no toxic effects are anticipated for these receptors under the defined exposure conditions. Although cumulative HIs for the adult and child resident exceed the target goal of unity, risks were primarily due to exposure to sediment and groundwater, media that are not being addressed in this EE/CA.

The cumulative ICR for the full-time worker, maintenance/utility worker, adult recreational user, adolescent trespasser, and day care center child under the RME scenario are within the EPA target risk range of $1x10^{-06}$ to $1x10^{-04}$. These risks are primarily due to exposure to PAHs and Aroclor 1260 in soil. The cumulative ICR for residential exposures exceeds the target risk range. These elevated carcinogenic risks are the result of exposure to PAHs and PCBs in surface soil; PAHs and arsenic in sediment; and TCE, vinyl chloride, and arsenic in groundwater. Exposure to groundwater is the primary contributor to the risk for residential exposure. Risks solely attributable to exposure to soil fall within the target risk range. PAHs in soil account for only 12 percent of the total carcinogenic risk.

2.2 ECOLOGICAL IMPACTS

Much of the eastern part of the Westfarm Branch stream valley was filled to create the landfill, and the steep western landfill slope directly abuts the stream channel. Since the landfill slope restricts the natural meander pattern of the stream, the stream has begun to erode the base of the slope. Flood events associated with the remnants of two tropical storms in the fall of 1999 ("Dennis" and "Floyd") have hastened erosion of the landfill slope, threatening to expose buried contaminants, which could contaminate Westfarm Branch and its sediments. The downstream reach of Westfarm Branch flows through a relatively undisturbed forested stream valley and likely contributes to the food chain in Paint Branch.

2.3 COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

ARARs are used to develop clean-up criteria for the removal action objectives and to identify removal action technologies. The term ARAR is defined in the National Oil and Hazardous Substances Contingency Plan (NCP) as follows:

- Applicable requirements are generally defined as clean-up standards, standards of control, or other substantive environmental protection requirements promulgated under federal or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, or location. Only those state standards that are identified by a state in a timely manner and that are more stringent than federal requirements may be considered as applicable requirements.

- Relevant and appropriate requirements are defined as clean-up standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state environmental or facility siting laws that are not directly "applicable" to a hazardous substance, pollutant, contaminant, remedial action, or location but address situations sufficiently relevant to those encountered at the site that their use is appropriate. Only those state standards that are identified by a state in a timely manner and that are more stringent than federal requirements may be considered as relevant and appropriate requirements.

- Any promulgated standard, requirement, criterion, or limitation under a state environmental or facility siting law that is more stringent than the associated federal standard, requirement, criterion, or limitation.

Based on the manner in which they are applied during a removal action, ARARs are classified into three categories.

- Chemical Specific. Chemical-specific ARARs were developed to provide health- or risk-based concentration limits. These limits are specific for an individual chemical or group of chemicals. Often, these ARARs are used to determine the extent of site remediation. Chemical-specific ARARs may be concentration-based clean-up goals or may provide the basis for calculating such levels. In cases where no chemical-specific ARAR exists, chemical advisories may be used to develop removal action objectives.

- Location Specific. Location-specific ARARs are considered in view of natural or man-made site features. These ARARs are intended to limit activities within designated areas.

- Action Specific. Action-specific ARARs pertain to the implementation of a given remedy. These ARARs control or restrict hazardous substance- or pollutant-related activities. These controls are considered when specific removal activities are planned for a site.

In addition to ARARs, other regulations and guidance may be classified as guidance "To Be Considered" (TBC). TBCs are non-promulgated, non-enforceable guidelines or criteria that may be useful for developing removal actions or are necessary for determining what is protective of human health and/or the environment. TBCs are also identified in this section to aid in evaluating the removal actions. Potential federal ARARs and TBCs are presented in Table 2-1. Table 2-2 presents potential state ARARs and TBCs.

2.4 REMOVAL ACTION OBJECTIVES

The purpose of this EE/CA is to determine the initial removal actions that would best address the conditions at Site 3.

This removal action is being conducted in conjunction with an RFI of Site 3. The removal action objectives for Site 3 address soil and solid waste that are present and serve to

- Prevent direct contact with landfill contents
- Limit the site's potential to act as a source for groundwater and surface water contamination
- Minimize the human health risk to future land users
- Mitigate impact to Westfarm Branch

Aroclor 1260 is detected in the soil, but its exposure point concentration (0.286 mg/kg) is less than 1 mg/kg, the Toxic Substances Control Act (TSCA) ARAR for "high occupancy" exposures [40 Code of Federal Regulations (CFR) 761.61]. High occupancy is defined as occupancy by a person for more than 6.7 hours per week, on average. Therefore, existing levels of PCBs could remain on site as long as occupancy of the site remains below this value. Based on the findings of the risk assessment, inorganics do not contribute to human health risk at Site 3. Additionally, while maximum concentrations of aluminum, arsenic, and manganese in subsurface soil exceeded residential RBCs, concentrations were below background (see Table 1-2).

While human health risk due to soil falls within the target risk range, a removal action is still appropriate at Site 3 due to the impacts on Westfarm Branch and the heterogeneity of the material buried at Site 3. Due to the limited subsurface soil analytical data, contaminants could be present at higher concentrations than what has been detected to date. These higher concentrations could pose a human health risk. A

removal action is also appropriate due to the hazards posed by UXO and other ordnance related debris, which is known to exist at Site 3.

The exceedances of EPA residential RBCs that were shown on Figure 1-5 were provided for informational purposes. The residential RBCs were used because they are conservative values that illustrated the worst-case scenario for risk at Site 3.

2.5 REMOVAL ACTION SCHEDULE

This removal action at NSWC-White Oak was determined by the Navy, as the lead agency, to be a time-critical removal action because a planning period of 6 months is not available before the removal action will be implemented.

2.6 STATUTORY LIMITS

The statutory limits for fund-financed removal actions are presented in Section 104(c)(1) of CERCLA. These limits do not apply because the actions at the former NSWC-White Oak are not financed by Superfund.

2.7 PRELIMINARY TECHNOLOGY SCREENING

This section screens technologies and identifies representative process options for treating the contaminated soil and waste at Site 3.

The preliminary technology screening conducted here is based on the knowledge of the contaminants that are present in Site 3 soils and the heterogeneity of the material buried at Site 3. Further discussion of site contaminants is presented in Section 1.11.

Under the Superfund Accelerated Cleanup Model (SACM), EPA has established a set of "presumptive remedies". Presumptive remedies are preferred technologies for common categories of sites based on historical patterns of remedy selection and EPA evaluation of performance data on technology implementation (EPA, 1996). EPA has identified source containment as a presumptive remedy for municipal solid waste landfills. EPA guidance (Application of the CERCLA Municipal Landfill Presumptive Remedy to Military Landfills) was reviewed to determine whether Site 3 is an appropriate site for the application of the containment presumptive remedy. The remedy should be applied to sites where the landfill contents are similar in nature to municipal-type wastes, no military waste is present, excavation is impractical, and containment is the most appropriate remedy. This evaluation should also take future facility reuse plans into consideration.

Given that the future reuse plans for NSWC-White Oak are uncertain and that military waste has been observed along the landfill slopes, use of the presumptive remedy is not recommended. Containment may ultimately be identified as the most appropriate remedy, but it is more appropriate at this stage to proceed through a technology screening and evaluate several alternatives for Site 3.

Table 2-3 presents the preliminary technology screening for Site 3.

2.8 REPRESENTATIVE TECHNOLOGIES AND PROCESS OPTIONS

The following technologies and process options have been retained from the preliminary screening for potential use at Site 3.

- No action
- Institutional controls
- Containment
- Incineration
- Off-site disposal

TABLE 2-1

FEDERAL ARARs AND TBCs
SITE 3 EE/CA
FORMER NSWC-WHITE OAK, SILVER SPRING AND ADELPHI, MARYLAND

ARAR/TBC	Type of ARAR	Synopsis	Comments
Clean Air Act (CAA)	Chemical Specific	Emission limitations related to attainment of National Ambient Air Quality Standards and Emission Standards for Hazardous Air Pollutants.	Potential removal action may involve air emissions. However, emissions are not likely to be affected by CAA due to small quantities of pollutants emitted and/or source not included in a regulated category.
RCRA 40 CFR 261	Chemical and Action Specific	Regulations governing identifying and listing hazardous waste.	Potential removal action may involve off-site disposal of materials.
EPA Region III Residential RBCs	TBC	Chemical concentrations at which various media (water, air, fish tissue, soil) would pose a potential risk to humans.	Potential removal action may require removal of material with contaminant levels in excess of these concentrations.
Land Disposal Restrictions (LDR) under RCRA 40 CFR 268	TBC	Bans land disposal of hazardous waste unless treated to substantially reduce its toxicity or mobility. Sets forth treatment standards for wastewater and soil that must be met prior to land disposal.	Potential removal action may involve off-site land disposal of hazardous waste.
Clean Water Act	Chemical Specific	Regulates the discharge of pollutants into waterways.	Potential removal action may generate contaminated water, either due to solids (runoff) or chemical constituents (groundwater).
Clean Water Act Section 404 (Wetlands Act)	Location Specific	Sets forth requirements for land-disturbing activities in and adjacent to wetlands.	Potential removal action may impact wetland area associated with Westfarm Branch.

TABLE 2-1

FEDERAL ARARs AND TBCs
SITE 3 EE/CA
FORMER NSWC-WHITE OAK, SILVER SPRING AND ADELPHI, MARYLAND

ARAR/TBC	Type of ARAR	Synopsis	Comments
PCB Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions 40 CFR 761	Chemical and Action Specific	Amends rules under the TSCA that address the use, handling, and disposal of PCBs and PCB-contaminated material.	Potential removal action may include remediation of PCB-contaminated soil and/or debris.
Standards for Owner's and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities 40 CFR 264.310 Subpart N – Landfills	Action Specific	Sets forth requirements for closure and post-closure care of hazardous waste landfills.	Potential removal action may include an impermeable cap over the impacted area. This regulation may be relevant and appropriate given the nature of the waste buried at Site 3.
Criteria for Municipal Solid Waste Landfills 40 CFR 258 Subpart F – Closure and Post-Closure Care	Action Specific	Sets forth requirements for closure and post-closure care of municipal solid waste landfills.	Potential removal action may include an impermeable cap over the impacted area. This regulation may be relevant and appropriate given the nature of the waste buried at Site 3.
Department of Defense Standard 6055.9 Ammunitions and Explosives Safety Standards	TBC	Sets forth requirements for minimum depth remediation at sites containing UXO as a function of planned end use to ensure public safety.	Potential removal action may include an impermeable cap over the impacted area. This standard may be TBC since UXO will remain on site beneath the cap.

TABLE 2-2

STATE OF MARYLAND ARARs AND TBCs
SITE 3 EE/CA
FORMER NSWC-WHITE OAK, SILVER SPRING AND ADELPHI, MARYLAND

Citation (COMAR)[1]	Title	Type of ARAR	Requirement Synopsis	Comments
26.02.03	Control of Noise Pollution	Action Specific	Provides limits on the maximum allowable levels of noise at the site boundaries during site remediation work to protect the health, general welfare, and property of the people of the state.	Potential removal action may involve use of heavy machinery.
26.04.07	Solid Waste Management	Action Specific	Provides requirements for construction, operation, and closure at solid waste acceptance facilities, including landfills.	Potential removal action may include an impermeable cap over the area.
26.08	Water Pollution	Chemical Specific	Governs discharges into waters of the state.	Potential removal action may generate contaminated water, either due to solids (runoff) or chemical constituents (groundwater).
26.11	Air Quality	Action Specific	Provides ambient air quality standards, general emissions standards, and restrictions for air emissions from construction activities, vents, and treatment technologies such as incinerators. Also includes nuisance and odor control. Construction activities may emit particulate matter into the ambient air. Remedial activities must follow regulations.	Potential removal action may involve air emissions.
26.13.01 26.13.02	Hazardous Waste Management System; General Identification and Listing of Hazardous Waste	Action Specific Action Specific	Provides criteria to identify toxicity characteristic hazardous waste and listed waste. Defines solid wastes that are subject to regulation as hazardous waste.	Potential removal action may generate hazardous waste.

TABLE 2-2

STATE OF MARYLAND ARARs AND TBCs
SITE 3 EE/CA
FORMER NSWC-WHITE OAK, SILVER SPRING AND ADELPHI, MARYLAND

Citation (COMAR)[1]	Title	Type of ARAR	Requirement Synopsis	Comments
26.13.03	Standards Applicable to Generators of Hazardous Waste	Action Specific	Establishes standards for generators of hazardous waste.	Potential removal action may generate hazardous waste.
26.13.04	Standards Applicable to Transporters of Hazardous Waste	Action Specific	Provides regulations for transporting hazardous waste. Any hazardous waste found during site remediation must be disposed according to regulation. Any residues or by-products from treatment systems that are hazardous must be disposed properly.	Potential removal action may generate hazardous waste.
26.17.01 26.17.02	Erosion and Sediment Control Stormwater Management	Action Specific Action Specific	Any land-clearing, grading, or other earth disturbances require an erosion and sediment control plan. This plan must be approved before construction activities begin. Stormwater must be managed to prevent off-site sedimentation and maintain current site conditions. The primary goal is to maintain after development, as nearly as possible, the pre-development runoff characteristics and to reduce stream channel erosion, pollution, sedimentation, and local flooding.	Potential removal action may involve significant earth disturbance.
26.17.04	Construction on Nontidal Waters and Floodplains	Action Specific	Govern any change of the course, current, or cross section of a stream or body of water within the state including the 100-year frequency flood plain of free-flowing waters.	Potential removal action may require temporary relocation of Westfarm Branch.

1 Code of Maryland Regulations

TABLE 2-3

SCREENING OF SOIL TECHNOLOGIES
SITE 3 EE/CA
FORMER NSWC-WHITE OAK, SILVER SPRING AND ADELPHI, MARYLAND

General Response Action	Technology Type	Process Options	Brief Description	Screening Comment
No Action	None	Not Applicable	No action is taken.	Retain as a baseline for comparison as required by the NCP.
Institutional Controls	Monitoring	Groundwater and Surface Water Monitoring	Periodic sampling and analysis to track the spread of contamination.	Retain to assess the migration of contaminants left on site.
	Access/Use Restrictions	Active Restrictions - Physical Barriers	Fencing, markers, and warning signs to restrict site access.	Retain to limit exposure to contaminated media.
		Passive Restrictions - Land Use Restrictions	Administrative actions establishing site use prohibitions to restrict future activities.	Retain to limit exposure to contaminated media.
Minimal Action	Natural Attenuation	Chemical/Biological	Allows naturally occurring chemical and microbial agents to degrade contaminants.	Do not retain. Not effective for site contaminants.
Containment	Capping	Single or Multi-Layer Cap	Low-permeability cap comprising single or multiple layers over an area of contamination; low-permeability material includes concrete, asphalt, soil, clay, synthetic membranes, etc.	Potentially applicable. Retain for further consideration.
In-situ Treatment	Physical/ Chemical	Soil Vapor Extraction (SVE)	A vacuum is applied to soil to induce the flow of air and remove volatile and semivolatile contaminants from the soil. Extracted vapor may require treatment prior to discharge.	Do not retain. Technology is not suitable for all site contaminants.
		Soil Flushing	An extraction fluid (water or other aqueous solution) passes through soil by either injection or infiltration and removes contaminants. Extraction fluid is recovered from the underlying aquifer and treated.	Do not retain. Technology is not suitable for all site contaminants, specifically PCBs.
		Solidification/Stabilization	Reduces the mobility of contaminants in soil using auger systems or injection systems to apply solidification/stabilization agents to soil.	Do not retain. Debris and other large objects in the subsurface may limit effectiveness and ability to implement the technology.

TABLE 2-3

SCREENING OF SOIL TECHNOLOGIES
SITE 3 EE/CA
FORMER NSWC-WHITE OAK, SILVER SPRING AND ADELPHI, MARYLAND

General Response Action	Technology Type	Process Options	Brief Description	Screening Comment
	Biological	Biodegradation	Enhances natural aerobic and/or anaerobic processes by injecting nutrients and appropriate chemicals into the subsurface.	Do not retain. High concentrations of heavy metals may be toxic to microorganisms.
		Bioventing	Enhances biodegradation in soil by providing oxygen to existing soil microorganisms.	Do not retain. High concentrations of heavy metals may be toxic to microorganisms.
	Thermal	Vitrification	An electric current is used to melt soils, immobilizing inorganic contaminants and destroying volatile contaminants.	Do not retain. Debris or other large objects can limit technology effectiveness.
	Thermal	Thermally Enhanced SVE	Uses steam or hot-air injection to increase the mobility of semivolatiles in the subsurface. A vacuum is applied to the soil to remove contaminants. Extracted vapor may require treatment prior to discharge.	Do not retain. Debris or other large objects can limit system effectiveness.
Ex-situ Treatment	Physical/ Chemical	Soil Washing	Removes contaminants either by dissolving or suspending them in the wash solution or concentrating them into a smaller volume of soil.	Do not retain. Technology is not suitable for all site contaminants, specifically PCBs.
		Solidification/Stabilization	Excavated material is mixed with a reagent to stabilize or solidify the material. Resultant materials must be disposed off site.	Do not retain. Technology has limited effectiveness on SVOCs and pesticides. Off-site disposal of material is still required. Site contaminant levels do not appear significant enough to require pre-treatment.
		SVE	Soil is excavated and placed over a network of aboveground piping to which a vacuum is applied to encourage volatilization of organics.	Do not retain. Technology is not suitable for all site contaminants.

TABLE 2-3

SCREENING OF SOIL TECHNOLOGIES
SITE 3 EE/CA
FORMER NSWC-WHITE OAK, SILVER SPRING AND ADELPHI, MARYLAND

General Response Action	Technology Type	Process Options	Brief Description	Screening Comment
	Thermal	Low /High Temperature Thermal Desorption	Excavated material is heated to volatilize water and organic contaminants. A carrier gas or vacuum system transports volatilized water and organics to a gas treatment system. Treatment is performed on site with a mobile treatment unit. Treated soil can be used on site as backfill or disposed off site.	Do not retain. Technology is not suitable for all site contaminants.
		Incineration	High temperatures are used to volatilize and combust organics. Treatment is performed off site at a RCRA-permitted incinerator. Residual ash is disposed in a landfill.	Potentially applicable due to PCB contamination. Retain for further consideration.
Disposal	Physical	Landfill	Contaminated material is removed and transported to a permitted off-site treatment and/or disposal facility. Some pretreatment of the contaminated media may be required to meet land disposal restrictions.	Potentially applicable. Retain for further consideration.

3.0 IDENTIFICATION AND ANALYSIS OF REMOVAL ACTION ALTERNATIVES

These alternatives were developed based on the technologies retained from the preliminary screening presented in Section 2.7 and summarized in Section 2.8:

- Alternative 1: No Action
- Alternative 2: Excavation, Off-Site Treatment or Off-Site Landfill Disposal, and Site Restoration
- Alternative 3: Containment and Institutional Controls

Landfill disposal and incineration were combined to form Alternative 2. Since a full characterization of the material present at Site 3 has not been conducted and only limited analytical data are available, incineration was included in the alternative in the event hazardous waste was encountered during the removal action. Alternative 3 was developed to compare the viability of containment over excavation and off-site disposal. Institutional controls were included in Alternative 3 because the waste and fill material would be left on site. The no-action alternative will provide a comparative baseline as required by the NCP.

The following sections will describe these removal action alternatives and evaluate each based on effectiveness, implementability, and cost as outlined in Guidance on Conducting Non-Time-Critical Removal Actions under CERCLA (EPA, 1993). Although the removal action at Site 3 is time-critical, evaluation of the alternatives using criteria set forth in the guidance is still appropriate.

3.1 ALTERNATIVE 1: NO ACTION

The no-action alternative is evaluated to provide a comparative baseline against which other alternatives can be evaluated, as required by the NCP. Under this alternative, no removal action would be taken and the site would be left as is, without implementing any removal, treatment, or mitigating actions.

3.1.1 Effectiveness

Alternative 1 does not provide an effective solution for the waste present at Site 3, does not achieve the removal action objectives, and does not comply with ARARs.

3.1.2 Implementability

Under Alternative 1, no removal action would be taken; therefore, there would not be any difficulties or uncertainties associated with implementation.

3.1.3 Cost

There are no capital, operation, maintenance, or monitoring costs associated with this alternative.

3.2 ALTERNATIVE 2: EXCAVATION, OFF-SITE TREATMENT OR OFF-SITE LANDFILL DISPOSAL, AND SITE RESTORATION

Under Alternative 2, 20,400 cy of soil and solid waste at Site 3 would be excavated to the limits shown on Figure 1-3. To prepare for excavation, Westfarm Branch would be temporarily diverted west of its present location. Vegetation along the northern and western landfill slopes would be removed (approximately 0.7 acres). Following excavation, the site would be graded to restore a gradual slope from Perimeter Road to Westfarm Branch. The Westfarm Branch channel would be re-established and wetlands restored. Topsoil would be placed over the excavated area and the site would be vegetated.

There are several underground and aboveground utilities in the vicinity of Site 3. A 12-inch reinforced concrete pipe under Perimeter Road extends into the southeastern corner of Site 3 and emerges in a swale that drains into Westfarm Branch. An overhead utility line is approximately 15 feet south of the fence line. Both utility lines are shown on Figure 1-3. A WSSC sewer right-of-way, measuring 30 feet, is located west of the stream.

Material in the landfill would be characterized for disposal purposes prior to mobilization. This would enable immediate transportation off site once excavation operations began. Conventional excavation equipment would be employed to excavate and restore the site.

For costing purposes, it was estimated that 10 percent (2,040 cy) of the excavated material would be disposed at either a RCRA Subtitle C landfill, incinerated, or handled as UXO. Disposal at a RCRA Subtitle C landfill or incineration would be required to comply with RCRA or TSCA disposal regulations. UXO material would be turned over to Navy Explosive Ordnance Disposal (EOD) personnel for proper handling and disposal. The remaining 90 percent (18,360 cy) would be disposed at a municipal solid waste landfill.

Such an assumption is reasonable given the limited knowledge of the characteristics of the material at Site 3. Inclusion of these additional disposal options provides a conservative estimate of the cost of the removal action and enables a more complete evaluation of implementability issues associated with this alternative.

Based on the discovery of ordnance debris during the DVS, an UXO-trained technician would be required on site for the duration of excavation activities. Site restoration would involve seeding and slope

stabilization with erosion control matting. Westfarm Branch would be re-established in its original streambed and surrounding wetlands restored. No verification sampling would be conducted following the removal action. An addendum to the RFI for Site 3 will be performed to evaluate risks posed by the soil remaining after the removal action. Sampling may be performed to support this RFI addendum. All work would be performed in compliance with a site-specific Health and Safety Plan (HASP) and Occupational Safety and Health Administration (OSHA) regulations.

3.2.1 Effectiveness

This alternative complies with ARARs and would achieve the removal action objectives. Removing the waste and fill material would prevent contact with landfill contents and eliminate the potential for the waste to act as a source for groundwater and surface water contamination. The alternative would be protective of human health and the environment.

The alternative would also mitigate long-term impacts to Westfarm Branch and restore the stream valley to a natural configuration. A gentler, more natural slope would replace the unnaturally steep slope currently adjoining the channel. Riparian vegetation would be planted on both sides of the channel to provide shaded nooks on the banks of the channel, increasing the diversity of aquatic habitat within the channel. As the planted riparian trees grow, they will shade the water in the stream and cool it, thereby cooling water that eventually flows into Paint Branch. Cool water is essential for providing habitat for trout.

Compliance with OSHA regulations and procedures set forth in a site-specific HASP would ensure protection of workers during implementation of the removal action. The presence of UXO and other ordnance-related materials increases the health and safety concerns associated with this removal action.

Transportation of the material off site slightly increases the potential for human exposure due to a spill or accident. However, the low levels of contaminants present are not expected to pose a significant risk, as shown by the risk evaluation presented in Section 2.1. The volume and toxicity of the fraction of material that is incinerated would be reduced. Mobility would not be affected.

3.2.2 Implementability

This alternative is technically feasible. Techniques to excavate materials similar to those at Site 3 are common. The Navy has determined that the removal action at Site 3 is time critical. Therefore, a 6-month planning period is not available prior to removal action implementation. Significant planning and preparatory work would not be required prior to implementation of this alternative. This alternative could be completed in less than 1 year.

The equipment needed to implement this alternative is readily available. Standard equipment can be used to excavate and restore the site. Landfill capacity for hazardous and municipal-type waste is readily available. Incineration facilities are capable of handling the volume of material that would be generated. However, only a few incinerators are permitted to accept TSCA-regulated waste, which may result in additional transportation requirements. Incineration has been proven to be effective for soils contaminated with PCBs.

The potential presence of UXO and other ordnance items would necessitate a slower than normal pace for excavation to allow visual screening for ordnance and to ensure worker safety. Implementation of this removal action would require a significant amount of clearing along the northern and western landfill slopes. The vegetation in this area is well established, with many large trees.

The removal action would require acceptance and implementation of an erosion and sediment control plan. The plan would have to include measures to protect the Westfarm Branch from sediment deposition and ensure surface water flow is not blocked or limited. Flow from the 12-inch reinforced concrete pipe would have to be managed during the period of time that Westfarm Branch is diverted. The pipe may also be disturbed during excavation activities. Temporary relocation or replacement of the overhead utility line may be required to facilitate excavation activities.

Sufficient land is available west of the stream's current location to temporarily contain the stream and ensure continued flow. A permit or other approval may be required from the WSSC if disturbance within the sewer right-of-way is necessary. Methods to re-direct and restore the stream are readily available.

The removal area is contained within the facility and, therefore, no easements or impacts to adjoining properties are anticipated. In the event waste is present north of the fence line (and assumed property line of the former NSWC-White Oak), permission from the adjacent property owner may be required.

3.2.3 Cost

A detailed cost estimate for this alternative is provided in Appendix E. The capital cost associated with this alternative is approximately $3,200,000. There are no long-term operation, maintenance, or monitoring costs associated with this alternative.

3.3 ALTERNATIVE 3: CONTAINMENT AND INSTITUTIONAL CONTROLS

Under Alternative 3, a multi-layer cap that meets or exceeds the requirements of state of Maryland solid waste regulation (COMAR 26.04.07), Subtitle D and federal PCB remediation waste regulations (40 CFR

761.61) would be placed over Site 3. The landfill cap would act as a barrier over the soil and solid waste. The cap would limit the infiltration of precipitation and runoff into the subsurface and prevent contaminants from leaching to the aquifer. Institutional controls would be implemented to monitor the underlying aquifer and limit future land use.

The cap would be approximately 2 acres, based on the limits of waste shown on Figure 1-3. Vegetation along the northern and western landfill slopes (approximately 0.7 acres) would have to be cleared. Westfarm Branch would be temporarily diverted west of its present location.

The present grades of Site 3 exceed those at which stable slopes can be constructed. Due to the limited amount of space available, completely regrading the site to establish shallower slopes would not be feasible. Therefore, a retaining wall would be constructed along the northern and western site boundaries. Due to site conditions (shallow bedrock), a typical cantilever wall section would require extensive drilling to facilitate the construction of wall sections to the required height. A gravity wall with geogrid reinforcement would be most suitable. A figure showing a conceptual cross-section following wall and cap installation is provided on Figure 3-1.

Minimal grading of the present landfill surface would be required to prepare the site for cap installation. Fill would be placed adjacent to the walls to establish grade and the landfill cap would be constructed. The cap would terminate at the tie-in with the gravity wall. The cap, from the bottom to top, would include a low-density polyethylene (LDPE) layer to act as an infiltration barrier, geotextile fabric, 12 inches of gravel as a drainage layer, a second layer of geotextile fabric, and 2 feet of soil cover. The cap surface would be vegetated. Following wall installation, Westfarm Branch would be returned to its original stream channel and the wetlands would be restored.

There are several underground and aboveground utilities in the vicinity of Site 3. A 12-inch reinforced concrete pipe under Perimeter Road extends into the southeast corner of Site 3 and emerges in a swale that drains into Westfarm Branch. An overhead utility line is approximately 15 feet south of the fence line. Both utilities are shown on Figure 1-3. A WSSC sewer right-of-way, measuring 30 feet, is located west of the stream.

All work would be performed in compliance with a site-specific HASP and OSHA regulations. Based on the discovery of ordnance debris during the DVS, an UXO-trained technician would be required on site for the duration of wall installation and landfill grading activities. The presence of landfill material in the wall location is not anticipated, but the UXO-trained technician would also remain on site as a precaution.

Institutional controls consist of maintaining records of the soil contamination and buried waste at Site 3 and designating the area as a restricted or limited-use area. Residential land use or intrusive (e.g., excavation) activities would be prohibited. A fence would also be constructed around the site to limit access.

Under this alternative, long-term monitoring of the aquifer below and downgradient of the cap would be necessary. Monitoring would include bi-annual sampling of five groundwater monitoring wells and sample analysis. The objective of monitoring would be to confirm that migration of contaminants from the site into the environment is not occurring and to determine the effectiveness of the remedy.

Maintaining the integrity of the final cover system, including making repairs to the cover to correct the effects of settlement, subsidence, and erosion, and preventing run-on and runoff from eroding and damaging the final cover, would be necessary. Maintenance would occur once per month, year round.

A site review would be conducted every 5 years to evaluate the site status and provide direction for further action, if deemed necessary at that time.

3.3.1 Effectiveness

This alternative would achieve three of the removal action objectives and comply with ARARs. Capping the landfill would prevent contact with the waste and limit the potential for the waste to act as a source for groundwater or surface water contamination. There is the potential for the cover system to fail, at which time human health would not be protected. Monitoring of the aquifer would ensure continued effectiveness of the remedy. Land use restrictions would prevent future use of the site.

The alternative would mitigate some of the long-term impacts to Westfarm Branch by preventing additional erosion and possible surface water contamination due to exposure of buried waste. However, the retaining wall required under the alternative would constitute a permanent man-made structure located at the immediate edge of the stream channel. The wall would tend to deflect flow toward the natural western bank of the stream, increasing erosion of that bank. Eventually, mature trees on the western shore could fall. The wall would also tend to increase flow velocities in the downstream reaches of Westfarm Branch, possibly eroding downstream sediments and killing benthic biota. Trees could not be planted on top of the wall because the roots would compromise cap integrity. The stream channel would be permanently exposed to bright sunlight, permanently elevating water temperatures and potentially altering the ecological makeup of the stream and wetlands. These changes could ultimately impact Paint Branch.

Compliance with OSHA regulations and procedures set forth in a site-specific HASP would ensure protection of workers during implementation of the removal action. Since no treatment is applied, this alternative would not reduce the mobility, volume, or toxicity of the contaminants.

In order to comply with Department of Defense Standard 6055.9 the thickness of clean fill and the cap materials would have to exceed minimum clearance depths to ensure safety of personnel with access to the site. Sufficient space may not be available within the site boundaries to provide the required depth of material over the entire site.

3.3.2 Implementability

This alternative is technically feasible. Techniques to construct gravity walls and landfill caps are well known in the construction industry, and the materials and equipment necessary are readily available. Implementation of this alternative would require a period of detailed engineering and design prior to construction. The Navy has determined that the removal action at Site 3 is time critical. Therefore, a 6-month planning period is not available prior to removal action implementation. Completion of detailed engineering and design activities in such a short period of time may not be feasible. Construction of this alternative could be completed in approximately 1 year.

The presence of a landfill cap may impact the implementation of the groundwater remedial action planned for Site 3 by limiting access to the aquifer. The presence of a landfill cap would also limit the future land use options for the site and would prevent future development of the site.

The potential presence of UXO and other ordnance items would necessitate a slower than normal pace during site grading and wall installation to allow visual screening for ordnance and to ensure worker safety. Implementation of this removal action would require a significant amount of clearing along the northern and western landfill slopes. The vegetation in this area is well established, with many large trees.

The removal action would require acceptance and implementation of an erosion and sediment control plan. The plan would have to include measures to protect Westfarm Branch from sediment deposition and ensure surface water flow is not blocked or limited. Construction would also have to comply with stormwater management requirements.

Flow from the 12-inch reinforced concrete pipe will have to be managed during the period of time that Westfarm Branch is diverted. The pipe may also require permanent relocation so discharge does not interfere with the cap or gravity wall. The overhead utility lines should be permanently relocated to the south, along Dahlgren Road, prior to cap installation to minimize interference. If permanent relocation

were not feasible, at least several utility poles would be located within the limits of the cap. The LDPE and geotextile layers would have to be carefully installed to ensure that the integrity of the cover system is maintained and that the cap-utility pole interface does not become a pathway for rainwater infiltration.

Sufficient land is available west of the stream's current location to temporarily contain the stream and ensure continued flow. A permit or other approval may be required from the WSSC if disturbance within the sewer right-of-way is necessary. Methods to re-direct and restore the stream are readily available.

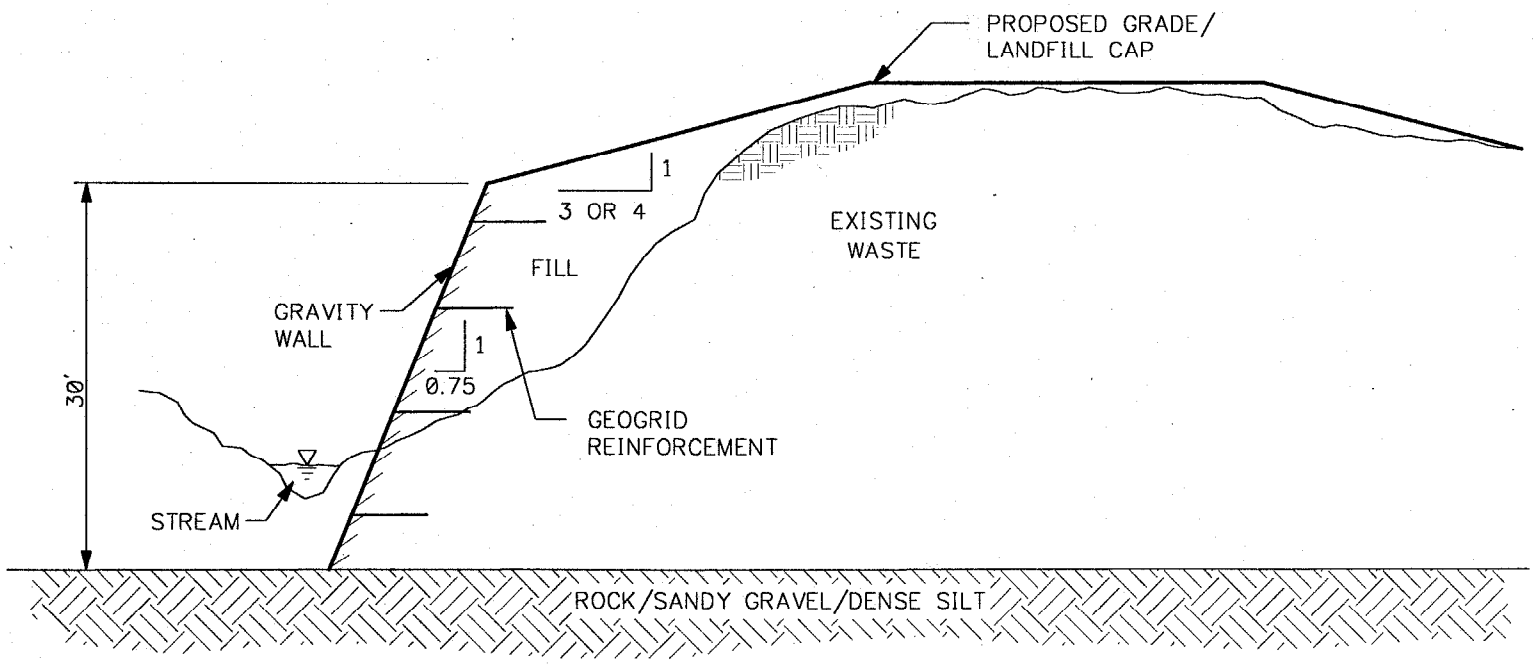
The gravity wall and landfill cap could be constructed completely within the facility and, therefore, no easements or impacts to adjoining properties are anticipated.

Monthly maintenance of the cover system would be required to maintain the integrity of the cap. Land use restrictions can be strictly enforced because the site is located within a government-owned facility.

3.3.3 Cost

A detailed cost estimate for this alternative is provided in Appendix E. The capital cost associated with this alternative is approximately $2,150,000. The total present-worth cost of this alternative, assuming a 30-year life, is approximately $2,500,000.

ACAD:0398cx01.dwg 02/16/00 HJP



DRAWN BY DLT DATE 2/4/00	Tetra Tech NUS, Inc.	CONTRACT NO. 0398	OWNER NO. 0324
CHECKED BY SN DATE 2/10/00	CONCEPTUAL CROSS-SECTION ALTERNATIVE 3 SITE 3 EE/CA FORMER NSWC – WHITE OAK SILVER SPRING AND ADELPHI, MARYLAND	APPROVED BY Roxanne M Sepley-Yolch DATE 2/18/00	
COST/SCHED-AREA		APPROVED BY DATE	
SCALE NOT TO SCALE		DRAWING NO. FIGURE 3-1	REV. 0

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

4.0 COMPARATIVE ANALYSIS OF REMOVAL ACTION ALTERNATIVES

This section compares the removal action alternatives, identified in Section 3.0 as follows:

- Alternative 1: No Action
- Alternative 2: Excavation, Off-Site Treatment or Off-Site Landfill Disposal, and Site Restoration
- Alternative 3: Containment and Institutional Controls

These alternatives will be compared to each other using the criteria identified in Section 3.0. The purpose of the comparative analysis is to identify the key advantages and disadvantages of each alternative relative to one another so tradeoffs that would affect remedy selection can be identified. The following discussion is summarized in Table 4-1.

4.1 EFFECTIVENESS

Except for the no-action alternative, the alternatives comply with the ARARs identified. Alternative 2 meets all the removal action objectives. By removing the waste material direct contact with landfill contents is prevented, human health risk to future land users is minimized, the waste can no longer act as a source for groundwater and surface water contamination, and the Westfarm Branch stream valley would be restored, mitigating long-term impacts.

Alternative 3, while achieving the other removal action objectives, would not mitigate impacts to Westfarm Branch. The retaining wall could adversely alter flow patterns in the stream and would prevent the future establishment of riparian vegetation. This would have long-term effects on the stream ecology, especially downstream of the site. Compliance with Department of Defense Standard 6055.9 may not be possible.

The no-action alternative is ineffective in the long term because the buried waste and contaminated soil would remain, posing potential risk to future land users and allowing the site to be a potential source of groundwater and surface water contamination.

Compliance with OSHA regulations and procedures set forth in a site-specific HASP would ensure protection of workers during implementation of both Alternatives 2 and 3.

If incineration of some of the material were required under Alternative 2, there would be a reduction in volume and toxicity. Mobility would be unaffected by Alternative 2. Alternative 3 is slightly less effective because it would not reduce the toxicity or volume of the material. However, given the minimal volume

and toxicity reductions that would be achieved under Alternative 2, this is not a significant detractor from the overall effectiveness of Alternative 3.

4.2 IMPLEMENTABILITY

The no-action alternative is the most easily implemented of the three alternatives because no removal action would be taken and, therefore, there would not be difficulties or uncertainties associated with implementation.

Alternative 2 is more easily implemented than Alternative 3, which would require a period of detailed engineering and design prior to implementation. Due to the time-critical nature of this removal action, a 6-month planning period is not available prior to implementation. The presence of a landfill cap may impact the implementation of the groundwater remedial action planned for Site 3 by limiting access to the aquifer. The landfill cap that is proposed under Alternative 3 may also interfere with future land use scenarios.

The technologies to be used under the action-oriented alternatives are well proven. Equipment and materials are readily available from vendors, suppliers, and subcontractors. Permitted facilities are available for off-site waste disposal, required under Alternative 2.

Both alternatives would require an UXO-trained technician on site during intrusive activities, but UXO is less of a concern under Alternative 3 because intrusive activities are limited to some minor grading of the landfill surface. While the UXO-trained technician would also be on site during gravity wall installation, as a precaution, the presence of landfill material in the wall location is not anticipated.

There are no long-term operation or maintenance requirements associated with Alternative 2. Alternative 3 would require monthly maintenance in the form of mowing and other cap surface maintenance activities. Alternative 3 would also require long-term monitoring of the underlying aquifer.

The action-oriented alternatives have similar implementability considerations, specifically the need for significant clearing of vegetation, relocation of Westfarm Branch during removal action implementation, erosion and sediment control, and temporary relocation of utilities, specifically the 12-inch reinforced concrete drainage pipe and the overhead utility line.

Neither alternative would impact adjoining properties and no easements are anticipated.

4.3 COST

Detailed cost estimates for the removal action alternatives are provided in Appendix E and are summarized in Table 4-1.

TABLE 4-1

SUMMARY COMPARISON OF REMOVAL ACTION ALTERNATIVES
SITE 3 EE/CA
FORMER NSWC-WHITE OAK, SILVER SPRING AND ADELPHI, MARYLAND

No.	Alternative	Effectiveness	Implementability	Complies with ARARs	Off-Site Treatment/ Disposal Required	Cost
1	No Action	Low	High	No	No	$0
2	Excavation, Off-Site Treatment or Off-Site Landfill Disposal, and Site Restoration	High - Meets all removal action objectives	High - Easily implemented in light of time-critical nature of the removal action - Restores stream valley and allows future use of the site - UXO concerns would slow the pace of excavation	Yes	Yes - Significant	$3,200,000
3	Containment and Institutional Controls	Moderate - Does not meet all removal action objectives - Long-term ecological impact to Westfarm Branch	Moderate - Period of detailed engineering and design required - Future land use limited - Interference with future groundwater remedial action	Yes	No	$2,500,000[1]

1 Present-worth cost

5.0 RECOMMENDED REMOVAL ACTION

This section presents the recommended removal action alternative to address soil and solid waste at Site 3. For the purpose of meeting the requirements of the removal action, the alternative that offers the best balance of effectiveness and implementability in a cost-effective manner is preferred.

Alternative 2 is the recommended removal action for Site 3. It most effectively addresses the removal action objectives and complies with ARARs. Alternative 2 is more easily implemented than the other alternative, especially in light of the time-critical nature of the removal action. Although Alternative 2 is more expensive than Alternative 3, the greater effectiveness and implementability justify this additional cost. This is especially true in light of the potential long-term impacts of Alternative 3 on Westfarm Branch. The no-action alternative was eliminated because it is ineffective and does not comply with the identified removal action objectives and ARARs.

REFERENCES

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APPENDIX A

TOPOGRAPHIC MAPS AND CROSS SECTIONS

CALCULATION WORKSHEET

CLIENT NAVY, NSWC WHITE OAK, MD		0398-0101	
SUBJECT SITE 3 – PISTOL RANGE LANDFILL			
BASED ON		DRAWING NUMBER	
BY LMY	CHECKED BY JJR 2/17	APPROVED BY	2/17/00

OBJECTIVE

Illustrate the method used to estimate the volume of waste present within the Pistol Range Landfill (Site 3) at the former NSWC-White Oak, Silver Spring and Adelphi, Maryland.

For each cross section shown on Figures A-3 through A-5 the area between the existing and historic ground surface was measured in square inches using a planimeter. Each area was measured three times and averaged to obtain a more accurate measurement. The number of square inches was multiplied by 900 square feet (30^2) to calculate the area of each cross section.

To account for variability across the width of each section, its area was averaged with the area of the adjacent cross section to the north. For cross section 1, the historic ground surface was higher than the present ground surface; therefore, the cross sectional area was taken to be 0. The average cross section for section 1 was calculated as 0 + 444 (area of section 2) divided by 2. Since section 6 has a cross sectional area of 0 and there is no adjacent cross section to the north, its average cross section was taken to be 0.

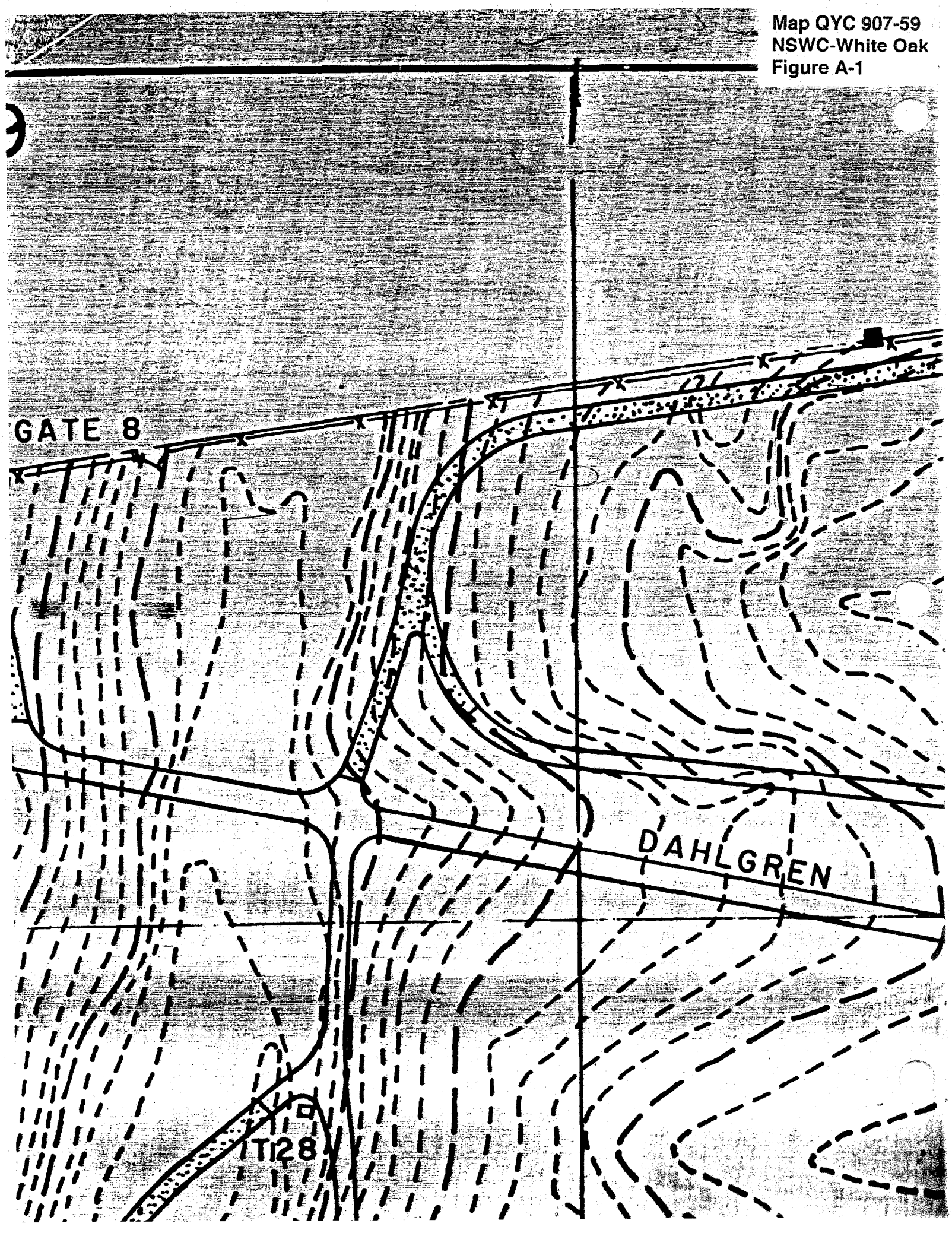
Multiplying each area by the width of the cross section (the distance between each cross section) yielded a volume estimate for that section in cubic feet. Given 27 cubic feet per cubic yard, the volumes were converted to cubic yard quantities. The six volumes were summed to arrive at a total volume for the site.

The following table summarizes the calculations.

Section	Measurement 1	Measurement 2	Measurement 3	Average (sq inches)	Area (sq feet)	Average Cross Section (sq feet)	Width (feet)	Volume (cy)
1	Historic ground surface higher than present ground surface. Cross sectional area assumed to equal 0.					222	50	411
2	0.53	0.53	0.42	0.49	444	1119	50	2072
3	1.55	1.49	1.46	1.50	1350	2576	50	4769
4	2.54	2.79	2.84	2.72	2451	4214	50	7803
5 [1]	3.95	3.88	3.92	3.92	3525	1763	50	5353
6	Historic ground surface higher than present ground surface. Cross sectional area assumed to equal 0.					0	32	0
							TOTAL	**20408**

1 A width of 82 feet was used to calculate the volume associated with cross section 5. This width includes the 50 feet between sections 5 and 6, plus the maximum width of section 6 (32 feet). This was done because section 6 has an average cross section of 0.

Map QYC 907-59
NSWC-White Oak
Figure A-1



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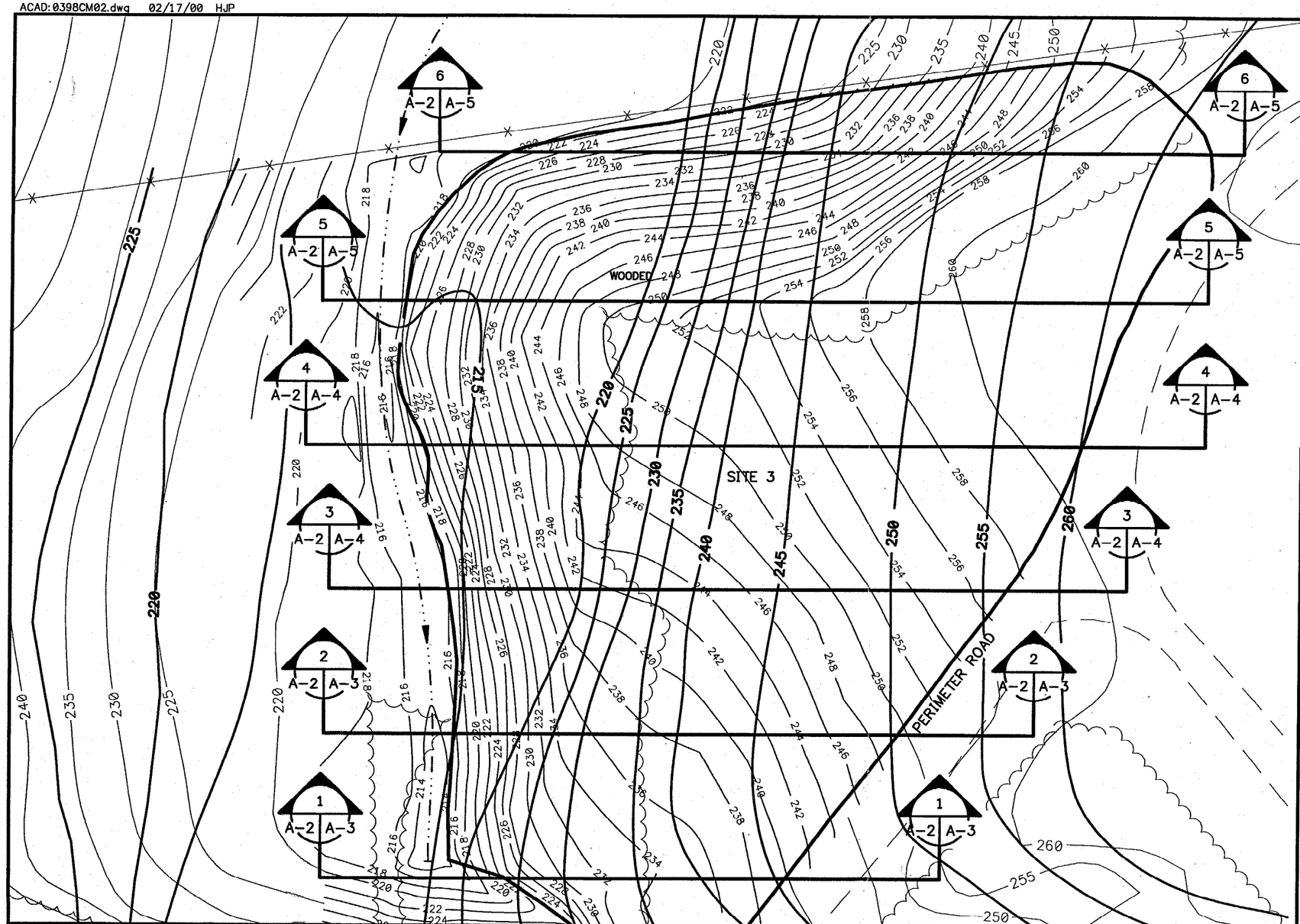

LEGEND

- PRE-EXISTING CONTOUR
- SURVEY CONTOUR
- HISTORIC CONTOUR
- FENCE LINE
- TREE LINE
- CENTERLINE OF STREAM (SHOWING FLOW DIRECTION)
- CROSS SECTION LOCATIONS

NOTE:

1. MAP DEVELOPED FROM LAND SURVEY COMPLETED BY MURPHY HOBSON SACKS, MAY 1995 AND 1985 AERIAL PHOTO.
2. HISTORIC TOPOGRAPHIC DATA TAKEN FROM WHITE OAK MAP QYC 907-59.

0 40 80
SCALE IN FEET

NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY MF DATE 2/6/00
CHECKED BY TJA DATE 2/18/00
COST/SCHED-AREA
SCALE AS NOTED

Tetra Tech NUS, Inc.

MAJOR SUBJECT
CROSS SECTION LOCATION MAP
SITE 3 EE/CA
FORMER NSWC – WHITE OAK
SILVER SPRING AND ADELPHI, MARYLAND

CONTRACT NO. 0398
OWNER NO. 0324
APPROVED BY Lorraine M. Sipley-yalch DATE 2/18/00
APPROVED BY DATE
DRAWING NO. FIGURE A-2
REV. 0

FORM CADD NO. T+NUS_BH.DGN - REV 0 - 1/20/98

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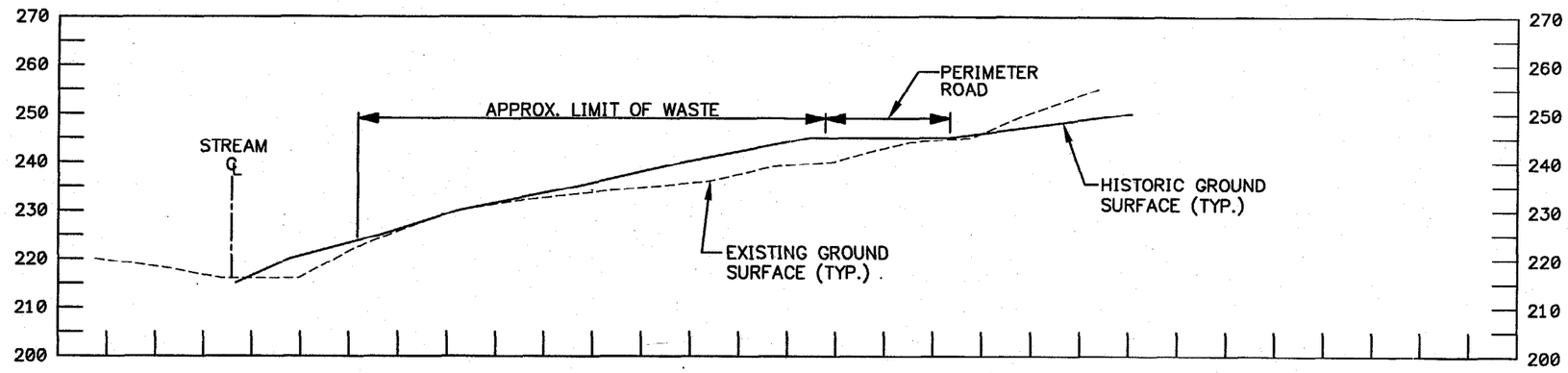
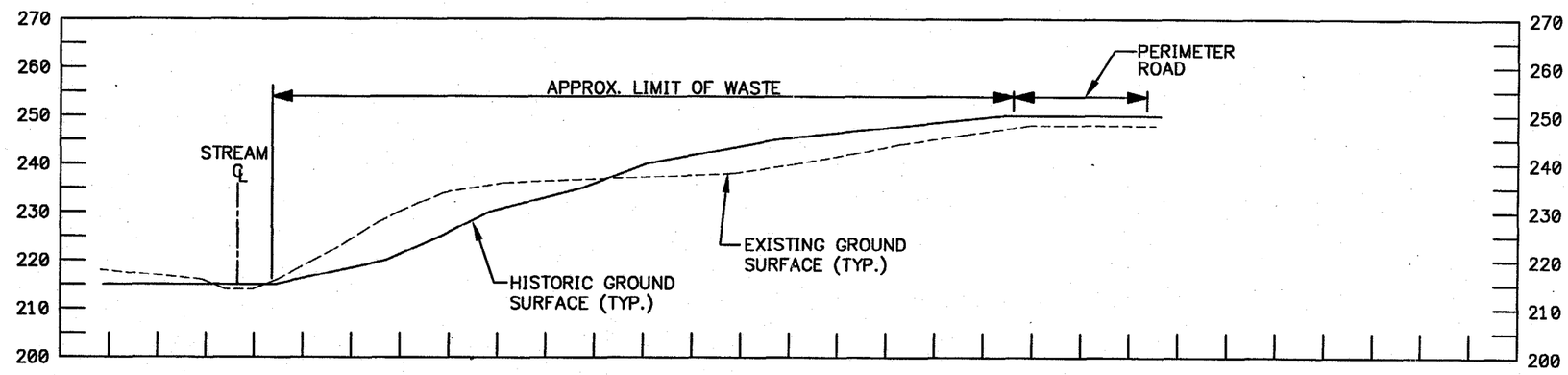


CROSS SECTION 1 A-2 A-3



CROSS SECTION 2 A-2 A-3

0 30 60
SCALE IN FEET

NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY MF DATE 2/8/00
CHECKED BY TJR DATE 2/8/00
COST/SCHED-AREA
SCALE AS NOTED

Tetra Tech NUS, Inc.

CROSS SECTIONS 1 AND 2
SITE 3 EE/CA
FORMER NSWC – WHITE OAK
SILVER SPRING AND ADELPHI, MARYLAND

CONTRACT NO. 0398
OWNER NO. 0324
APPROVED BY Donald M. Shipley-Yaeth DATE 2/18/00
APPROVED BY DATE
DRAWING NO. FIGURE A-3
REV. 0

FORM CADD NO. TtNUS_BH.DGN - REV 0 - 1/20/98

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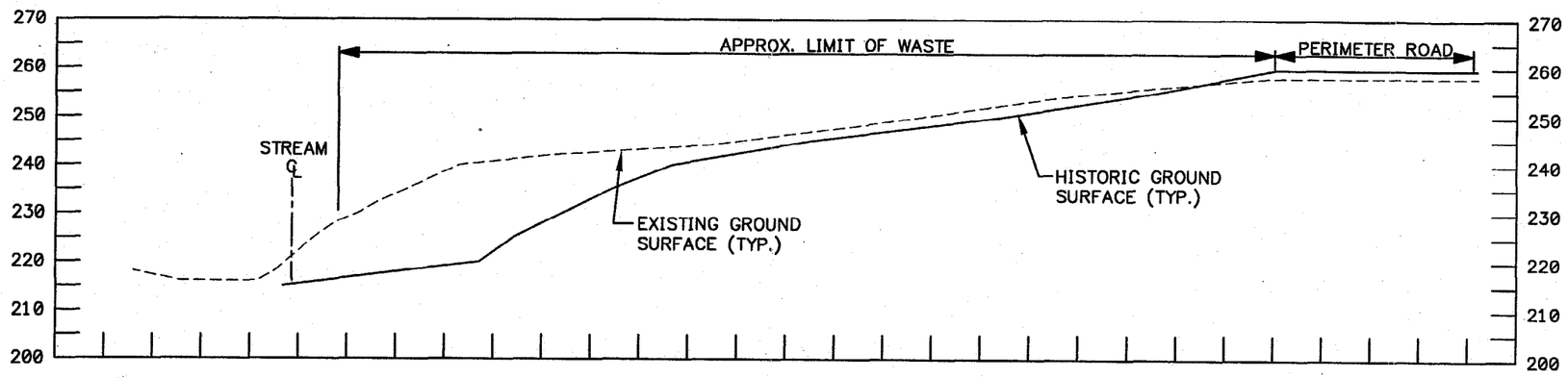
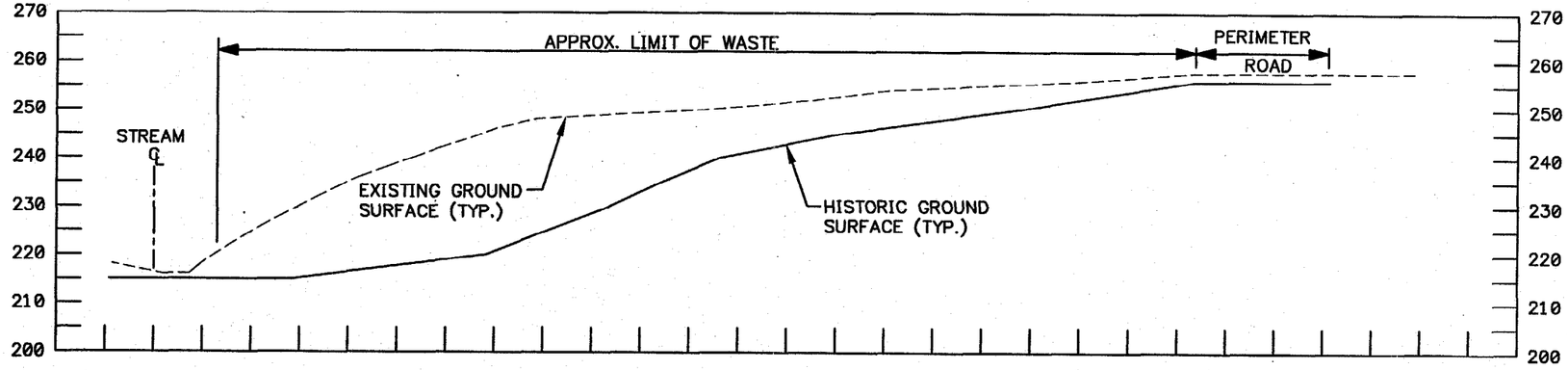


CROSS SECTION 3 A-2 A-4



CROSS SECTION 4 A-2 A-4

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SCALE IN FEET

NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY MF DATE 2/8/00
CHECKED BY TJR DATE 2/18/00
COST/SCHED-AREA
SCALE AS NOTED

Tetra Tech NUS, Inc.

CROSS SECTIONS 3 AND 4
SITE 3 EE/CA
FORMER NSWC – WHITE OAK
SILVER SPRING AND ADELPHI MARYLAND

CONTRACT NO. 0398
OWNER NO. 0324
APPROVED BY [signature] DATE 2/18/00
APPROVED BY DATE
DRAWING NO. FIGURE A-4
REV. 0

FORM CADD NO. TtNUS_BH.DGN – REV 0 – 1/20/98

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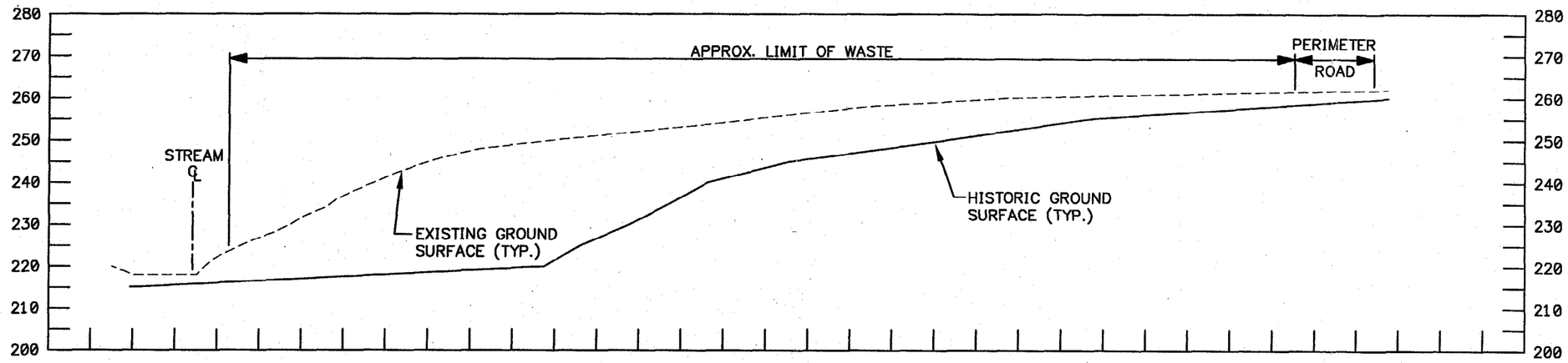

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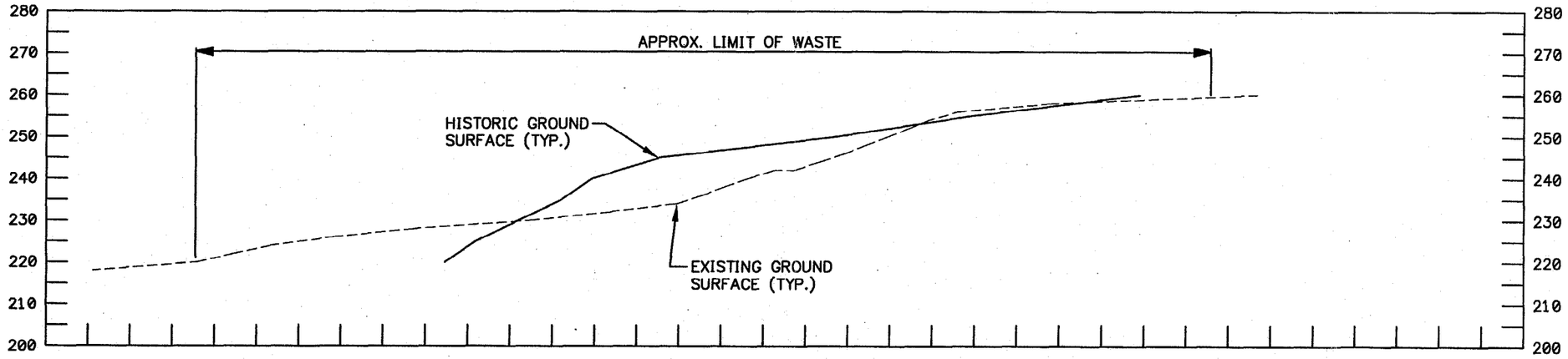

CROSS SECTION 6 A-2 A-5

0 30 60
SCALE IN FEET

NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY MF DATE 2/8/00
CHECKED BY TJD DATE 2/18/00
COST/SCHED-AREA
SCALE AS NOTED

Tetra Tech NUS, Inc.

CROSS SECTIONS 5 AND 6
SITE 3 EE/CA
FORMER NSWC – WHITE OAK
SILVER SPRING AND ADELPHI, MARYLAND

CONTRACT NO. 0398
OWNER NO. 0324
APPROVED BY [signature] DATE 2/18/00
APPROVED BY DATE
DRAWING NO. FIGURE A-5
REV. 0

FORM CADD NO. T+NUS_BH.DGN - REV 0 - 1/20/98

APPENDIX B

EM SURVEY FIELD DATA

CALCULATION WORKSHEET

Order No. 19116 (01-91)

PAGE ____ OF ____

CLIENT	JOB NUMBER
NSWC WHITEOAK	2295

SUBJECT	
EM SURVEY - SITE 23	

BASED ON	DRAWING NUMBER

BY	CHECKED BY	APPROVED BY	DATE
PLN			

NORTH - CENTRAL SECTION of GRID

TO SITE 4

		6 L6	L7	L8	L7	L6	L7	8 L7
280		6 L5	L6	L7	L6	L8	L8	(10) L6
270		L6	L5	L6	L6	L7	L7	4 L6
260		5 L12	L8	L6	L7	L7	L6	8 L8
250		8 L6	L6	L5	L6	L6	L7	6 L7
240		6 L5	L6	L5	L6	L6	L7	8 L7
230		5 L3.5	L6	L6	L6	L7	L7	6 L6
220		6.2 L6.1	L6	7 L4	L8	L8	L7	6 L7
210		6 L7	7 L7	L6	L7	L7	L6	L7
200		5 L6	6 L7	L7	L6	L6	L7	9 L8
190		(2) L(1)	5 L6	L7	L7	L6	L7	9 L7
180		(21) L(13)	7 L6	L6	L6	L7	L7	7 L
170		(20) L(8)	6 L7	L6	L6	L6	L7	2.5 L8
160		L(2)	L6	L4	L7	L7	7 L7	6 L7
150		8 L6	7 L7	L6.3	L7	L7	L8	L(3)
140		L	L	L	L	L	L	L

0 000
0000
0000
MANY MINE SHAPES

Metal Plate

CULVERT

SCALE 10'

SEE SOUTHERN SECTION

0 10 20 30 40 50 60

CALCULATION WORKSHEET Order No. 19116 (01-91) PAGE ____ OF ____

CLIENT NSWC WHITECAK	JOB NUMBER 2295
SUBJECT EM SURVEY - SITE 23	
BASED ON	DRAWING NUMBER
BY PLN	CHECKED BY / APPROVED BY / DATE

SOUTHERN SECTION OF GRID

140	6 / 3	7	5.6	5	6.3	8	11.1 / 8
130	5 / 6	7 / 7	8 / 6	7	7	7	9 / 9
120	8.7 / 8.1	6 / 5.4	7 / 6.5	6	6	6	8.9 / 9
110	6.9 / 8.3	7.3 / (4)	3 / 0	6.0 / 4.7	6	6	7
100	(3) / (7.2)	(3.7) / 6.1	4.7 / 11.1	7.0	5.6	6.2	6.2 / 6.2
90	(13) / 23	(22) / (4.8)	5.7 / 6.5	6.2 / 7.3	7.3	9.7	9.1 / 8.2
80	17 / 11.8	4 / (2)	9.1 / 8.9	6.6	5.5	5.3	6.3 / 6.3
70	18 / 17	16 / 12	6.4 / 6.5	6.5	5.0	5.1	4.6 / 4.0
60	(1) / 2.5	10.2	8.8	6.4	6.1 / 5.5	5.5 / 5.0	4.4 / 4.0
50	(28.3) / (18)	(22) / (10)	3 / 0	7.2 / 7.3	8.0 / 8.0	5.8 / 6.3	4.8 / 4.1
40	(8.3) / (1.3)	(4.3) / (8.7)	2.2 / 2.8	9.0 / 7.2	5.4 / 5.0	4.5 / 4.6	4.0 / 4.7
30	(10) / 6.6	6.6 / 10.1	(3.6) / 0.0	3.5 / 4.0	5.9 / 6.5	4.6 / 4.4	6.7 / 3.6
20	14.4	13.6	10.2	5.4	6.6	4.7	4.5
10	15.1 / 5.2	6.0 / 11.4	6.1 / 14.[illegible]	2.3 / 4.8	6.7 / 5.9	5.1 / 4.4	4.9 / 4.3
0	6.0 / 4.1	7.7 / 7.4	7.5 / 6.4	6.6 / 6.3	7.0	6.5 / 5.0	5.5 / 4.4

SCALE 10'

(X) = STAKED LOCATION

L EM READING AT 2 CONDITIONS

Area of Anomalous Readings. (metal)

Y-DISTANCE

(0,0) (100,0)

X-DISTANCE

CALCULATION WORKSHEET

Order No. 19116 (01-91)

CLIENT: NSWC WHITEOAK	JOB NUMBER: 2295
SUBJECT: EM SURVEY - SITE 23	
BASED ON:	DRAWING NUMBER:
BY: PLN	CHECKED BY:
APPROVED BY:	DATE: 3/3/95

SOUTHERN SECTION OF GRID

140	6 3	7	5.6	5	6.3	8	11.1 8
130	5 6	7 7	8 6	7	7	7	9 9
120	8.7 8.1	6 5.4	7 6.5	6	6	6	8.9 9
110	6.9 8.3	7.3 (4)	3 0	6.0 4.7	6	6	7
100	(3) (12)	(3.7) 6.1	4.7 11.1	7.0	5.6	6.2	6.2 6.2
90	(13) 23	(22) (4.8)	5.7 6.5	6.2 7.3	7.3	9.7	9.1 8.2
80	17 11.8	4 (2)	9.1 8.9	6.6	5.5	5.3	6.3 6.3
70	18 17	16 12	6.4 6.5	6.5	5.0	5.1	4.6 4.0
60	(1) 2.5	10.2	8.8	6.4	6.1 5.5	5.5 5.0	4.4 4.0
50	(28.8) (18)	(22) (10)	3 0	7.2 7.3	8.0 8.6	5.8 6.3	4.8 4.1
40	(8.3) (1.3)	(4.3) (8.7)	2.2 2.8	9.0 9.2	5.4 5.9	4.5 4.9	4.0 4.7
30	(10) 6.0	6.9 10.7	(3.6) 0.0	3.5 4.0	5.9 6.5	4.6 4.4	4.7 3.6
20	14.4	13.0	10.2	3.4	6.6	4.7	4.5
10	19.1 15.2	10.2 11.4	10.1 10.1	2.8 4.8	6.7 5.9	5.1 4.9	4.8 4.3
0	6.6 4.1	7.7 7.4	5.8 6.9	6.9 6.3	7.0 7.0	6.5 5.0	5.8 4.4

(0,0) (60,0)

Y-DISTANCE

X-DISTANCE: 0 10 20 30 40 50 60

SCALE: 10'

⊗ = STAKED LOCATION

L EM READING at 2 ORIENTATIONS

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT: NSWC WHITEOAK	JOB NUMBER: 3295
SUBJECT: EM SURVEY – SITE 2 3	
BASED ON	DRAWING NUMBER

BY	CHECKED BY	APPROVED BY	DATE
RLN			3/3/95

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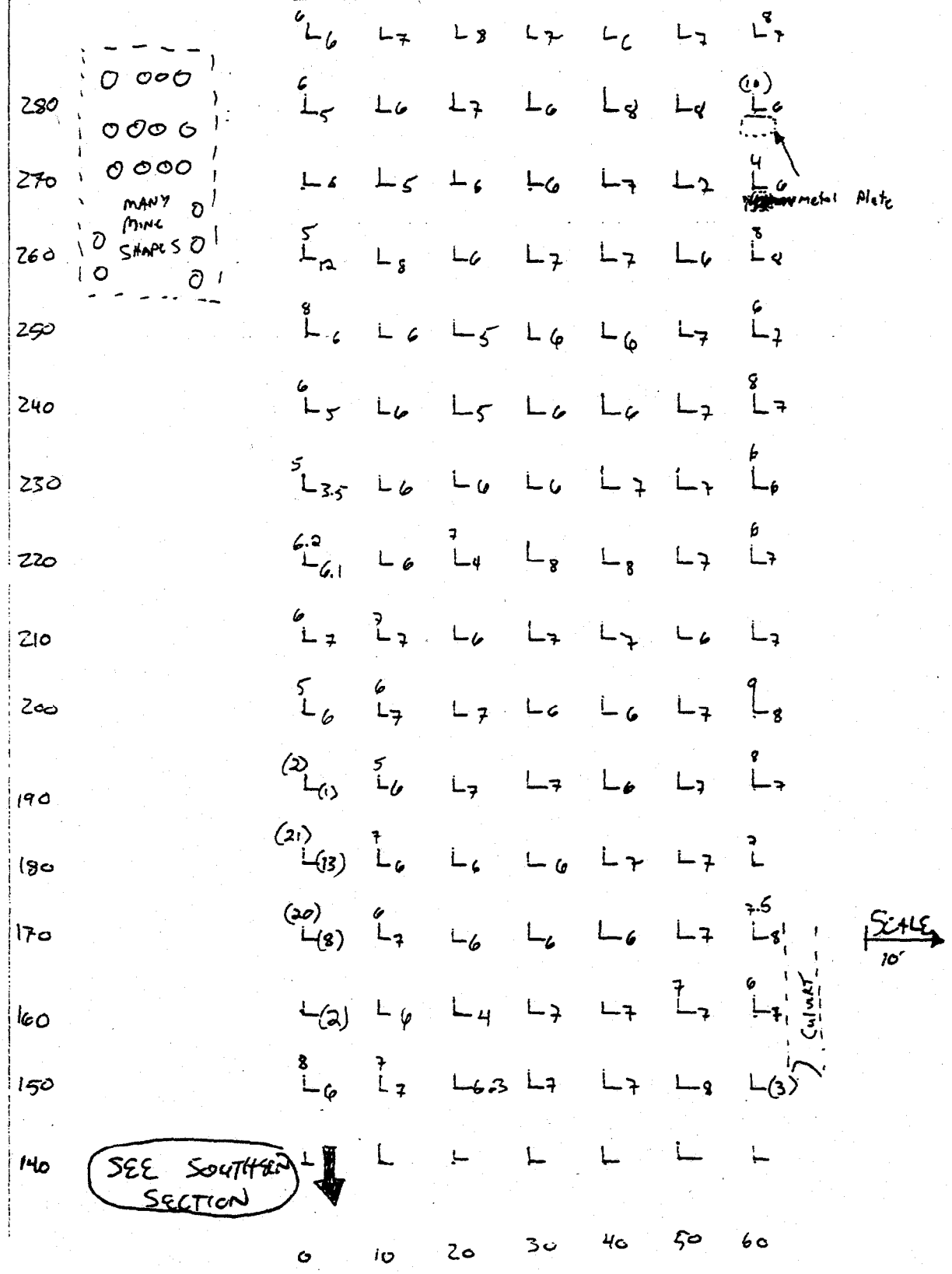


APPENDIX C

TEST PIT LOGS

TEST PIT LOG **HALLIBURTON NUS**

PROJECT: WHITE OAK TEST PIT NO.: 3-TP1

PROJECT NO.: 2295 DATE: 3/6/95

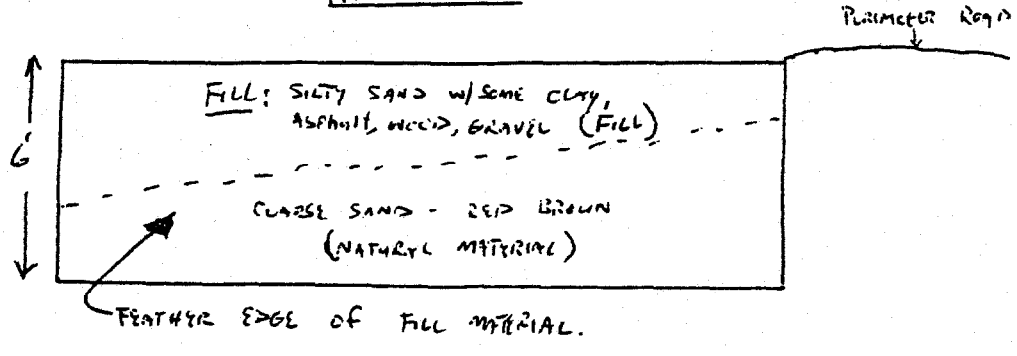
LOCATION: Site 3 - Pistol Range Landfill, NE End

FIELD GEOLOGIST: P. Nimmer / R. Willoughby

DEPTH (ft.)	LITHOLOGY CHANGE (Depth, ft.)	MATERIAL DESCRIPTION (Soil Density / Consistency, Color)	USCS	REMARKS
		Silty sand w/ clay. Black - Brown		Fill material
1.0		As above w/ some gravel.		
	Fill			
2.0	SM/GC	As above w/ black material including		Fill
		asphalt and wood.		
3.0		Red - Brn. ~~Coarse~~ Graded sand w/ some fine gravel.		Natural material in angular
				contact w/ fill.
4.0	Natural	As above.		
	SP/SM			
5.0		As above		
6.0		As above		
	TD = 6'			

Test Pit Cross Section and / or Plan View

P.T X-SECTION



REMARKS Pit 19.5' long x 3' wide x 6' deep

PHOTO LOG

TEST PIT 3-TP1

PAGE 1 OF 1

TEST PIT LOG **HALLIBURTON NUS**

PROJECT: WHITE OAK TEST PIT NO.: 3-TP2

PROJECT NO.: 2295 DATE: 3/6/95

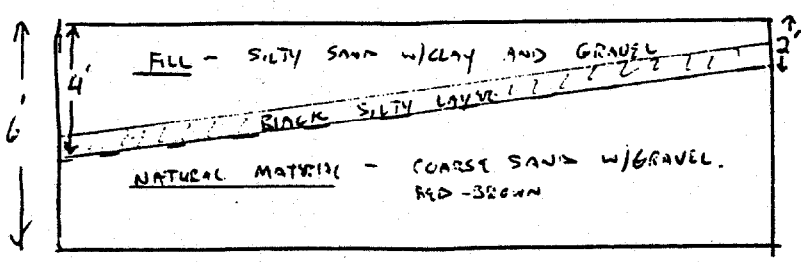
LOCATION: NE END of Site 3, along Perimeter Road.

FIELD GEOLOGIST: L. NIMMER / R. Willebe

DEPTH (ft.)	LITHOLOGY CHANGE (Depth, ft.)	MATERIAL DESCRIPTION (Soil Density / Consistency, Color)	USCS	REMARKS
	GC FILL	SILTY SAND w/ CLAY AND GRAVEL. GREY -		FILL MATERIAL
1.0		BROWN.		
2.0		AS ABOVE w/ BLACK ORGANIC MATERIAL		
3.0	NATURAL SP/SM	RED-BRN COARSE SAND w/ GRAVEL		NATURAL MATERIAL
4.0		AS ABOVE		
5.0		AS ABOVE		
6.0				
	TD=6'			

Test Pit Cross Section and / or Plan View

PIT CROSS-SECTION



REMARKS Pit 25' long x 3' wide x 6' deep.

PHOTO LOG TEST PIT

PAGE ____ OF ____

TEST PIT LOG **HALLIBURTON NUS**

PROJECT: WHITE OAK TEST PIT NO.: 3-TP3

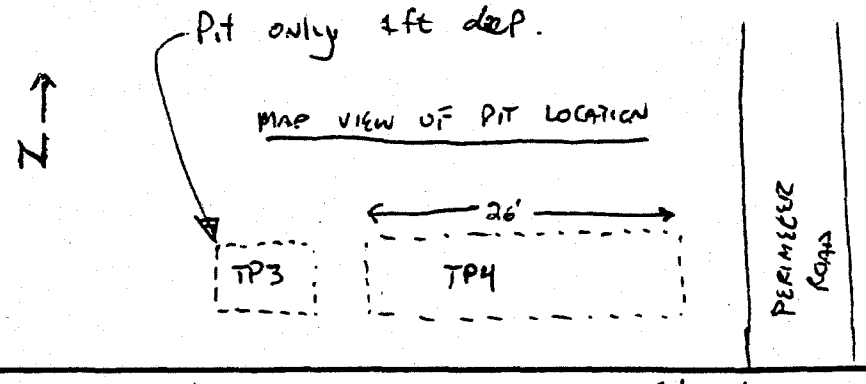
PROJECT NO.: 2295 DATE: 3/6/95

LOCATION: CENTER OF Site 3 NEAR Perimeter Road.

FIELD GEOLOGIST: P. NIMMER / R. Willowke

DEPTH (ft.)	LITHOLOGY CHANGE (Depth,ft.)	MATERIAL DESCRIPTION (Soil Density / Consistency, Color)	USCS	REMARKS
	FILL	Black - BRN - RED SAND, SILT + Cobbles,		TRASH material, possibly burned.
1.0	GM	Glass, metal, nails.		Excluded 3 Potential UXO
	TD = 1'			Objects. 6" x 3" Cylinder
				2 more in Soil Pile.

Test Pit Cross Section and / or Plan View



REMARKS 9' Long x 3' wide x 1' deep.

5 UXO OBJECTS (BOMB FUSES) DISCOVERED.
ALL WERE TAKEN BY EOD PERSONNEL FROM SITE.

PHOTO LOG

TEST PIT 3-TP3

PAGE 1 OF 1

TEST PIT LOG

HALLIBURTON NUS

PROJECT: WHITE OAK TEST PIT NO.: 3-TP4

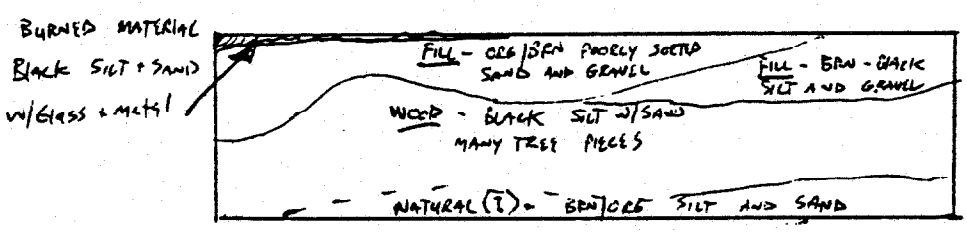
PROJECT NO.: 2295 DATE: 3/6/95

LOCATION: CENTER OF Site 3, NEAR Perimeter ROAD.

FIELD GEOLOGIST: P. NIMMER / R. Willowbe

DEPTH (ft.)	LITHOLOGY CHANGE (Depth, ft.)	MATERIAL DESCRIPTION (Soil Density / Consistency, Color)	USCS	REMARKS
	GC	BRN - ORG GRADED SAND, GRAVEL AND SILT		POORLY SORTED
1.0		THIN LAYER (~6") of TRASH at WEST END.		SOME TRASH PRESENT.
2.0		BRN - BLACK SANDY SILT W/ GRAVEL		
3.0	WOOD	BLACK ORGANIC (TREE) MATERIAL		LAYER OF WOOD @ 3-5'
4.0		AS ABOVE		
5.0	GC SM	BRN - ORG SILT W/SAND AND GRAVEL		POSSIBLE NATURAL MATERIAL
	TD=5'			

Test Pit Cross Section and / or Plan View PIT CROSS-SECTION



REMARKS Metal + Trash AT SURFACE.

Pit 25' x 5' x 3' wide

PHOTO LOG

TEST PIT 3-TP4

PAGE 1 OF 1

TEST PIT LOG

HALLIBURTON NUS

PROJECT: WHITE OAK TEST PIT NO.: 3-TP5

PROJECT NO.: 2295 DATE: 3/7/95

LOCATION: CENTER of S.k 3, NEAR PERIMETER RD.

FIELD GEOLOGIST: P. NIMMER / R. WILLOWBE

DEPTH (ft.)	LITHOLOGY CHANGE (Depth.ft.)	MATERIAL DESCRIPTION (Soil Density / Consistency, Color)	USCS	REMARKS
	GC	BRN SAND W/SILT AND GRAVEL		CLEAN FILL
1.0		BRN - GREY MOTTLED GRADED SAND		
		W/ GRAVEL		
2.0	GC			
		AS ABOVE.		BACKHOE GOT STUCK IN
3.0				AT COLLAPSED SIDES
	TD=3'			

Test Pit Cross Section and / or Plan View

CLEAN FILL, NO EVIDENCE OF TRASH OR METAL.

REMARKS Pit 36' long x 5' wide x 3' deep.

PHOTO LOG

TEST PIT 3-TP5

PAGE 1 OF 1

TEST PIT LOG **HALLIBURTON NUS**

PROJECT: WHITE OAK TEST PIT NO.: 3-TP6

PROJECT NO.: 2295 DATE: 3/7/95

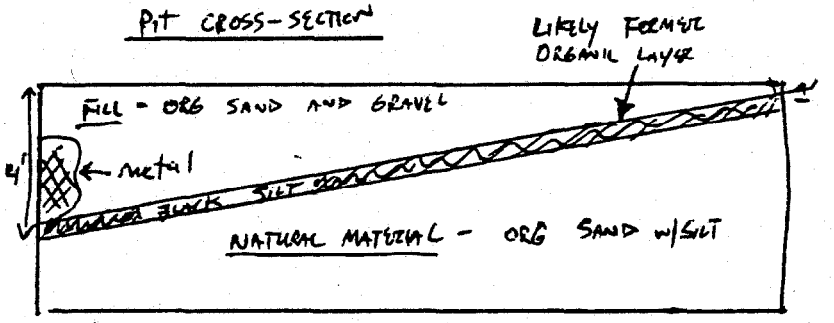
LOCATION: Southern Center area, towards

FIELD GEOLOGIST: P. NIMMER / R. Willowby

DEPTH (ft.)	LITHOLOGY CHANGE (Depth, ft.)	MATERIAL DESCRIPTION (Soil Density / Consistency, Color)	USCS	REMARKS
		ORG/BRN POORLY GRADED SAND w/ SILT + GRAVEL		FILL
1.0	SP/GC			
		BLACK SILT OVER GREY CLAY		POSSIBLE ORGANIC (NATIVE) ZONE
2.0				
3.0		ORG-GREY SAND w/cobbles		
4.0	SM	ORG SAND AND SILT - well GRADED		NATURAL MATERIAL
5.0		AS ABOVE		
	TD=5'			

Test Pit Cross Section and / or Plan View

Pit CROSS-SECTION



REMARKS Pit 21' LONG x 3' wide x 5' deep

PHOTO LOG

TEST PIT 3-TP6

PAGE 1 OF 1

TEST PIT LOG

HALLIBURTON NUS

PROJECT: WHITE OAK TEST PIT NO.: 3-TP7

PROJECT NO.: 2295 DATE: 3/9/95

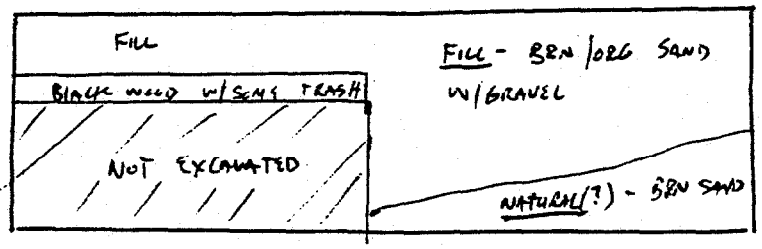
LOCATION: Southern edge of site

FIELD GEOLOGIST: P. Nimmer / R. Willowby

DEPTH (ft.)	LITHOLOGY CHANGE (Depth.ft.)	MATERIAL DESCRIPTION (Soil Density / Consistency, Color)	USCS	REMARKS
1.0	SM	ORG-BRN GRADED SAND w/ MILK		LIKELY FILL
2.0				
	WOOD	BLACK - ORGANIC - WOOD ZONE w/TRASH		SOME TRASH @ 25'
3.0				
4.0				
	SM	DKZ BRN - Sandy SILT		POSSIBLE NATURAL MATERIAL
5.0				
	TD=5'			

Test Pit Cross Section and / or Plan View

PIT CROSS-SECTION



REMARKS pit 25' long x 3' wide x 5' deep.

PHOTO LOG

TEST PIT 3-TP7

PAGE 1 OF 1

APPENDIX D

ANALYTICAL DATA

D.1 SUMMARY OF POSITIVE DETECTIONS IN SURFACE SOIL

D.2 SUMMARY OF POSITIVE DETECTIONS IN SUBSURFACE SOIL

D.3 HISTORIC ANALYTICAL DATA - SURFACE SOIL

D.1 SUMMARY OF POSITIVE DETECTIONS IN SURFACE SOIL

Data Qualifiers

The following analytical data include data qualifiers that were added by the laboratory following sample analysis. The qualifiers can be interpreted as follows:

- **U** – indicates that the chemical was not detected at the numerical detection limit (quantitation limit) noted.
- **B** – indicates that the chemical was detected but that the result is considered to be a false positive as a consequence of laboratory blank contamination.
- **UJ** – indicates that the chemical was not detected. However, the detection limit (quantitation limit) is considered estimated based on noncompliances encountered during laboratory analysis. The associated numerical detection limit is regarded as inaccurate or imprecise.
- **J** – indicates that the chemical was detected. However, the associated numerical result is not a precise representation of the amount that is actually present in the sample. The laboratory result is considered to be an estimate.
- **UL** - indicates that the chemical was not detected. However, the detection limit is considered biased low as a result of noncompliances encountered during laboratory analysis. The associated numerical detection limit is regarded as having a low bias.
- **L** - indicates that the chemical was detected. However, the associated numerical result is considered to have a low bias as a result of noncompliances encountered during laboratory analysis. The laboratory quantity is considered to be biased low.
- **K** - indicates that the chemical was detected. However, the associated numerical result is considered to have a high bias as a result of noncompliances encountered during laboratory analysis. The laboratory quantity is considered to be biased low.
- **UR** - indicates that the chemical was not detected at the numerical detection limit (quantitation limit), but that the chemical may or may not be present and the result reported by the laboratory is considered to be unreliable and unusable.
- **R** - indicates that the chemical may or may not be present, the positive analytical result reported by the laboratory is considered to be unreliable and unusable.

SITE 3
FORMER NSWC-WHITE OAK
SILVER SPRING AND ADELPHI, MARYLAND
SUMMARY OF ANALYTICAL RESULTS FOR SURFACE SOIL

SAMPLE I.D.:	3SS1020100	3SS1040100	3SS1050100	3SS1060100	3SS1070100	3SS1080100	3SS1090100
LOCATION:	3SB102/SGW102	3SB104/SGW104	3SB105	3SB106	3SB107	3SS108	3SS109
SAMPLE DATE:	12/18/98	12/18/98	12/18/98	12/18/98	12/18/98	12/14/98	12/14/98
DEPTH INTERVAL (FEET):	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5
ASSOCIATED DUPLICATE:							
VALIDATION STATUS:	VALIDATED	VALIDATED	VALIDATED	VALIDATED	VALIDATED	VALIDATED	VALIDATED
VOLATILES (ug/kg)							
1,1,1-TRICHLOROETHANE	12 U	12 U	12 U	12 U	12 U	12 U	11 U
1,1,2,2-TETRACHLOROETHANE	12 U	12 U	12 U	12 U	12 U	12 U	11 U
1,1,2-TRICHLOROETHANE	12 U	12 U	12 U	12 U	12 U	12 U	11 U
1,1-DICHLOROETHANE	12 U	12 U	12 U	12 U	12 U	12 U	11 U
1,1-DICHLOROETHENE	12 U	12 U	12 U	12 U	12 U	12 U	11 U
1,2-DICHLOROETHANE	12 U	12 U	12 U	12 U	12 U	12 U	11 U
1,2-DICHLOROETHENE (TOTAL)	12 U	12 U	12 U	12 U	12 U	12 U	11 U
1,2-DICHLOROPROPANE	12 U	12 U	12 U	12 U	12 U	12 U	11 U
2-BUTANONE	12 U	12 U	12 U	12 U	12 U	12 U	11 U
2-HEXANONE	12 U	12 U	12 U	12 U	12 U	12 U	11 U
4-METHYL-2-PENTANONE	12 U	12 U	12 U	12 U	12 U	12 U	11 U
ACETONE	12 U	12 U	12 U	12 U	12 U	12 U	11 U
BENZENE	12 U	12 U	12 U	12 U	12 U	12 U	11 U
BROMODICHLOROMETHANE	12 U	12 U	12 U	12 U	12 U	12 U	11 U
BROMOFORM	12 U	12 U	12 U	12 U	12 U	12 U	11 U
BROMOMETHANE	12 U	12 U	12 U	12 U	12 U	12 U	11 U
CARBON DISULFIDE	12 U	12 U	12 U	12 U	12 U	12 U	11 U
CARBON TETRACHLORIDE	12 U	12 U	12 U	12 U	12 U	12 U	11 U
CHLOROBENZENE	12 U	12 U	12 U	12 U	12 U	12 U	11 U
CHLORODIBROMOMETHANE	12 U	12 U	12 U	12 U	12 U	12 U	11 U
CHLOROETHANE	12 U	12 U	12 U	12 U	12 U	12 U	11 U
CHLOROFORM	12 U	12 U	12 U	12 U	12 U	12 U	11 U
CHLOROMETHANE	12 U	12 U	12 U	12 U	12 U	12 U	11 U
CIS-1,3-DICHLOROPROPENE	12 U	12 U	12 U	12 U	12 U	12 U	11 U
ETHYLBENZENE	12 U	12 U	12 U	12 U	12 U	12 U	11 U
METHYLENE CHLORIDE	3 B	2 B	2 B	12 U	2 B	12 U	11 U
STYRENE	12 U	12 U	12 U	12 U	12 U	12 U	11 U
TETRACHLOROETHENE	12 U	12 U	12 U	12 U	12 U	12 U	11 U
TOLUENE	12 U	12 U	12 U	12 U	12 U	12 U	11 U
TRANS-1,3-DICHLOROPROPENE	12 U	12 U	12 U	12 U	12 U	12 U	11 U
TRICHLOROETHENE	12 U	12 U	12 U	12 U	12 U	12 U	11 U
VINYL CHLORIDE	12 U	12 U	12 U	12 U	12 U	12 U	11 U
XYLENES, TOTAL	12 U	12 U	12 U	12 U	12 U	12 U	11 U
SEMIVOLATILES (ug/kg)							
1,2,4-TRICHLOROBENZENE	400 U	390 U	390 U	420 U	390 U	390 U	370 U
1,2-DICHLOROBENZENE	400 U	390 U	390 U	420 U	390 U	390 U	370 U
1,3-DICHLOROBENZENE	400 U	390 U	390 U	420 U	390 U	390 U	370 U
1,4-DICHLOROBENZENE	400 U	390 U	390 U	420 U	390 U	390 U	370 U
2,2'-OXYBIS(1-CHLOROPROPANE)	400 U	390 U	390 U	420 U	390 U	390 U	370 U
2,4,5-TRICHLOROPHENOL	960 U	950 U	950 U	1000 U	950 U	950 U	900 U
2,4,6-TRICHLOROPHENOL	400 U	390 U	390 U	420 U	390 U	390 U	370 U
2,4-DICHLOROPHENOL	400 U	390 U	390 U	420 U	390 U	390 U	370 U
2,4-DIMETHYLPHENOL	400 U	390 U	390 U	420 U	390 U	390 U	370 U
2,4-DINITROPHENOL	960 U	950 U	950 U	1000 U	950 U	950 U	900 U
2,4-DINITROTOLUENE	400 U	390 U	390 U	420 U	390 U	390 U	370 U
2,[illegible]TROTOLUENE	400 U	390[illegible]	390 U	420 U	390 U	390 U	[illegible]

SITE 3
FORMER NSWC-WHITE OAK
SILVER SPRING AND ADELPHI, MARYLAND
SUMMARY OF ANALYTICAL RESULTS FOR SURFACE SOIL

SAMPLE I.D.:	3SS1020100	3SS1040100	3SS1050100	3SS1060100	3SS1070100	3SS1080100	3SS1090100
LOCATION:	3SB102/SGW102	3SB104/SGW104	3SB105	3SB106	3SB107	3SS108	3SS109
SAMPLE DATE:	12/18/98	12/18/98	12/18/98	12/18/98	12/18/98	12/14/98	12/14/98
DEPTH INTERVAL (FEET):	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5
ASSOCIATED DUPLICATE:							
VALIDATION STATUS:	VALIDATED	VALIDATED	VALIDATED	VALIDATED	VALIDATED	VALIDATED	VALIDATED
2-CHLORONAPHTHALENE	400 U	390 U	390 U	420 U	390 U	390 U	370 U
2-CHLOROPHENOL	400 U	390 U	390 U	420 U	390 U	390 U	370 U
2-METHYLNAPHTHALENE	400 U	390 U	390 U	420 U	390 U	390 U	370 U
2-METHYLPHENOL	400 U	390 U	390 U	420 U	390 U	390 U	370 U
2-NITROANILINE	960 U	950 U	950 U	1000 U	950 U	950 U	900 U
2-NITROPHENOL	400 U	390 U	390 U	420 U	390 U	390 U	370 U
3,3'-DICHLOROBENZIDINE	400 U	390 U	390 U	420 U	390 U	390 U	370 U
3-NITROANILINE	960 U	950 U	950 U	1000 U	950 U	950 U	900 U
4,6-DINITRO-2-METHYLPHENOL	960 U	950 U	950 U	1000 U	950 U	950 U	900 U
4-BROMOPHENYL PHENYL ETHER	400 U	390 U	390 U	420 U	390 U	390 U	370 U
4-CHLORO-3-METHYLPHENOL	400 U	390 U	390 U	420 U	390 U	390 U	370 U
4-CHLOROANILINE	400 U	390 U	390 U	420 U	390 U	390 U	370 U
4-CHLOROPHENYL PHENYL ETHER	400 U	390 U	390 U	420 U	390 U	390 U	370 U
4-METHYLPHENOL	400 U	390 U	390 U	420 U	390 U	390 U	370 U
4-NITROANILINE	960 U	950 U	950 U	1000 U	950 U	950 U	900 U
4-NITROPHENOL	960 U	950 U	950 U	1000 U	950 U	950 U	900 U
ACENAPHTHENE	400 U	390 U	390 U	420 U	390 U	390 U	370 U
ACENAPHTHYLENE	400 U	390 U	390 U	420 U	390 U	390 U	370 U
ANTHRACENE	400 U	390 U	390 U	420 U	390 U	390 U	370 U
BENZO(A)ANTHRACENE	400 U	390 U	390 U	420 U	390 U	390 U	370 U
BENZO(A)PYRENE	400 U	390 U	390 U	420 U	390 U	390 U	370 U
BENZO(B)FLUORANTHENE	400 U	390 U	390 U	420 U	390 U	390 U	370 U
BENZO(G,H,I)PERYLENE	400 U	390 U	390 U	420 U	390 U	390 U	370 U
BENZO(K)FLUORANTHENE	400 U	390 U	390 U	420 U	390 U	390 U	370 U
BIS(2-CHLOROETHOXY)METHANE	400 U	390 U	390 U	420 U	390 U	390 U	370 U
BIS(2-CHLOROETHYL)ETHER	400 U	390 U	390 U	420 U	390 U	390 U	370 U
BIS(2-ETHYLHEXYL)PHTHALATE	400 U	390 U	390 U	420 U	390 U	390 U	370 U
BUTYLBENZYL PHTHALATE	400 U	390 U	390 U	420 U	390 U	390 U	370 U
CARBAZOLE	400 U	390 U	390 U	420 U	390 U	390 U	370 U
CHRYSENE	400 U	390 U	390 U	420 U	390 U	390 U	370 U
DI-N-BUTYL PHTHALATE	400 U	390 U	390 U	420 U	390 U	390 U	370 U
DI-N-OCTYL PHTHALATE	400 U	390 U	390 U	420 U	390 U	390 U	370 U
DIBENZO(A,H)ANTHRACENE	400 U	390 U	390 U	420 U	390 U	390 U	370 U
DIBENZOFURAN	400 U	390 U	390 U	420 U	390 U	390 U	370 U
DIETHYL PHTHALATE	400 U	390 U	390 U	420 U	390 U	390 U	370 U
DIMETHYL PHTHALATE	400 U	390 U	390 U	420 U	390 U	390 U	370 U
FLUORANTHENE	400 U	390 U	390 U	420 U	390 U	390 U	370 U
FLUORENE	400 U	390 U	390 U	420 U	390 U	390 U	370 U
HEXACHLOROBENZENE	400 U	390 U	390 U	420 U	390 U	390 U	370 U
HEXACHLOROBUTADIENE	400 U	390 U	390 U	420 U	390 U	390 U	370 U
HEXACHLOROCYCLOPENTADIENE	400 U	390 U	390 U	420 U	390 U	390 U	370 U
HEXACHLOROETHANE	400 U	390 U	390 U	420 U	390 U	390 U	370 U
INDENO(1,2,3-CD)PYRENE	400 U	390 U	390 U	420 U	390 U	390 U	370 U
ISOPHORONE	400 U	390 U	390 U	420 U	390 U	390 U	370 U
N-NITROSO-DI-N-PROPYLAMINE	400 U	390 U	390 U	420 U	390 U	390 U	370 U
N-NITROSODIPHENYLAMINE	400 U	390 U	390 U	420 U	390 U	390 U	370 U
NAPHTHALENE	400 U	390 U	390 U	420 U	390 U	390 U	370 U

SITE 3
FORMER NSWC-WHITE OAK
SILVER SPRING AND ADELPHI, MARYLAND
SUMMARY OF ANALYTICAL RESULTS FOR SURFACE SOIL

SAMPLE I.D.:	3SS1020100	3SS1040100	3SS1050100	3SS1060100	3SS1070100	3SS1080100	3SS1090100
LOCATION:	3SB102/SGW102	3SB104/SGW104	3SB105	3SB106	3SB107	3SS108	3SS109
SAMPLE DATE:	12/18/98	12/18/98	12/18/98	12/18/98	12/18/98	12/14/98	12/14/98
DEPTH INTERVAL (FEET):	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5
ASSOCIATED DUPLICATE:							
VALIDATION STATUS:	VALIDATED	VALIDATED	VALIDATED	VALIDATED	VALIDATED	VALIDATED	VALIDATED
NITROBENZENE	400 U	390 U	390 U	420 U	390 U	390 U	370 U
PENTACHLOROPHENOL	960 U	950 U	950 U	1000 U	950 U	950 U	900 U
PHENANTHRENE	400 U	390 U	390 U	420 U	390 U	390 U	370 U
PHENOL	400 U	390 U	390 U	46 J	390 U	390 U	370 U
PYRENE	400 U	390 U	390 U	420 U	390 U	390 U	370 U
PESTICIDES/PCBs (ug/kg)							
4,4'-DDD	4.0 U	3.9 U	3.9 U	4.1 U	3.9 U	3.9 U	3.7 U
4,4'-DDE	4.0 U	3.9 U	3.9 U	4.1 U	3.9 U	3.9 U	3.7 U
4,4'-DDT	4.0 U	3.9 U	3.9 U	4.1 U	3.9 U	3.9 U	3.7 U
ALDRIN	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U	1.9 U
ALPHA-BHC	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U	1.9 U
ALPHA-CHLORDANE	7.2 J	2.0 U	2.0 U	2.1 U	2.0 U	3.1 J	6.4 J
AROCLOR-1016	40 U	39 U	39 U	41 U	39 U	39 U	37 U
AROCLOR-1221	80 U	79 U	79 U	83 U	80 U	80 U	75 U
AROCLOR-1232	40 U	39 U	39 U	41 U	39 U	39 U	37 U
AROCLOR-1242	40 U	39 U	39 U	41 U	39 U	39 U	37 U
AROCLOR-1248	40 U	39 U	39 U	41 U	39 U	39 U	37 U
AROCLOR-1254	61 J	39 U	58 J	41 U	39 U	39 U	37 U
AROCLOR-1260	50 J	39 U	39 U	41 U	39 U	250	420
BETA-BHC	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U	1.9 U
DELTA-BHC	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U	1.9 U
DIELDRIN	4.0 U	3.9 U	3.9 U	4.1 U	3.9 U	3.9 U	2.0 R
ENDOSULFAN I	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U	1.9 U
ENDOSULFAN II	4.0 U	3.9 U	3.9 U	4.1 U	3.9 U	6.5 R	13 R
ENDOSULFAN SULFATE	4.0 U	3.9 U	3.9 U	4.1 U	3.9 U	3.9 U	3.7 U
ENDRIN	4.0 U	3.9 U	3.9 U	4.1 U	3.9 U	2.3 R	3.7 U
ENDRIN ALDEHYDE	4.0 U	3.9 U	3.9 U	4.1 U	3.9 U	9.3	14
ENDRIN KETONE	4.0 U	3.9 U	3.9 U	4.1 U	3.9 U	3.9 U	3.7 U
GAMMA-BHC (LINDANE)	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U	1.9 U
GAMMA-CHLORDANE	5.7 J	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U	1.9 U
HEPTACHLOR	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U	1.9 U
HEPTACHLOR EPOXIDE	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U	1.9 U
METHOXYCHLOR	20 U	20 U	20 U	21 U	20 U	20 U	19 U
TOXAPHENE	200 U	200 U	200 U	210 U	200 U	200 U	190 U
EXPLOSIVES (mg/kg)							
1,3,5-TRINITROBENZENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
1,3-DINITROBENZENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2,4 DINITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2,4,6-TRINITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2,6 DINITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2-AMINO-4,6-DINITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2-NITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
3-NITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
4-AMINO-2,6-DINITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
4-NITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
HMX	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
NI[illegible]NZENE	0.25 U	0.25 [illegible]	0.25 U	0.25 U	0.25 U	0.25 U	[illegible]

SITE 3
FORMER NSWC-WHITE OAK
SILVER SPRING AND ADELPHI, MARYLAND
SUMMARY OF ANALYTICAL RESULTS FOR SURFACE SOIL

SAMPLE I.D.:	3SS1020100	3SS1040100	3SS1050100	3SS1060100	3SS1070100	3SS1080100	3SS1090100
LOCATION:	3SB102/SGW102	3SB104/SGW104	3SB105	3SB106	3SB107	3SS108	3SS109
SAMPLE DATE:	12/18/98	12/18/98	12/18/98	12/18/98	12/18/98	12/14/98	12/14/98
DEPTH INTERVAL (FEET):	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5
ASSOCIATED DUPLICATE:							
VALIDATION STATUS:	VALIDATED	VALIDATED	VALIDATED	VALIDATED	VALIDATED	VALIDATED	VALIDATED
RDX	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
TETRYL	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U
INORGANICS (mg/kg)							
ALUMINUM	7930	8950	6180	6900	11200	6820	4860
ANTIMONY	0.67 UL	0.67 UL	0.66 UL	0.70 UL	0.67 UL	0.66 UL	0.63 UL
ARSENIC	3.2 K	3.3 K	2.5 K	2.9 K	2.9 K	2.7 K	2.0 K
BARIUM	43.0	60.1	40.6	40.0	54.7	41.5	43.1
BERYLLIUM	0.14 B	0.14 B	0.06 B	0.16 B	0.31 B	0.11 B	0.08 B
CADMIUM	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
CALCIUM	770	746	554	530	860	1260	1170
CHROMIUM	15.9	13.9	11.1	13.8	16.0	13.6	8.4
COBALT	5.4	7.1	6.6	4.3	13.2	3.5	3.0
COPPER	13.1 J	13.0 J	13.6 J	13.0 J	28.4 J	10.9 J	10.1 J
CYANIDE	0.16 UL	0.16 UL	0.17 B	0.17 UL	0.16 UL	0.16 UL	0.15 UL
IRON	11900	15500	12500	11200	22900	10100	7510
LEAD	12.8	10.3	9.3	19.8	12.7	24.3	42.2
MAGNESIUM	1610	1800	1840	1010	2620	918	755
MANGANESE	210	374	298	154	644	124	147
MERCURY	0.12 B	0.08 B	0.07 B	0.09 B	0.06 U	0.12 B	0.14
NICKEL	15.1	15.4	13.6	8.7	18.0	13.4	8.5 B
POTASSIUM	813 J	844 J	1030 J	557 J	1510 J	345 J	414 J
SELENIUM	0.67 UJ	1.3 J	1.1 J	0.73 J	1.3 J	0.73 J	1.1 J
SILVER	0.17 U	0.17 U	0.17 U	0.18 U	0.17 U	0.17 U	0.16 U
SODIUM	36.0	19.7 U	35.6	20.8 U	38.6	21.9	39.1
THALLIUM	1.3 U	1.3 U	1.3 U	1.4 U	1.3 U	1.3 U	1.3 U
VANADIUM	20.2	19.4	13.6	20.1	21.1	19.9	14.7
ZINC	32.5 J	39.5 J	32.9 J	29.5 J	54.4 J	33.0 J	33.9 J
MISCELLANEOUS PARAMETERS							
ACID-INSOLUBLE SULFIDE mg/kg	50 U	50 U	N/A	N/A	N/A	N/A	N/A
BOD-5DAY (TOTAL) mg/kg	100	77	N/A	N/A	N/A	N/A	N/A
CHEMICAL OXYGEN DEMAND mg/L	47	57	N/A	N/A	N/A	N/A	N/A
FERROUS IRON mg/kg	6 U	6 U	N/A	N/A	N/A	N/A	N/A
HEXAVALENT CHROMIUM mg/kg	1.2 U	1.2 U	N/A	N/A	N/A	N/A	N/A
PH	3.8	2.3	N/A	N/A	N/A	N/A	N/A
TOTAL ORGANIC CARBON mg/kg	9500	9600	N/A	N/A	N/A	N/A	N/A

SITE 3
FORMER NSWC-WHITE OAK
SILVER SPRING AND ADELPHI, MARYLAND
SUMMARY OF ANALYTICAL RESULTS FOR SURFACE SOIL

SAMPLE I.D.:	3SS1100100	3SS1110100	3SS1120100	3SS1120100-D	3SS1130100	3SS1140100	3SS1150100
LOCATION:	3SS110	3SS111	3SS112	3SB112	3SS113	3SS114	3SS115
SAMPLE DATE:	12/14/98	12/14/98	12/14/98	12/14/98	12/14/98	12/14/98	12/14/98
DEPTH INTERVAL (FEET):	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5
ASSOCIATED DUPLICATE:			3SS1120100-D	3SS1120100			
VALIDATION STATUS:	VALIDATED	VALIDATED	VALIDATED	VALIDATED	VALIDATED	VALIDATED	VALIDATED
VOLATILES (ug/kg)							
1,1,1-TRICHLOROETHANE	14 U	13 U	11 U	11 U	11 U	12 U	12 U
1,1,2,2-TETRACHLOROETHANE	14 U	13 U	11 U	11 U	11 U	12 U	12 U
1,1,2-TRICHLOROETHANE	14 U	13 U	11 U	11 U	11 U	12 U	12 U
1,1-DICHLOROETHANE	14 U	13 U	11 U	11 U	11 U	12 U	12 U
1,1-DICHLOROETHENE	14 U	13 U	11 U	11 U	11 U	12 U	12 U
1,2-DICHLOROETHANE	14 U	13 U	11 U	11 U	11 U	12 U	12 U
1,2-DICHLOROETHENE (TOTAL)	14 U	13 U	11 U	11 U	11 U	12 U	12 U
1,2-DICHLOROPROPANE	14 U	13 U	11 U	11 U	11 U	12 U	12 U
2-BUTANONE	14 U	13 U	11 U	11 U	11 U	12 U	12 U
2-HEXANONE	14 U	13 U	11 U	11 U	11 U	12 U	12 U
4-METHYL-2-PENTANONE	14 U	13 U	11 U	11 U	11 U	12 U	12 U
ACETONE	14 U	13 U	11 U	11 U	11 U	12 U	12 U
BENZENE	14 U	13 U	11 U	11 U	11 U	12 U	12 U
BROMODICHLOROMETHANE	14 U	13 U	11 U	11 U	11 U	12 U	12 U
BROMOFORM	14 U	13 U	11 U	11 U	11 U	12 U	12 U
BROMOMETHANE	14 U	13 U	11 U	11 U	11 U	12 U	12 U
CARBON DISULFIDE	14 U	13 U	11 U	11 U	11 U	12 U	12 U
CARBON TETRACHLORIDE	14 U	13 U	11 U	11 U	11 U	12 U	12 U
CHLOROBENZENE	14 U	13 U	11 U	11 U	11 U	12 U	12 U
CHLORODIBROMOMETHANE	14 U	13 U	11 U	11 U	11 U	12 U	12 U
CHLOROETHANE	14 U	13 U	11 U	11 U	11 U	12 U	12 U
CHLOROFORM	14 U	13 U	11 U	11 U	11 U	12 U	12 U
CHLOROMETHANE	14 U	13 U	11 U	11 U	11 U	12 U	12 U
CIS-1,3-DICHLOROPROPENE	14 U	13 U	11 U	11 U	11 U	12 U	12 U
ETHYLBENZENE	14 U	13 U	11 U	11 U	11 U	12 U	12 U
METHYLENE CHLORIDE	14 U	13 U	11 U	11 U	11 U	12 U	12 U
STYRENE	14 U	13 U	11 U	11 U	11 U	12 U	12 U
TETRACHLOROETHENE	14 U	13 U	11 U	11 U	11 U	12 U	12 U
TOLUENE	14 U	13 U	11 U	11 U	11 U	12 U	12 U
TRANS-1,3-DICHLOROPROPENE	14 U	13 U	11 U	11 U	11 U	12 U	12 U
TRICHLOROETHENE	14 U	13 U	11 U	11 U	11 U	12 U	12 U
VINYL CHLORIDE	14 U	13 U	11 U	11 U	11 U	12 U	12 U
XYLENES, TOTAL	14 U	13 U	11 U	11 U	11 U	12 U	12 U
SEMIVOLATILES (ug/kg)							
1,2,4-TRICHLOROBENZENE	450 UR	430 U	370 U	380 U	360 U	390 U	400 U
1,2-DICHLOROBENZENE	450 UR	430 U	370 U	380 U	360 U	390 U	400 U
1,3-DICHLOROBENZENE	450 UR	430 U	370 U	380 U	360 U	390 U	400 U
1,4-DICHLOROBENZENE	450 UR	430 U	370 U	380 U	360 U	390 U	400 U
2,2'-OXYBIS(1-CHLOROPROPANE)	450 UR	430 U	370 U	380 U	360 U	390 U	400 U
2,4,5-TRICHLOROPHENOL	1100 UR	1000 U	900 U	910 U	880 U	950 U	970 U
2,4,6-TRICHLOROPHENOL	450 UR	430 U	370 U	380 U	360 U	390 U	400 U
2,4-DICHLOROPHENOL	450 UR	430 U	370 U	380 U	360 U	390 U	400 U
2,4-DIMETHYLPHENOL	450 UR	430 U	370 U	380 U	360 U	390 U	400 U
2,4-DINITROPHENOL	1100 UR	1000 U	900 U	910 U	880 U	950 U	970 U
2,4-DINITROTOLUENE	450 UR	430 U	370 U	380 U	360 U	390 U	400 U
2,6-DINITROTOLUENE	450 UR	430 U	370 U	380 U	360 U	390 U	400 U

SITE 3
FORMER NSWC-WHITE OAK
SILVER SPRING AND ADELPHI, MARYLAND
SUMMARY OF ANALYTICAL RESULTS FOR SURFACE SOIL

SAMPLE I.D.:	3SS1100100	3SS1110100	3SS1120100	3SS1120100-D	3SS1130100	3SS1140100	3SS1150100
LOCATION:	3SS110	3SS111	3SS112	3SB112	3SS113	3SS114	3SS115
SAMPLE DATE:	12/14/98	12/14/98	12/14/98	12/14/98	12/14/98	12/14/98	12/14/98
DEPTH INTERVAL (FEET):	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5
ASSOCIATED DUPLICATE:			3SS1120100-D	3SS1120100			
VALIDATION STATUS:	VALIDATED	VALIDATED	VALIDATED	VALIDATED	VALIDATED	VALIDATED	VALIDATED
2-CHLORONAPHTHALENE	450 UR	430 U	370 U	380 U	360 U	390 U	400 U
2-CHLOROPHENOL	450 UR	430 U	370 U	380 U	360 U	390 U	400 U
2-METHYLNAPHTHALENE	450 UR	430 U	370 U	380 U	360 U	390 U	400 U
2-METHYLPHENOL	450 UR	430 U	370 U	380 U	360 U	390 U	400 U
2-NITROANILINE	1100 UR	1000 U	900 U	910 U	880 U	950 U	970 U
2-NITROPHENOL	450 UR	430 U	370 U	380 U	360 U	390 U	400 U
3,3'-DICHLOROBENZIDINE	450 UR	430 U	370 U	380 U	360 U	390 U	400 U
3-NITROANILINE	1100 UR	1000 U	900 U	910 U	880 U	950 U	970 U
4,6-DINITRO-2-METHYLPHENOL	1100 UR	1000 U	900 U	910 U	880 U	950 U	970 U
4-BROMOPHENYL PHENYL ETHER	450 UR	430 U	370 U	380 U	360 U	390 U	400 U
4-CHLORO-3-METHYLPHENOL	450 UR	430 U	370 U	380 U	360 U	390 U	400 U
4-CHLOROANILINE	450 UR	430 U	370 U	380 U	360 U	390 U	400 U
4-CHLOROPHENYL PHENYL ETHER	450 UR	430 U	370 U	380 U	360 U	390 U	400 U
4-METHYLPHENOL	450 UR	430 U	370 U	380 U	360 U	390 U	400 U
4-NITROANILINE	1100 UR	1000 U	900 U	910 U	880 U	950 U	970 U
4-NITROPHENOL	1100 UR	1000 U	900 U	910 U	880 U	950 U	970 U
ACENAPHTHENE	450 UR	430 U	370 U	380 U	360 U	390 U	400 U
ACENAPHTHYLENE	450 UR	430 U	370 U	380 U	360 U	390 U	400 U
ANTHRACENE	450 UR	67 J	370 U	380 U	360 U	390 U	400 U
BENZO(A)ANTHRACENE	450 UR	310 J	370 U	380 U	360 U	68 J	400 U
BENZO(A)PYRENE	450 UR	230 J	370 U	380 U	360 U	62 J	55 J
BENZO(B)FLUORANTHENE	450 UR	300 J	370 U	380 U	360 U	72 J	48 J
BENZO(G,H,I)PERYLENE	450 UR	85 J	370 U	380 U	360 U	390 U	400 U
BENZO(K)FLUORANTHENE	450 UR	110 J	370 U	380 U	360 U	390 U	49 J
BIS(2-CHLOROETHOXY)METHANE	450 UR	430 U	370 U	380 U	360 U	390 U	400 U
BIS(2-CHLOROETHYL)ETHER	450 UR	430 U	370 U	380 U	360 U	390 U	400 U
BIS(2-ETHYLHEXYL)PHTHALATE	450 UR	430 U	370 U	380 U	360 U	390 U	400 U
BUTYLBENZYL PHTHALATE	450 UR	430 U	370 U	380 U	360 U	390 U	400 U
CARBAZOLE	450 UR	430 U	370 U	380 U	360 U	390 U	400 U
CHRYSENE	450 UR	310 J	370 U	380 U	360 U	67 J	44 J
DI-N-BUTYL PHTHALATE	450 UR	430 U	370 U	380 U	360 U	390 U	400 U
DI-N-OCTYL PHTHALATE	450 UR	430 U	370 U	380 U	360 U	390 U	400 U
DIBENZO(A,H)ANTHRACENE	450 UR	430 U	370 U	380 U	360 U	390 U	400 U
DIBENZOFURAN	450 UR	430 U	370 U	380 U	360 U	390 U	400 U
DIETHYL PHTHALATE	450 UR	430 U	370 U	380 U	360 U	390 U	400 U
DIMETHYL PHTHALATE	450 UR	430 U	370 U	380 U	360 U	390 U	400 U
FLUORANTHENE	450 UR	730	370 U	380 U	360 U	110 J	400 U
FLUORENE	450 UR	430 U	370 U	380 U	360 U	390 U	400 U
HEXACHLOROBENZENE	450 UR	430 U	370 U	380 U	360 U	390 U	400 U
HEXACHLOROBUTADIENE	450 UR	430 U	370 U	380 U	360 U	390 U	400 U
HEXACHLOROCYCLOPENTADIENE	450 UR	430 U	370 U	380 U	360 U	390 U	400 U
HEXACHLOROETHANE	450 UR	430 U	370 U	380 U	360 U	390 U	400 U
INDENO(1,2,3-CD)PYRENE	450 UR	110 J	370 U	380 U	360 U	390 U	400 U
ISOPHORONE	450 UR	430 U	370 U	380 U	360 U	390 U	400 U
N-NITROSO-DI-N-PROPYLAMINE	450 UR	430 U	370 U	380 U	360 U	390 U	400 U
N-NITROSODIPHENYLAMINE	450 UR	430 U	370 U	380 U	360 U	390 U	400 U
NAPHTHALENE	450 UR	430 U	370 U	380 U	360 U	390 U	400 U

SITE 3
FORMER NSWC-WHITE OAK
SILVER SPRING AND ADELPHI, MARYLAND
SUMMARY OF ANALYTICAL RESULTS FOR SURFACE SOIL

SAMPLE I.D.:	3SS1100100	3SS1110100	3SS1120100	3SS1120100-D	3SS1130100	3SS1140100	3SS1150100
LOCATION:	3SS110	3SS111	3SS112	3SB112	3SS113	3SS114	3SS115
SAMPLE DATE:	12/14/98	12/14/98	12/14/98	12/14/98	12/14/98	12/14/98	12/14/98
DEPTH INTERVAL (FEET):	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5
ASSOCIATED DUPLICATE:			3SS1120100-D	3SS1120100			
VALIDATION STATUS:	VALIDATED	VALIDATED	VALIDATED	VALIDATED	VALIDATED	VALIDATED	VALIDATED
NITROBENZENE	450 UR	430 U	370 U	380 U	360 U	390 U	400 U
PENTACHLOROPHENOL	1100 UR	1000 U	900 U	910 U	880 U	950 U	970 U
PHENANTHRENE	450 UR	490	370 U	380 U	360 U	110 J	400 U
PHENOL	450 UR	430 U	370 U	380 U	360 U	390 U	400 U
PYRENE	450 UR	600	370 U	380 U	360 U	110 J	59 J
PESTICIDES/PCBs (ug/kg)							
4,4'-DDD	4.5 U	4.3 U	3.7 U	3.8 U	3.6 U	3.9 U	3.9 R
4,4'-DDE	4.5 U	4.3 U	3.7 U	3.8 U	3.6 U	3.9 U	4.1 J
4,4'-DDT	4.5 U	2.7 R	3.7 U	3.8 U	3.6 U	3.9 U	11 J
ALDRIN	2.3 U	2.2 U	1.9 U	1.9 U	1.9 U	2.0 U	2.0 U
ALPHA-BHC	2.3 U	2.2 U	1.9 U	1.9 U	1.9 U	2.0 U	2.0 U
ALPHA-CHLORDANE	5.9 J	12 J	10 J	8.9 R	1.9 U	2.5 J	2.0 U
AROCLOR-1016	45 U	43 U	37 U	38 U	36 U	39 U	39 U
AROCLOR-1221	92 U	87 U	75 U	76 U	74 U	80 U	81 U
AROCLOR-1232	45 U	43 U	37 U	38 U	36 U	39 U	39 U
AROCLOR-1242	45 U	43 U	37 U	38 U	36 U	39 U	39 U
AROCLOR-1248	45 U	43 U	37 U	38 U	36 U	39 U	39 U
AROCLOR-1254	45 U	43 U	37 U	38 U	36 U	39 U	39 U
AROCLOR-1260	380	250	430	330	36 U	52	69 J
BETA-BHC	2.3 U	2.2 U	1.9 U	1.9 U	1.9 U	2.0 U	2.0 U
DELTA-BHC	2.3 U	2.2 U	1.9 U	1.9 U	1.9 U	2.0 U	2.0 U
DIELDRIN	4.5 U	4.3 U	3.7 U	3.8 U	3.6 U	3.9 U	3.9 U
ENDOSULFAN I	2.3 U	2.2 U	1.9 U	1.9 U	1.9 U	2.0 U	2.0 U
ENDOSULFAN II	10 R	5.9 R	13 R	8.8 R	3.6 U	3.9 U	2.5 R
ENDOSULFAN SULFATE	4.5 U	4.3 U	3.7 U	3.8 U	3.6 U	3.9 U	2.8 J
ENDRIN	4.5 U	4.3 U	3.7 U	3.8 U	3.6 U	3.9 U	7.0 R
ENDRIN ALDEHYDE	13 J	8.4	16	11	3.6 U	3.9 U	3.9 R
ENDRIN KETONE	4.5 U	4.3 U	3.7 U	3.8 U	3.6 U	3.9 U	3.9 U
GAMMA-BHC (LINDANE)	2.3 U	2.2 U	1.9 U	1.9 U	1.9 U	2.0 U	2.0 U
GAMMA-CHLORDANE	2.3 U	6.3 J	1.9 U	5.9 J	1.9 U	2.0 U	2.0 U
HEPTACHLOR	2.3 U	2.2 U	1.9 U	1.9 U	1.9 U	2.0 U	2.0 U
HEPTACHLOR EPOXIDE	2.3 U	2.2 U	1.9 J	1.8 J	1.9 U	2.0 U	2.0 U
METHOXYCHLOR	23 U	22 U	19 U	19 U	19 U	20 U	13 R
TOXAPHENE	230 U	220 U	190 U	190 U	190 U	200 U	200 U
EXPLOSIVES (mg/kg)							
1,3,5-TRINITROBENZENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
1,3-DINITROBENZENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2,4 DINITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2,4,6-TRINITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2,6 DINITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2-AMINO-4,6-DINITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2-NITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
3-NITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
4-AMINO-2,6-DINITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
4-NITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
HMX	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
[illegible]ROBENZENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 [illegible]

SITE 3
FORMER NSWC-WHITE OAK
SILVER SPRING AND ADELPHI, MARYLAND
SUMMARY OF ANALYTICAL RESULTS FOR SURFACE SOIL

SAMPLE I.D.:	3SS1100100	3SS1110100	3SS1120100	3SS1120100-D	3SS1130100	3SS1140100	3SS1150100
LOCATION:	3SS110	3SS111	3SS112	3SB112	3SS113	3SS114	3SS115
SAMPLE DATE:	12/14/98	12/14/98	12/14/98	12/14/98	12/14/98	12/14/98	12/14/98
DEPTH INTERVAL (FEET):	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5
ASSOCIATED DUPLICATE:			3SS1120100-D	3SS1120100			
VALIDATION STATUS:	VALIDATED	VALIDATED	VALIDATED	VALIDATED	VALIDATED	VALIDATED	VALIDATED
RDX	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
TETRYL	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U
INORGANICS (mg/kg)							
ALUMINUM	6250	4360	7630	5500	10500	13700	6750
ANTIMONY	0.760000 UL	1.3 L	0.63 UL	0.64 UL	0.62 UL	0.67 UL	0.68 UL
ARSENIC	3.1 K	2.1 K	3.0 K	2.6 K	4.4 K	4.1 K	7.1
BARIUM	49.9	22.9	54.1	45.1	28.8	45.7	29.7
BERYLLIUM	0.14 B	0.08 B	0.20 B	0.14 B	0.15 B	0.16 B	0.17 B
CADMIUM	0.05 U	0.05 U	0.05 U	0.05 U	0.04 U	0.05 U	0.30
CALCIUM	1010	712	816	674	564	3700	1470
CHROMIUM	12.2	9.0	14.5	9.0	19.3	22.5	13.6
COBALT	3.6	2.6	3.5	3.1	2.3	4.9	2.6
COPPER	8.3 J	26.2 J	31.1 J	11.5 J	12.2 J	25.1 J	19.3 J
CYANIDE	0.18 UL	0.30 B	0.29 B	0.15 UL	0.15 UL	0.16 UL	0.16 UL
IRON	10300	7750	10100	7870	13800	18600	13000
LEAD	56.0	308	11.7	12.7	7.9	27.9	35.5
MAGNESIUM	740	552	812	703	534	1770	433
MANGANESE	229	108	154	128	34.8	176	193
MERCURY	0.15 B	0.14 B	0.08 B	0.13 B	0.10 B	0.19 B	0.24 B
NICKEL	8.8	6.2	8.5	7.2	4.6	10.1	5.8
POTASSIUM	299 J	360 J	315 J	296 J	401 J	636 J	320 J
SELENIUM	0.76 UJ	0.73 UJ	1.2 J	0.64 UJ	0.62 UJ	1.6 J	1.0 J
SILVER	0.19 U	0.18 U	0.16 U	0.16 U	0.15 U	0.69	0.23
SODIUM	31.5	21.4 U	26.0	34.2	43.4	44.1	36.4
THALLIUM	1.5 U	1.5 U	1.3 U	1.3 U	1.2 U	1.3 U	1.4 U
VANADIUM	19.6	17.9	20.0	15.4	33.4	43.9	22.7
ZINC	22.4 J	25.6 J	24.3 J	23.9 J	19.4 J	42.7 J	121 J
MISCELLANEOUS PARAMETERS							
ACID-INSOLUBLE SULFIDE mg/kg	N/A	50 U	N/A	N/A	N/A	50 U	N/A
BOD-5DAY (TOTAL) mg/kg	N/A	26 UR	N/A	N/A	N/A	24 UR	N/A
CHEMICAL OXYGEN DEMAND mg/L	N/A	77	N/A	N/A	N/A	52	N/A
FERROUS IRON mg/kg	N/A	26 U	N/A	N/A	N/A	23.9 U	N/A
HEXAVALENT CHROMIUM mg/kg	N/A	1.3 U	N/A	N/A	N/A	1.2 U	N/A
PH	N/A	5.6	N/A	N/A	N/A	5.5	N/A
TOTAL ORGANIC CARBON mg/kg	N/A	15000	N/A	N/A	N/A	5700	N/A

D.2 SUMMARY OF POSITIVE DETECTIONS IN SUBSURFACE SOIL

Data Qualifiers

The following analytical data include data qualifiers that were added by the laboratory following sample analysis. The qualifiers can be interpreted as follows:

- U – indicates that the chemical was not detected at the numerical detection limit (quantitation limit) noted.
- B – indicates that the chemical was detected but that the result is considered to be a false positive as a consequence of laboratory blank contamination.
- UJ – indicates that the chemical was not detected. However, the detection limit (quantitation limit) is considered estimated based on noncompliances encountered during laboratory analysis. The associated numerical detection limit is regarded as inaccurate or imprecise.
- J – indicates that the chemical was detected. However, the associated numerical result is not a precise representation of the amount that is actually present in the sample. The laboratory result is considered to be an estimate.
- UL - indicates that the chemical was not detected. However, the detection limit is considered biased low as a result of noncompliances encountered during laboratory analysis. The associated numerical detection limit is regarded as having a low bias.
- K - indicates that the chemical was detected. However, the associated numerical result is considered to have a high bias as a result of noncompliances encountered during laboratory analysis. The laboratory quantity is considered to be biased low.
- R - indicates that the chemical may or may not be present, the positive analytical result reported by the laboratory is considered to be unreliable and unusable.

SITE 3
FORMER NSWC-WHITE OAK
SILVER SPRING AND ADELPHI, MARYLAND
SUMMARY OF ANALYTICAL RESULTS FOR SUBSURFACE SOIL

SAMPLE I.D.:	3SU1020200	3SU1040300	3SU1050300	3SU1060300	3SU1070300
LOCATION:	3SB102/SGW102	3SB104/SGW104	3SB105	3SB106	3SB107
SAMPLE DATE:	12/18/98	12/18/98	12/18/98	12/18/98	12/18/98
DEPTH INTERVAL (FEET):	2.0 - 3.5	3.0 - 3.0	3.0 - 3.0	3.0 - 3.0	3.0 - 3.0
VALIDATION STATUS:	VALIDATED	VALIDATED	VALIDATED	VALIDATED	VALIDATED
VOLATILES (ug/kg)					
1,1,1-TRICHLOROETHANE	12 U	12 U	14 U	11 U	12 U
1,1,2,2-TETRACHLOROETHANE	12 U	12 U	14 U	11 U	12 U
1,1,2-TRICHLOROETHANE	12 U	12 U	14 U	11 U	12 U
1,1-DICHLOROETHANE	12 U	12 U	14 U	11 U	12 U
1,1-DICHLOROETHENE	12 U	12 U	14 U	11 U	12 U
1,2-DICHLOROETHANE	12 U	12 U	14 U	11 U	12 U
1,2-DICHLOROETHENE (TOTAL)	12 U	12 U	14 U	11 U	12 U
1,2-DICHLOROPROPANE	12 U	12 U	14 U	11 U	12 U
2-BUTANONE	12 U	12 U	10 J	11 U	12 U
2-HEXANONE	12 U	12 U	14 U	11 U	12 U
4-METHYL-2-PENTANONE	12 U	12 U	14 U	11 U	12 U
ACETONE	12 U	12 U	55 J	11 U	12 U
BENZENE	12 U	12 U	14 U	11 U	12 U
BROMODICHLOROMETHANE	12 U	12 U	14 U	11 U	12 U
BROMOFORM	12 U	12 U	14 U	11 U	12 U
BROMOMETHANE	12 U	12 U	14 U	11 U	12 U
CARBON DISULFIDE	12 U	12 U	14 U	11 U	12 U
CARBON TETRACHLORIDE	12 U	12 U	14 U	11 U	12 U
CHLOROBENZENE	12 U	12 U	14 U	11 U	12 U
CHLORODIBROMOMETHANE	12 U	12 U	14 U	11 U	12 U
CHLOROETHANE	12 U	12 U	14 U	11 U	12 U
CHLOROFORM	12 U	12 U	14 U	11 U	12 U
CHLOROMETHANE	12 U	12 U	14 U	11 U	12 U
CIS-1,3-DICHLOROPROPENE	12 U	12 U	14 U	11 U	12 U
ETHYLBENZENE	12 U	12 U	14 U	11 U	12 U
METHYLENE CHLORIDE	2 B	3 B	12 B	2 B	3 B
STYRENE	12 U	12 U	14 U	11 U	12 U
TETRACHLOROETHENE	12 U	12 U	14 U	11 U	12 U
TOLUENE	12 U	12 U	1 J	11 U	12 U
TRANS-1,3-DICHLOROPROPENE	12 U	12 U	14 U	11 U	12 U
TRICHLOROETHENE	12 U	12 U	14 U	11 U	12 U
VINYL CHLORIDE	12 U	12 U	14 U	11 U	12 U
XYLENES, TOTAL	12 U	12 U	14 U	11 U	12 U
SEMIVOLATILES (ug/kg)					
1,2,4-TRICHLOROBENZENE	390 U	380 U	440 U	370 U	390 U
1,2-DICHLOROBENZENE	390 U	380 U	440 U	370 U	390 U
1,3-DICHLOROBENZENE	390 U	380 U	440 U	370 U	390 U
1,4-DICHLOROBENZENE	390 U	380 U	440 U	370 U	390 U
2,2'-OXYBIS(1-CHLOROPROPANE)	390 U	380 U	440 U	370 U	390 U
2,4,5-TRICHLOROPHENOL	940 U	920 U	1100 U	900 U	940 U
2,4,6-TRICHLOROPHENOL	390 U	380 U	440 U	370 U	390 U
2,4-DICHLOROPHENOL	390 U	380 U	440 U	370 U	390 U
2,4-DIMETHYLPHENOL	390 U	380 U	440 U	370 U	390 U
2,4-DINITROPHENOL	940 U	920 U	1100 U	900 U	940 U

SITE 3
FORMER NSWC-WHITE OAK
SILVER SPRING AND ADELPHI, MARYLAND
SUMMARY OF ANALYTICAL RESULTS FOR SUBSURFACE SOIL

SAMPLE I.D.:	3SU1020200	3SU1040300	3SU1050300	3SU1060300	3SU1070300
LOCATION:	3SB102/SGW102	3SB104/SGW104	3SB105	3SB106	3SB107
SAMPLE DATE:	12/18/98	12/18/98	12/18/98	12/18/98	12/18/98
DEPTH INTERVAL (FEET):	2.0 - 3.5	3.0 - 3.0	3.0 - 3.0	3.0 - 3.0	3.0 - 3.0
VALIDATION STATUS:	VALIDATED	VALIDATED	VALIDATED	VALIDATED	VALIDATED
2,4-DINITROTOLUENE	390 U	380 U	440 U	370 U	390 U
2,6-DINITROTOLUENE	390 U	380 U	440 U	370 U	390 U
2-CHLORONAPHTHALENE	390 U	380 U	440 U	370 U	390 U
2-CHLOROPHENOL	390 U	380 U	440 U	370 U	390 U
2-METHYLNAPHTHALENE	390 U	380 U	440 U	370 U	390 U
2-METHYLPHENOL	390 U	380 U	440 U	370 U	390 U
2-NITROANILINE	940 U	920 U	1100 U	900 U	940 U
2-NITROPHENOL	390 U	380 U	440 U	370 U	390 U
3,3'-DICHLOROBENZIDINE	390 U	380 U	440 U	370 U	390 U
3-NITROANILINE	940 U	920 U	1100 U	900 U	940 U
4,6-DINITRO-2-METHYLPHENOL	940 U	920 U	1100 U	900 U	940 U
4-BROMOPHENYL PHENYL ETHER	390 U	380 U	440 U	370 U	390 U
4-CHLORO-3-METHYLPHENOL	390 U	380 U	440 U	370 U	390 U
4-CHLOROANILINE	390 U	380 U	440 U	370 U	390 U
4-CHLOROPHENYL PHENYL ETHER	390 U	380 U	440 U	370 U	390 U
4-METHYLPHENOL	390 U	380 U	440 U	370 U	390 U
4-NITROANILINE	940 U	920 U	1100 U	900 U	940 U
4-NITROPHENOL	940 U	920 U	1100 U	900 U	940 U
ACENAPHTHENE	390 U	380 U	440 U	370 U	390 U
ACENAPHTHYLENE	390 U	380 U	440 U	370 U	390 U
ANTHRACENE	390 U	380 U	440 U	370 U	390 U
BENZO(A)ANTHRACENE	390 U	380 U	440 U	370 U	390 U
BENZO(A)PYRENE	390 U	380 U	440 U	370 U	390 U
BENZO(B)FLUORANTHENE	390 U	380 U	440 U	370 U	390 U
BENZO(G,H,I)PERYLENE	390 U	380 U	440 U	370 U	390 U
BENZO(K)FLUORANTHENE	390 U	380 U	440 U	370 U	390 U
BIS(2-CHLOROETHOXY)METHANE	390 U	380 U	440 U	370 U	390 U
BIS(2-CHLOROETHYL)ETHER	390 U	380 U	440 U	370 U	390 U
BIS(2-ETHYLHEXYL)PHTHALATE	390 U	380 U	440 U	370 U	390 U
BUTYLBENZYL PHTHALATE	390 U	380 U	440 U	370 U	390 U
CARBAZOLE	390 U	380 U	440 U	370 U	390 U
CHRYSENE	390 U	380 U	440 U	370 U	390 U
DI-N-BUTYL PHTHALATE	390 U	380 U	440 U	370 U	390 U
DI-N-OCTYL PHTHALATE	390 U	380 U	440 U	370 U	390 U
DIBENZO(A,H)ANTHRACENE	390 U	380 U	440 U	370 U	390 U
DIBENZOFURAN	390 U	380 U	440 U	370 U	390 U
DIETHYL PHTHALATE	390 U	380 U	440 U	370 U	390 U
DIMETHYL PHTHALATE	390 U	380 U	440 U	370 U	390 U
FLUORANTHENE	390 U	380 U	440 U	370 U	390 U
FLUORENE	390 U	380 U	440 U	370 U	390 U
HEXACHLOROBENZENE	390 U	380 U	440 U	370 U	390 U
HEXACHLOROBUTADIENE	390 U	380 U	440 U	370 U	390 U
HEXACHLOROCYCLOPENTADIENE	390 U	380 U	440 U	370 U	390 U
HEXACHLOROETHANE	390 U	380 U	440 U	370 U	390 U
INDENO(1,2,3-CD)PYRENE	390 U	380 U	440 U	370 U	390 U

SITE 3
FORMER NSWC-WHITE OAK
SILVER SPRING AND ADELPHI, MARYLAND
SUMMARY OF ANALYTICAL RESULTS FOR SUBSURFACE SOIL

SAMPLE I.D.:	3SU1020200	3SU1040300	3SU1050300	3SU1060300	3SU1070300
LOCATION:	3SB102/SGW102	3SB104/SGW104	3SB105	3SB106	3SB107
SAMPLE DATE:	12/18/98	12/18/98	12/18/98	12/18/98	12/18/98
DEPTH INTERVAL (FEET):	2.0 - 3.5	3.0 - 3.0	3.0 - 3.0	3.0 - 3.0	3.0 - 3.0
VALIDATION STATUS:	VALIDATED	VALIDATED	VALIDATED	VALIDATED	VALIDATED
ISOPHORONE	390 U	380 U	440 U	370 U	390 U
N-NITROSO-DI-N-PROPYLAMINE	390 U	380 U	440 U	370 U	390 U
N-NITROSODIPHENYLAMINE	390 U	380 U	440 U	370 U	390 U
NAPHTHALENE	390 U	380 U	440 U	370 U	390 U
NITROBENZENE	390 U	380 U	440 U	370 U	390 U
PENTACHLOROPHENOL	940 U	920 U	1100 U	900 U	940 U
PHENANTHRENE	390 U	380 U	440 U	370 U	390 U
PHENOL	390 U	380 U	89 J	370 U	390 U
PYRENE	390 U	380 U	440 U	370 U	390 U
PESTICIDES/PCBs (ug/kg)					
4,4'-DDD	3.9 U	3.8 U	4.5 U	3.7 U	3.9 U
4,4'-DDE	3.9 U	3.8 U	2.4 J	3.7 U	3.9 U
4,4'-DDT	3.9 U	3.8 U	4.5 U	3.7 U	3.9 U
ALDRIN	2.0 U	2.0 U	2.3 U	1.9 U	2.0 U
ALPHA-BHC	2.0 U	2.0 U	2.3 U	1.9 U	2.0 U
ALPHA-CHLORDANE	2.0 U	2.0 U	13.0 J	1.9 U	2.0 U
AROCLOR-1016	39 U	38 U	45 U	37 U	39 U
AROCLOR-1221	78 U	78 U	91 U	75 U	79 U
AROCLOR-1232	39 U	38 U	45 U	37 U	39 U
AROCLOR-1242	39 U	38 U	45 U	37 U	39 U
AROCLOR-1248	39 U	38 U	45 U	37 U	39 U
AROCLOR-1254	39 U	38 U	45 U	37 U	39 U
AROCLOR-1260	39 U	38 U	45 U	37 U	39 U
BETA-BHC	2.0 U	2.0 U	2.3 U	1.9 U	2.0 U
DELTA-BHC	2.0 U	2.0 U	1.2 R	1.9 U	2.0 U
DIELDRIN	3.9 U	3.8 U	4.5 U	3.7 U	3.9 U
ENDOSULFAN I	2.0 U	2.0 U	2.3 U	1.9 U	2.0 U
ENDOSULFAN II	3.9 U	3.8 U	4.5 U	3.7 U	3.9 U
ENDOSULFAN SULFATE	3.9 U	3.8 U	4.5 U	3.7 U	3.9 U
ENDRIN	3.9 U	3.8 U	4.5 U	3.7 U	3.9 U
ENDRIN ALDEHYDE	3.9 U	3.8 U	4.5 U	3.7 U	3.9 U
ENDRIN KETONE	3.9 U	3.8 U	4.5 U	3.7 U	3.9 U
GAMMA-BHC (LINDANE)	2.0 U	2.0 U	2.3 U	1.9 U	2.0 U
GAMMA-CHLORDANE	2.0 U	2.0 U	15	1.9 U	2.0 U
HEPTACHLOR	2.0 U	2.0 U	2.3 U	1.9 U	2.0 U
HEPTACHLOR EPOXIDE	2.0 U	2.0 U	2.3 U	1.9 U	2.0 U
METHOXYCHLOR	20 U	20 U	23 U	19 U	20 U
TOXAPHENE	200 U	200 U	230 U	190 U	200 U
EXPLOSIVES (mg/kg)					
1,3,5-TRINITROBENZENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
1,3-DINITROBENZENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2,4 DINITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2,4,6-TRINITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2,6 DINITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2-AMINO-4,6-DINITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U

SITE 3
FORMER NSWC-WHITE OAK
SILVER SPRING AND ADELPHI, MARYLAND
SUMMARY OF ANALYTICAL RESULTS FOR SUBSURFACE SOIL

SAMPLE I.D.:	3SU1020200	3SU1040300	3SU1050300	3SU1060300	3SU1070300
LOCATION:	3SB102/SGW102	3SB104/SGW104	3SB105	3SB106	3SB107
SAMPLE DATE:	12/18/98	12/18/98	12/18/98	12/18/98	12/18/98
DEPTH INTERVAL (FEET):	2.0 - 3.5	3.0 - 3.0	3.0 - 3.0	3.0 - 3.0	3.0 - 3.0
VALIDATION STATUS:	VALIDATED	VALIDATED	VALIDATED	VALIDATED	VALIDATED
2-NITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
3-NITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
4-AMINO-2,6-DINITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
4-NITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
HMX	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
NITROBENZENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
RDX	0.50 U	0.04 J	0.50 U	0.50 U	0.50 U
TETRYL	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U
INORGANICS (mg/kg)					
ALUMINUM	3160	7510	8370	5700	11700
ANTIMONY	0.66 UL	0.65 UL	0.76 UL	0.63 UL	0.66 UL
ARSENIC	1.8 K	1.7 K	3.3 K	0.58 U	3.0 K
BARIUM	12.0	51.2	82.9	47.5	36.2
BERYLLIUM	0.08 B	0.14 B	0.25 B	0.16 B	0.01 U
CADMIUM	0.05 U	0.05 U	0.05 U	0.04 U	0.05 U
CALCIUM	187 B	185 B	632	188 B	284
CHROMIUM	9.0	10.8	12.2	6.1	18.1
COBALT	2.3	6.6	7.4	2.7	6.4
COPPER	7.8 J	7.8 J	10.4 J	3.0 J	17.8 J
CYANIDE	0.16 UL	0.29 B	0.18 UL	0.15 UL	0.16 UL
IRON	6640	10100	10800	4100	17600
LEAD	5.5	7.0	23.2	5.9	9.1
MAGNESIUM	274	1290	1790	673	2200
MANGANESE	31.2	243	412	260	106
MERCURY	0.06 B	0.06 U	0.15 B	0.06 U	0.07 B
NICKEL	2.3	10.3	16.8	4.9	11.9
POTASSIUM	174 J	531 J	561 J	304 J	862 J
SELENIUM	1.5 J	0.65 UJ	0.76 UJ	0.63 UJ	0.66 UJ
SILVER	0.17 U	0.16 U	0.19 U	0.16 U	0.16 U
SODIUM	19.5 U	34.7	34.3	49.4	38.0
THALLIUM	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U
VANADIUM	17.4	14.4	18.3	7.6	26.9
ZINC	19.4 J	28.7 J	40.9 J	21.5 J	38.7 J

D.3 HISTORIC ANALYTICAL DATA - SURFACE SOIL

Data Qualifiers

The following analytical data include data qualifiers that were added by the laboratory following sample analysis. The qualifiers can be interpreted as follows:

- U – indicates that the chemical was not detected at the numerical detection limit (quantitation limit) noted.
- J – indicates that the chemical was detected. However, the associated numerical result is not a precise representation of the amount that is actually present in the sample. The laboratory result is considered to be an estimate.

SITE 3
FORMER NSWC-WHITE OAK
SILVER SPRING AND ADELPHI, MARYLAND
SUMMARY OF ANALYTICAL RESULTS FOR HISTORICAL SOIL SAMPLES

SAMPLE I.D.: LOCATION: SAMPLE DATE:	3SL1 a mp(OLD) 03SL1 1989	3SL2 a mp(OLD) 03SL2 1989	3SL3 b mp(OLD) 03SL3 1991	3SL4 b mp(OLD) 03SL4 1991
VOLATILES (µg/kg)				
ACETONE	N/A	N/A	36	80
METHYLENE CHLORIDE	N/A	N/A	58	48
SEMIVOLATILES (µg/kg)				
ANTHRACENE	1300 J	2200 U	ND	ND
BENZO(A)ANTHRACENE	5200	2300	ND	ND
BENZO(A)PYRENE	4800	2600	ND	ND
BENZO(B)FLUORANTHENE	4700	2700	ND	ND
BENZO(G,H,I)PERYLENE	2600	1200	ND	ND
BENZO(K)FLUORANTHENE	4200	2000 J	ND	ND
CHRYSENE	5000	2500	ND	ND
DI-N-BUTYL PHTHALATE	15000	7200	ND	ND
DIBENZO(A,H)ANTHRACENE	1100 JX	2200 U	ND	ND
FLUORANTHENE	14000	5400	ND	ND
INDENO(1,2,3-CD)PYRENE	2600	1200	ND	ND
PHENANTHRENE	7400	2900	ND	ND
PYRENE	9600	4000	ND	ND
INORGANICS (mg/kg)				
ALUMINUM	40 U	40 U	40 U	40 U
ANTIMONY	12 U	12 U	12 U	12 U
ARSENIC	2 U	2 U	2 U	2 U
BARIUM	40 U	40 U	40 U	40 U
BERYLLIUM	1 U	1 U	1 U	1 U
CADMIUM	60.1	5.6	1.1	5 U
CALCIUM	1000 U	1000 U	1000 U	1000 U
CHROMIUM	83	34.2	28	12
COBALT	25 U	25 U	25 U	25 U
COPPER	2530	241	16	22
IRON	20 U	20 U	20 U	20 U
LEAD	1460	141	92	20
MAGNESIUM	1000 U	1000 U	1000 U	1000 U
MANGANESE	3 U	3 U	3 U	3 U
MERCURY	12.4	1.7	N/A	N/A
NICKEL	8 U	8 U	8 U	8 U
POTASSIUM	1000 U	1000 U	1000 U	1000 U
SELENIUM	1 U	1 U	1 U	1 U
SILVER	2 U	2 U	2 U	2 U
SODIUM	1000 U	1000 U	1000 U	1000 U
THALLIUM	2 U	2 U	2 U	2 U
VANADIUM	25 U	25 U	25 U	25 U
ZINC	7300	544	20	38

ND - Not detected
N/A - Not applicable

APPENDIX E

COST ESTIMATES

Site 3 – The Pistol Range Landfill
The former NSWC-White Oak
Silver Spring and Adelphi, Maryland

General Assumptions

The RAC would use the building on Sims Road as an office and for storage. Therefore, costs associated with office and storage trailer rental would not be incurred.

There would be a decontamination pad available at Site 4. Therefore, additional construction costs would not be incurred.

The landfill limits have been accurately delineated and waste does not extend past Westfarm Branch, the perimeter fence, Perimeter Road, and Dahlgren Road.

The estimated in-place volume of fill (waste) is 13,000 cubic yards based on the volume calculation presented in Section 1.11.3.

Due to the potential for UXO to exist at the site, an UXO-trained technician would be on site during all intrusive activities.

A 12-inch reinforced concrete pipe under Northern Perimeter Road extends into the southeast corner of Site 3 and emerges in a swale that drains into Westfarm Branch. There are no other buried utilities within the landfill footprint.

An overhead utility line is approximately 15 feet south of the fence line. Temporary relocation and replacement of this line may be required during the removal action. Costs have been included in the estimates.

RCRA C Landfill Cap

The outlet of the 12-inch reinforced concrete pipe under Northern Perimeter Road that extends into the southeastern corner of the site will be relocated so that discharge would not impact the wall or landfill cap.

Existing upgradient and downgradient groundwater wells provide sufficient monitoring of the underlying aquifer. Additional wells will not be installed.

Project duration would be 6 months. Gravity wall installation, including placement of additional fill to establish grades, would require 49 days (approximately 2 months). Cap construction would require 2 months. One month each would be required for mobilization/site preparation and demobilization/site restoration.

Contaminated Soil Removal

Material buried at Site 3 would be characterized prior to mobilization by excavating test pits and collecting representative samples of the landfill material. Excavated material would be hauled to the staging area (Site 4), where it would be loaded into trucks for immediate off-site transportation and disposal. Roll-off boxes would not be used.

Respiratory protection would not be required.

Ten percent of the material (2,040 cy) would be classified hazardous for disposal purposes and would be disposed at a RCRA Subtitle C landfill (1,836 cy) or hazardous waste incinerator (204 cy). The remainder of the material (18,360 cy) would be disposed at a municipal solid waste landfill. See Appendix A for volume calculations.

A production rate of 300 cy/day was assumed. This rate considers excavation, hauling to the stockpile area, and staging. The re-loading of the soil from the staging area for off-site transportation and disposal may vary.

Since future remedial investigation to characterize Site 3 is anticipated, no confirmatory samples would be collected following waste excavation.

Site 3 would not be returned to existing grade but only graded/backfilled sufficiently to establish gradual slopes to Westfarm Branch and to support vegetation.

A WSSC sewer right-of-way is adjacent to Site 3, west of the stream. This right-of-way is 30 feet. It has been assumed that necessary approvals/permits to excavate material within the right-of-way would be obtained. Interference with the sewer pipe would not occur.

Costs for site restoration activities that are required at Site 4 (due to its use as a staging/decontamination area) are not included in the estimate.

Project duration would be 5 months. Excavation of the waste would require 68 days (at 300 cy/day) or 3 months (22 working days per month). Site preparation would require 1 month and would be performed prior to excavation. Loading remaining material out of the staging area and site restoration would require 1 month following excavation.

SITE 3 - THE PISTOL RANGE LANDFILL
THE FORMER NSWC-WHITE OAK
SILVER SPRING, MARYLAND
ALTERNATIVE 2: EXCAVATION, OFF-SITE TREATMENT OR OFF-SITE LANDFILL DISPOSAL, AND SITE RESTORATION

DRAFT

Item	Quantity	Unit	Unit Cost Subcontract	Unit Cost Material	Unit Cost Labor	Unit Cost Equipment	Extended Cost Subcontract	Extended Cost Material	Extended Cost Labor	Extended Cost Equipment	Subtotal	Comments
1 MOBILIZATION/DEMOBILIZATION												
1.1 Utility connections (electric and phone)	1	ls	$1,500.00				$1,500	$0	$0	$0	$1,500	
1.2 Site utilities - usage	5	mo		$240.00			$0	$1,200	$0	$0	$1,200	
1.3 Personnel mobilization/demobilization	10	ea			$500.00		$0	$0	$5,000	$0	$5,000	
1.4 Equipment mobilization/demobilization	1	ls	$2,000.00				$2,000	$0	$0	$0	$2,000	trailers, excavator, FEL
1.5 Office equipment/supplies	1	ls		$2,000.00		$5,000.00	$0	$2,000	$0	$5,000	$7,000	computers, phones, copier
2 DECONTAMINATION												
2.1 Decontamination trailer	5	mo		$1,500.00			$0	$7,500	$0	$0	$7,500	
2.2 Clean water storage tank	5	mo				$150.00	$0	$0	$0	$750	$750	
2.3 Spent water storage tank	5	mo				$150.00	$0	$0	$0	$750	$750	
2.4 Pressure washer	5	mo				$465.00	$0	$0	$0	$2,325	$2,325	duration of excav and disp. activiti
2.5 Transportation and disposal of decontamination water	6845	gal	$2.00				$13,690	$0	$0	$0	$13,690	5 gallons/truck
2.6 Waste profile decontamination water	1	ls	$1,000.00				$1,000	$0	$0	$0	$1,000	
2.7 PPE	1	ls		$1,000.00			$0	$1,000	$0	$0	$1,000	
3 SITE PREPARTION												
3.1 Construction survey	1.5	ac	$760.00				$1,140	$0	$0	$0	$1,140	limits of removal action
3.2 Construction soil staging area	1	ls		$4,000.00	$1,716.00		$0	$4,000	$1,716	$0	$5,716	60 mil liner, straw bales
3.3 Clear and grub, heavy	0.7	ac			$1,225.00	$3,400.00	$0	$0	$858	$2,380	$3,238	
3.4 Remove trees, to 36" diameter	20	ea			$138.00	$148.00	$0	$0	$2,760	$2,960	$5,720	
3.5 Super silt fence	400	lf		$1.22	$2.21	$1.92	$0	$488	$884	$768	$2,140	
3.6 Temporarily relocate utility poles within landfill footprint	8	ea	$615.00				$4,920	$0	$0	$0	$4,920	
3.7 Modify stream channel to facilitate construction	1	ls		$2,500.00	$3,710.00	$1,850.00	$0	$2,500	$3,710	$1,850	$8,060	3 laborers, 1 equip op, excav, mat
4 EXCAVATION												
4.1 Excavator w/ operator to excavate/load buried waste	68	day			$268.10	$465.00	$0	$0	$18,231	$31,620	$49,851	Level C PPE
4.2 Photoionization detector to screen excavated material	68	day				$169.40	$0	$0	$0	$11,519	$11,519	
4.3 Off-road dump trucks to move excavated material to staging a	68	day			$353.60	$382.00	$0	$0	$24,045	$25,976	$50,021	2 dump trucks w/ drivers
4.4 Excavator w/ operator to load material at staging area	68	day			$268.10	$465.00	$0	$0	$18,231	$31,620	$49,851	Level C PPE
4.5 Laborers for PID, logistics, and confirmatory sampling	68	day			$404.98		$0	$0	$27,538	$0	$27,538	2 laborers, dur of excav/trans; Level C PPE
4.6 UXO technician on site during excavation	68	day	$2,250.00				$153,000	$0	$0	$0	$153,000	EOD personnel + equip, 10 hours/
4.7 Maintain staging area	1	ls		$2,000.00	$1,000.00		$0	$2,000	$1,000	$0	$3,000	
5 OFF-SITE DISPOSAL												
5.1 Transport waste to an incinerator (16 @ 350 mi)	5600	mi	$3.50				$19,600	$0	$0	$0	$19,600	20 tons/truck
5.2 Dispose of material at an incinerator	306	ton	$700.00				$214,200	$0	$0	$0	$214,200	WTI East Liverpool, OH (1 percent
5.3 Transport waste to RCRA Subtitle C landfill (138 @ 350 mi)	48300	mi	$3.50				$169,050	$0	$0	$0	$169,050	20 tons/truck
5.4 Dispose of material at RCRA Subtitle C landfill	2754	ton	$65.00				$179,010	$0	$0	$0	$179,010	CWM Model City, NY (9 percent)
5.5 Transport and dispose of material at MSW landfill	27540	ton	$38.00				$1,046,520	$0	$0	$0	$1,046,520	1.5 tons/cy
5.6 Transport and dispose of UXO	1	ls	$10,000.00				$10,000	$0	$0	$0	$10,000	
5.7 Waste disposal application fees	3	ls	$3,000.00				$9,000	$0	$0	$0	$9,000	
6 SITE RESTORATION												
6.1 Grade disturbed area	65	msf			$4.99	$10.50	$0	$0	$324	$683	$1,007	
6.2 Import vegetative cover	1200	cy		$16.70			$0	$20,040	$0	$0	$20,040	
6.3 Place, grade vegetative cover	1200	cy			$0.31	$0.84	$0	$0	$372	$1,008	$1,380	
6.4 Vegetate site	65	msf		$29.00	$7.20	$7.55	$0	$1,885	$468	$491	$2,844	utility mix w/ mulch and fertilizer
6.5 Slope stabilization (erosion control blankets)	270	sy		$2.88	$0.34		$0	$778	$92	$0	$869	
6.6 Disconnect utilities	1	ls	$500.00				$500	$0	$0	$0	$500	
6.7 Re-establish stream channel	1	ls		$2,000.00	$3,710.00	$1,850.00	$0	$2,000	$3,710	$1,850	$7,560	
6.8 Replace wetlands	0.1	ac	$10,000.00				$1,000	$0	$0	$0	$1,000	
6.9 Repair culverts that convey stream beneath Dahlgren Road	20	lf		$53.50	$20.50	$12.40	$0	$1,070	$410	$248	$1,728	2, 10-foot sections (one per culver
6.10 Install wing walls on upstream side of Dahlgren Road	1	ls		$790.00	$1,000.00	$1,375.00	$0	$790	$1,000	$1,375	$3,165	
7 OFFICE SUPPORT/FIELD SUPPORT												
7.1 Site Supervisor	20	week			$980.00		$0	$0	$19,600	$0	$19,600	
7.2 Job Foreman	20	week			$674.00		$0	$0	$13,480	$0	$13,480	
7.3 Project Accountant	20	week			$550.00		$0	$0	$11,000	$0	$11,000	
7.4 Health and Safety Officer	20	week			$647.00		$0	$0	$12,940	$0	$12,940	
7.5 Site Engineer	20	week			$663.00		$0	$0	$13,260	$0	$13,260	
7.6 Project Manager (office - 1/2 time)	10	week			$1,158.00		$0	$0	$11,580	$0	$11,580	
7.7 Project Engineer (office - 1/2 time)	10	week			$999.00		$0	$0	$9,990	$0	$9,990	
8 PROJECT DOCUMENTATION												
8.1 Pre- and post-construction submittals	1000	hours			$40.00		$0	$0	$40,000	$0	$40,000	
8.2 Post-removal survey	1.5	ac	$1,975.00				$2,963	$0	$0	$0	$2,963	limits of removal action and topo
8.3 Sampling and waste characterization	1	ls	$5,000.00	$500.00	$1,000.00	$2,000.00	$5,000	$500	$1,000	$2,000	$8,500	

THE FORMER NSWC-WHITE OAK
SILVER SPRING, MARYLAND
ALTERNATIVE 2: EXCAVATION, OFF-SITE TREATMENT OR OFF-SITE LANDFILL DISPOSAL, AND SITE RESTORATION

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Item	Quantity	Unit	Unit Cost Subcontract	Unit Cost Material	Unit Cost Labor	Unit Cost Equipment	Extended Cost Subcontract	Extended Cost Material	Extended Cost Labor	Extended Cost Equipment	Subtotal	Comments
Subtotal Direct Costs less Subcontract								$47,751	$243,198	$125,172	$416,121	
Local Area Adjustments								105%	92%	92%		
Subtotal								$50,138	$223,742	$115,159	$389,039	
Overhead on Labor Cost @ 30%									$67,123		$67,123	
G & A on Labor Cost @ 10%									$22,374		$22,374	
G & A on Material Cost @ 10%								$5,014			$5,014	
Total Direct Cost								$55,152	$313,239	$115,159	$483,549	
Indirects on Total Direct Labor Cost @ 30%									$93,972		$93,972	
Profit on Total Direct Cost @ 10%											$48,355	
Subtotal											$625,876	
Health & Safety Monitoring @											$10,000	
Total Field Cost											**$635,876**	
Subtotal Subcontractor Cost							$1,834,093				$1,834,093	
G & A on Subcontract Cost @ 10%							$183,409				$183,409	
Profit on Subcontractor Cost @ 5%											$91,705	
Subcontractor Cost											**$2,109,206**	
Contingency on Total Field and Subcontractor Costs @ 15%											**$411,762**	
Engineering/Permitting											**$50,000**	
TOTAL COST											**$3,206,845**	

SITE 3 - THE PISTOL RANGE LANDFILL
THE FORMER NSWC-WHITE OAK
SILVER SPRING AND ADELPHI, MARYLAND
ALTERNATIVE 3: CONTAINMENT AND INSTITUTIONAL CONTROLS

DRAFT

Item	Quantity	Unit	Unit Cost Subcontract	Unit Cost Material	Unit Cost Labor	Unit Cost Equipment	Extended Cost Subcontract	Extended Cost Material	Extended Cost Labor	Extended Cost Equipment	Subtotal	Comments
1 MOBILIZATION/DEMOBILIZATION												
1.1 Utility connections (electric and phone)	1	ls	$1,500.00				$1,500	$0	$0	$0	$1,500	
1.2 Site utilities - usage	6	mo		$240.00			$0	$1,440	$0	$0	$1,440	
1.3 Personnel mobilization/demobilization	10	ea			$500.00		$0	$0	$5,000	$0	$5,000	
1.4 Equipment mobilization/demobilization	1	ls	$3,000.00				$3,000	$0	$0	$0	$3,000	trailers, excavator, FEL
1.5 Office equipment/supplies	1	ls		$2,000.00		$5,000.00	$0	$2,000	$0	$5,000	$7,000	computers, phones, copier
2 DECONTAMINATION												
2.1 Decontamination trailer	3	mo		$1,500.00			$0	$4,500	$0	$0	$4,500	
2.2 Clean water storage tank	3	mo				$150.00	$0	$0	$0	$450	$450	
2.3 Spent water storage tank	3	mo				$150.00	$0	$0	$0	$450	$450	
2.4 Pressure washer	3	mo				$465.00	$0	$0	$0	$1,395	$1,395	duration of grading activities
2.5 Transportation and disposal of decontamination water	500	gal	$2.00				$1,000	$0	$0	$0	$1,000	
2.6 Waste profile decontamination water	1	ls	$1,000.00				$1,000	$0	$0	$0	$1,000	
2.7 PPE	1	ls		$500.00			$0	$500	$0	$0	$500	
3 SITE PREPARTION												
3.1 Construction survey	2	ac	$1,975.00				$3,950	$0	$0	$0	$3,950	
3.2 Clear and grub, heavy	0.7	ac			$1,225.00	$3,400.00	$0	$0	$858	$2,380	$3,238	
3.3 Remove trees, to 36" diameter	20	ea			$138.00	$148.00	$0	$0	$2,760	$2,960	$5,720	
3.4 Super silt fence	400	lf		$1.22	$2.21	$1.92	$0	$488	$884	$768	$2,140	
3.5 Relocate utility poles within landfill footprint	8	ea	$615.00				$4,920	$0	$0	$0	$4,920	
3.6 Modify stream channel to facilitate construction	1	ls		$2,500.00	$3,710.00	$1,850.00	$0	$2,500	$3,710	$1,850	$8,060	3 laborers, 1 equip op, excav, mat
4 INSTALL GRAVITY WALL/GRADE SITE												
4.1 Concrete gravity wall	550	lf		$165.00	$196.50	$34.50	$0	$90,750	$108,075	$18,975	$217,800	12 feet per day
4.2 Dozer with operator (200 HP) - minimal site grading	5	day			$268.10	$559.00	$0	$0	$1,341	$2,795	$4,136	Level C PPE
4.3 Import fill to bring site to grade	5000	cy		$6.65			$0	$33,250	$0	$0	$33,250	
4.4 Place, grade, compact fill - dozer with operator	10	day			$227.20	$559.00	$0	$0	$2,272	$5,590	$7,862	
4.5 UXO technician on-site during grading and wall installation	38	day	$2,250.00				$85,500	$0	$0	$0	$85,500	EOD personnel + equip, 10 hours
4.6 Transport and dispose of UXO	1	ls	$5,000.00				$5,000	$0	$0	$0	$5,000	
5 INSTALL LANDFILL CAP												
5.1 RCRA C landfill cap	2	ac		$87,500.00	$87,500.00	$75,000.00	$0	$175,000	$175,000	$150,000	$500,000	
6 SITE RESTORATION												
6.1 Disconnect utilities	1	ls	$500.00				$500	$0	$0	$0	$500	
6.2 Re-establish stream channel	1	ls		$2,000.00	$3,710.00	$1,850.00	$0	$2,000	$3,710	$1,850	$7,560	
6.3 Repair culverts that convey stream beneath Dahlgren Road	20	lf		$53.50	$20.50	$12.40	$0	$1,070	$410	$248	$1,728	2, 10-foot sections (one per culver
6.4 Install wing walls on upstream side of Dahlgren Road	1	ls		$790.00	$1,000.00	$1,375.00	$0	$790	$1,000	$1,375	$3,165	
6.5 Re-route 12" RCP pipe discharge	80	lf		$8.74	$8.22	$2.79	$0	$699	$658	$223	$1,580	
6.6 Install 8' chain link fence	465	lf		$17.95	$4.17	$3.00	$0	$8,347	$1,939	$1,395	$11,681	Along Dahlgren and Perimeter Rd
6.7 Install 8' gate	1	ea		$700.00	$350.00	$253.00	$0	$700	$350	$253	$1,303	
7 OFFICE SUPPORT/FIELD SUPPORT												
7.1 Site Supervisor	24	week			$980.00		$0	$0	$23,520	$0	$23,520	
7.2 Job Foreman	24	week			$674.00		$0	$0	$16,176	$0	$16,176	
7.3 Project Accountant	24	week			$550.00		$0	$0	$13,200	$0	$13,200	
7.4 Health and Safety Officer	24	week			$647.00		$0	$0	$15,528	$0	$15,528	
7.5 Site Engineer	24	week			$663.00		$0	$0	$15,912	$0	$15,912	
7.6 Project Manager (office - 1/2 time)	12	week			$1,158.00		$0	$0	$13,896	$0	$13,896	
7.7 Project Engineer (office - 1/2 time)	12	week			$999.00		$0	$0	$11,988	$0	$11,988	
8 PROJECT DOCUMENTATION												
8.1 Pre- and post-construction submittals	1500	hours			$40.00		$0	$0	$60,000	$0	$60,000	
8.2 Post-construction survey	2	ac	$1,975.00				$3,950	$0	$0	$0	$3,950	landfill cap
8.3 Long-term monitoring plan	1	ls	$25,000.00				$25,000	$0	$0	$0	$25,000	

THE FORMER NSWC-WHITE OAK
SILVER SPRING AND ADELPHI, MARYLAND
ALTERNATIVE 3: CONTAINMENT AND INSTITUTIONAL CONTROLS

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Item	Quantity	Unit	Unit Cost Subcontract	Unit Cost Material	Unit Cost Labor	Unit Cost Equipment	Extended Cost Subcontract	Extended Cost Material	Extended Cost Labor	Extended Cost Equipment	Subtotal	Comments
Subtotal Direct Costs less Subcontract								$324,034	$478,186	$197,957	$1,000,177	
Local Area Adjustments								105%	92%	92%		
Subtotal								$340,236	$439,931	$182,121	$962,287	
Overhead on Labor Cost @	30%								$131,979		$131,979	
G & A on Labor Cost @	10%								$43,993		$43,993	
G & A on Material Cost @	10%							$34,024			$34,024	
Total Direct Cost								$374,259	$615,903	$182,121	$1,172,283	
Indirects on Total Direct Labor Cost @	30%								$184,771		$184,771	
Profit on Total Direct Cost @	10%										$117,228	
Subtotal											$1,474,282	
Health & Safety Monitoring @											$10,000	
Total Field Cost											**$1,484,282**	
Subtotal Subcontractor Cost							$135,320				$135,320	
G & A on Subcontract Cost @	10%						$13,532				$13,532	
Profit on Subcontractor Cost @	5%										$6,766	
Subcontractor Cost											**$155,618**	
Contingency on Total Field and Subcontractor Costs @	25%										**$409,975**	
Basis of Design Development/Permitting Issues											**$100,000**	
TOTAL COST											**$2,149,875**	

SITE 3 - THE PISTOL RANGE LANDFILL
THE FORMER NSWC-WHITE OAK
SILVER SPRING AND ADELPHI, MARYLAND
ALTERNATIVE 3: CONTAINMENT AND INSTITUTIONAL CONTROLS
Annual Operating and Maintenance Costs

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	Item	Qty	Unit	Unit Cost	Subtotal Cost	Notes
1	1 Laborer / 1 Day per Month for 12 Months	96	hr	$40	$3,840	
2	Mobilization & Demobilization (pickup truck)	12	ea	$200	$2,400	
3	Misc. Materials (seed, rock, soil)	10	ea	$100	$1,000	
4	Misc. Equipment (mowers, hand tools)	10	ea	$200	$2,000	
	Total Annual Cost				$9,240	

SITE 3 - THE PISTOL RANGE LANDFILL
THE FORMER NSWC-WHITE OAK
SILVER SPRING AND ADELPHI, MARYLAND
ALTERNATIVE 3: CONTAINMENT AND INSTITUTIONAL CONTROLS
Annual Cost

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Item	Item Cost Annually	Item Cost per 5 Years	Notes
Sampling	$3,000		One technician, 2 days, twice per year, includes mobilization, travel expenses, and supplies
Analysis/Water	$7,500		Two rounds of groundwater samples per year - 5 wells. Analysis for TCL VOCs, TCL SVOCs, TAL metals, TCL pesticides/PCBs.
Annual Report	$5,000		
Site Review	-	$22,000	Every five years; 200 hours @ $100/hour + $2000 other costs
TOTALS	$15,500	$22,000	

SITE 3 - THE PISTOL RANGE LANDFILL
THE FORMER NSWC-WHITE OAK
SILVER SPRING AND ADELPHI, MARYLAND
ALTERNATIVE 3: CONTAINMENT AND INSTITUTIONAL CONTROLS
Present Worth Analysis

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Year	Capital Cost	Operation & Maintenance Cost	Annual Sampling Cost	Total Year Cost	Annual Discount Rate at 7%	Present Worth
0	$2,149,875			$2,149,875	1.000	$2,149,875
1		$9,240	$15,500	$24,740	0.935	$23,132
2		$9,240	$15,500	$24,740	0.873	$21,598
3		$9,240	$15,500	$24,740	0.816	$20,188
4		$9,240	$15,500	$24,740	0.763	$18,877
5		$9,240	$37,500	$46,740	0.713	$33,326
6		$9,240	$15,500	$24,740	0.666	$16,477
7		$9,240	$15,500	$24,740	0.623	$15,413
8		$9,240	$15,500	$24,740	0.582	$14,399
9		$9,240	$15,500	$24,740	0.544	$13,459
10		$9,240	$37,500	$46,740	0.508	$23,744
11		$9,240	$15,500	$24,740	0.475	$11,752
12		$9,240	$15,500	$24,740	0.444	$10,985
13		$9,240	$15,500	$24,740	0.415	$10,267
14		$9,240	$15,500	$24,740	0.388	$9,599
15		$9,240	$37,500	$46,740	0.362	$16,920
16		$9,240	$15,500	$24,740	0.339	$8,387
17		$9,240	$15,500	$24,740	0.317	$7,843
18		$9,240	$15,500	$24,740	0.296	$7,323
19		$9,240	$15,500	$24,740	0.277	$6,853
20		$9,240	$37,500	$46,740	0.258	$12,059
21		$9,240	$15,500	$24,740	0.242	$5,987
22		$9,240	$15,500	$24,740	0.226	$5,591
23		$9,240	$15,500	$24,740	0.211	$5,220
24		$9,240	$15,500	$24,740	0.197	$4,874
25		$9,240	$37,500	$46,740	0.184	$8,600
26		$9,240	$15,500	$24,740	0.172	$4,255
27		$9,240	$15,500	$24,740	0.161	$3,983
28		$9,240	$15,500	$24,740	0.150	$3,711
29		$9,240	$15,500	$24,740	0.141	$3,488
30		$9,240	$37,500	$46,740	0.131	$6,123
					TOTAL PRESENT WORTH	**$2,504,306**